AN ANALYSIS OF SOCIO-CULTURAL DETERMINANTS OF ANEMIA AMONG FEMALE OF AZAD JAMMU AND KASHMIR

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FORWARDING SHEET

This thesis entitled, "AN ANALYSIS OF SOCIO-CULTURAL DETERMINANTS OF ANEMIA AMONG FEMALE OF AZAD JAMMU AND KASHMIR" submitted by Nazneen Habib in partial fulfillment of the requirement of PhD in Sociology has been completed under my supervision. I am satisfied with quality and originality of the research work. I allow the researcher to submit the dissertation to the concerned authorities for further process as per rules and regulations.

Date________________ Supervisor_______________________

Prof. Dr. Saif-Ur-Rehman Saif Abbasi

STATEMENT OF UNDERSTANDING

I, Nazneen Habib Reg. No: 10-FSS/PhDSOC/S14, student of PhD Sociology, Department of Sociology, International Islamic University, Islamabad hereby declare that the thesis entitled "AN ANALYSIS OF SOCIO-CULTURAL DETERMINANTS OF ANEMIA AMONG FEMALE OF AZAD JAMMU AND KASHMIR" submitted in partial fulfillment for the requirement of PhD degree is my original work, except where otherwise acknowledged in the text.

Date_______________ Signature_________________

Nazneen Habib

DEDICATION

Dedicated to the memory of my parents and father-in-law

who always stand behind me

with their love, affection and unconditional support

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First and foremost, I would like to thank Almighty Allah, Lord of the Worlds, for giving me the strength, knowledge, wisdom and opportunity to undertake this research and complete it satisfactorily. Peace and salutation to the prophet Muhammad (Peace Be Upon Him) and his family, who guided the mankind to the divine path.

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Yasmeen Mir and my brothers Sarfaraz Mir, Gul Nawaz Mir, Shahnawaz Mir and Shoukat Nawaz and sister in-laws for their unconditional support. I owe heartiest regards to my father-in-law (late), mother-in-law and all in-laws for their prayers, moral support and encouragement.

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ABSTRACT

Anemia is an endemic public health problem affecting approximately two billion people worldwide. The global prevalence of anemia is estimated to be 25%, with 43% in developing and 9% in developed countries. The most vulnerable groups are pre-school children (42.6%), pregnant women (38.2%) and nonpregnant women (29.0%). In Pakistan, anemia is a neglected health problem and females are more susceptible to develop anemia at different stages of life span. Globally, anemia prevalence has decreased by 12% from 1995 to 2011, whereas in Pakistan it has increased from 28% to 50% among WRA from 2001 to 2011. The high prevalence of anemia in non-pregnant women poses a significant challenge to meet global target of 50% reduction in anemia among WRA by 2025 in Pakistan. To achieve target, better understanding of societal determinants of anemia and appropriate large-scale interventions are needed right from adolescence.

The present study was conducted to assess recent trends of anemia among adolescent girls (10-19 years) and married women (20-49 years) in AJK to identify more prevalent societal determinants and their drivers. A cross-sectional study was conducted on a sample size of 1529 respondents comprising of 626 adolescent girls and 903 married women in the Muzaffarabad division for understanding etiology of anemia and its societal determinants. The direct information from respondents was collected through the self-constructed interview schedule. Data sheet was prepared in SPSS 14.0 and responses were analyzed using univariate, bivariate, multiple linear regression (MLR) and data mining techniques.

The results revealed that anemia is a severe public-health problem among both adolescent girls and married women in AJK. Bivariate analysis of socio-economic variables (respondent's and her husband's education, respondent and her husband's occupation, respondent and her family monthly income, household and environmental factors), demographic *variables (age at marriage, prenatal care, heavy blood loss (HBL), number of pregnancies, average birth interval and communicable diseases (CDs)), cultural variables (family relationships, violence and knowledge about anemia) and nutritional variables nutritional variables (knowledge of balanced diet, meals regularity, iron supplementation and pica) were significantly associated with anemia among women. Among adolescent girls, socio-economic variables (parental education, parental and family monthly income, father's profession and sewerage type), demographic variables (healthcare utilization, HBL and CDs), cultural variables (exercise and knowledge about anemia) and nutritional variables (meals regularity and food supplementation) were significantly associated with anemia. The MLR analysis revealed that knowledge about barriers in anemia treatment, meals regularity, family monthly income, average birth interval and household structure showed positive effect, whereas, violence, HBL, CDs, pica intake and exacerbate family relations showed negative effect on the Hb level of married women. The respondent education, family monthly income, meals regularity and exercise showed positive effect, whereas, menstruation duration and CDs showed negative effect on the Hb level of the adolescent girls. All the classification algorithm classified anemic and non-anemic respondents with almost 100% accuracy except k-nearest neighbor approach. It is suggested that all the stakeholders should collaborate and synchronize efforts to combat anemia for meet global target of its 50% reduction among WRA by 2025.*

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ABBREVIATIONS/Symbols

AIDS	Acquired Immune Deficiency Syndrome
AJK	Azad Jammu and Kashmir
ANCOVA	Analysis of Co-variance
ANOVA	Analysis of Variance
DALYs	Disability-Adjusted Life Years
DHS	Demographic and Health Survey
DNA	Deoxyribonucleic Acid
EPI	Expanded Program on Immunization
FN	False Negative
FP	False Positive
IDA	Iron Deficiency Anemia
GGR	Global Gender Report
GHO	Global Health Observatory
IFA	Iron Folic Acid
Hb	Hemoglobin
HIV	Human Immunodeficiency Virus
k-NN	k-Nearest Neighbor
KPK	Khyber Pakhtunkhwa
LDA	Linear Discriminant Analysis
Logit	Logistic
MANCOVA	Multiple Analysis of Co-variance
MANOVA	Multiple Analysis of Variance
μg	microgram
mg	milligram
MDG	Millennium Development Goals
MLR	Multiple Linear Regression
MBL	Menstrual Blood Loss
NIH	National Institute of Health
NNMB	National Nutrition Monitoring Bureau
NIPS	National Institute of Population Studies
NNS	National Nutritional Survey

PDHS	Pakistan Demographic and Health Survey
OR	Odd Ratio
RCB	Red Blood Cell
RCC	Reinforce Concrete Construction
RF	Random Forest
SCA	Sickle Cell Anemia
SD	Standard Deviation
SDG	Sustainable Development Goals
SVM	Support Vector Machines
SVML	Support Vector Machines with linear kernel
SVMP	Support Vector Machines with polynomial kernel
SVMR	Support Vector Machines with regression kernel
SVMS	Support Vector Machines with sigmoid kernel
TN	True Negative
TP	True Positive
UNICEF	United Nation International Children Emergency Fund
VAD	Vitamin A Deficiency
WIFS	Weekly Iron and Folic Acid Supplementation
WHA	World Health Association
WHO	World Health Organization
WRA	Women of Reproductive Age

Chapter 1

Introduction

This chapter presents the preliminary information about anemia, assessment of anemia and its severity, different anemia types and the negative implications of anemia on the physical, mental and reproductive wellbeing of the females. The chapter discusses risk factors of anemia, its prevention and treatment. In addition, this chapter puts forward an overview of anemia as global public health problem, details anemia prevalence in the developing and developed countries, especially in the context of Pakistan. It briefly describes the problem statement and significance of the study, identify major contributing factors of anemia and to develop a framework for preventing anemia in the adolescent girls and married women in the region. Finally, it outlines main research objectives, major research hypotheses, research questions, study area profile and thesis outline.

1.1 Anemia

From clinical perspective, anemia is an insufficient quantity or quality of red blood cells (RBCs) and from public health viewpoint it is the deficient hemoglobin (Hb) concentration in the blood (World Health Organization [WHO], 2001a). Hb is a red pigmented protein found in RBCs that is responsible to carry oxygen from lungs to other body parts. The formation of Hb requires folate, folic acid, iron, minerals, vitamin A and vitamin B-12. Anemia leads to hypoxia, a condition in which oxygen becomes deficient which is vital to perform various body functions. Depending on the severity of anemia, it leads to wide range of health consequences. Anemia severity can be determined by its symptoms and Hb concentration and is categorized into mild, moderate, or severe anemia (Beutler & Waalen, 2006). Table 1.1 gives Hb levels for diagnosing mild, moderate

Table 1.1

Hb levels(g/dL) for diagnosing mild, moderate and severe anemia at sea level (WHO, 1989; WHO, 2011a)

Population	Age	Normal Range	Anemia		
			Mild	Moderate	Severe
Children	6-59 months	>=11 .0	10-10.9	7.0-9.9	< 7.0
Children	5-11 years	>=11 .5	11-11.4	8.0-10.9	< 7.0
Children	12-14 years	>=12.0	11-11.9	8.0-10.9	< 8.0
Pregnant Women	>= 15 years	>=11 .0	10-10.9	7.0-9.9	< 7.0
Non-pregnant Women	>= 15 years	>=12.0	11.0-11.9	8.0-10.9	< 8.0
Men	>= 15 years	>=13.0	11-11.9	8.0-10.9	< 8.0

and severe anemia. These levels were first published in 1968 by the WHO study group on nutritional anemias (WHO, 1968), which were slightly revised in 1989 (WHO, 1989) and then modified by splitting 5 to 14 years children in 5-11 years and 12-14 years (WHO, 2000).

Nutritional scarcities, infections, genetic disorders, reproductive health problems and poverty affect the anemia status among women. The deficiency of specific nutrients in the body essential for Hb production results in nutritional anemia. In human body iron plays vitally important role in the synthesis of Hb and its depleted stores in the body is the common cause of anemia. Deficient iron in the body is responsible of causing iron deficiency anemia (IDA) in 20% of the global population (Chen et al., 2005). Common reasons of anemia include heavy blood loss, small intake of dietary iron, production of deficient RBCs (due to chronic illness like cancer, kidney disease, diabetes, HIV/AIDS) and destruction of RBCs due to genetic disorders (sickle cell and hemolytic anemia).

1.2 Common Types of Anemia

Anemia has almost 400 different types, some of them are uncommon. Common types of anemia are briefly described below.

1.2.1 Iron deficiency anemia. The most common causes of anemia are dietary deficiencies wherein IDA is the major contributor of this ailment. According to WHO (2008a), 42% of pregnant women suffer from anemia; 50% of them are assumed as victims of IDA in malarial areas and 60% in non-malarial areas. Figure 1.1 shows the distribution and storage of body iron.

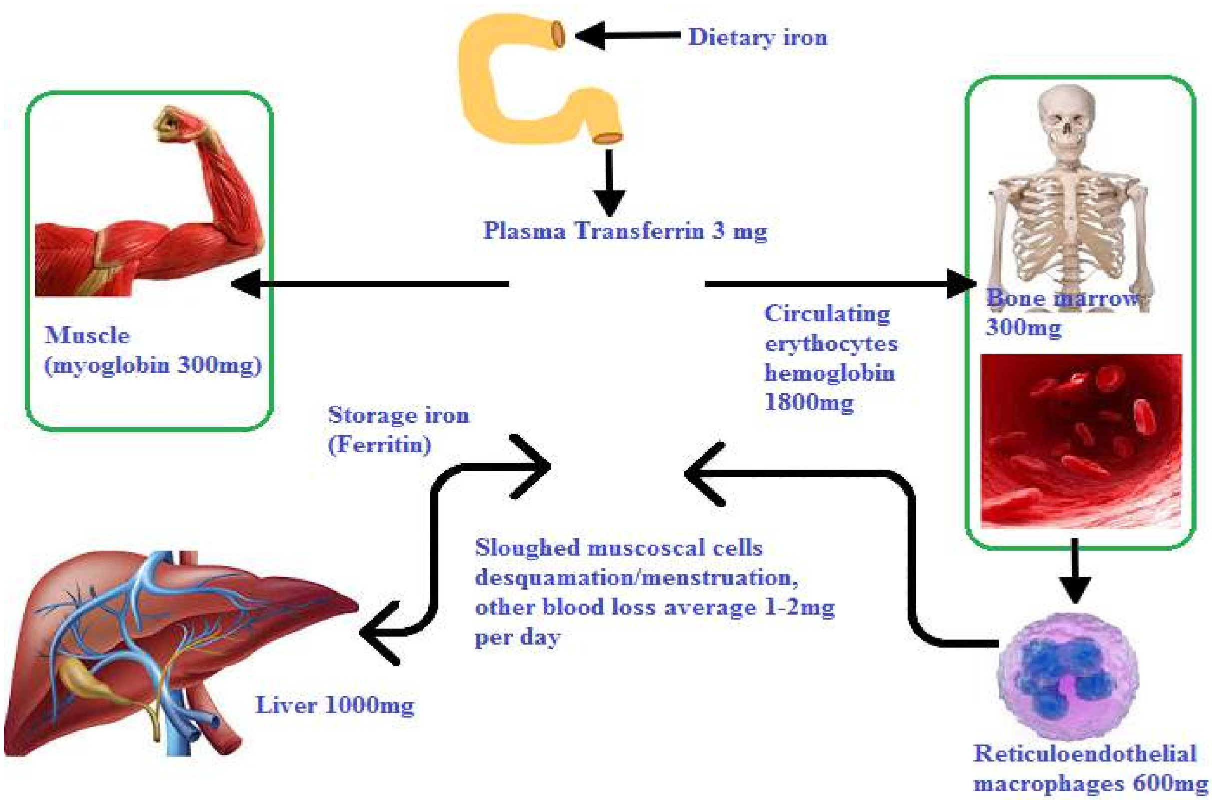

Figure 1.1: Distribution and storage of iron in the body

Dietary iron is required to compensate the basal iron loss (14µg per kg) through urine, stool and skin (WHO, 1989). The basal daily iron loss for an adult man weighing 65kg is 0.91mg and for an adult woman weighing 55kg is 0.77mg (WHO, 1970). The basal iron loss is same 14µg per kg for adult men and women (at menopause), while for women of reproductive age (WRA) iron loss due to menstruation must be added to the basal iron loss.

Table 1.2 shows age and sex based daily iron requirements in terms of iron absorbed. Infants and children require lesser iron but their iron needs per kg of body weight are markedly higher than adolescents and adults. Infants, children and adolescents need iron to grow their body

Table 1.2

Age and sex based daily iron requirements in terms of iron absorbed (WHO, 1989)

Age/status	Sex	Daily iron requirement	
		µg/kg	mg
4-12 months	Both male or female	120	0.96
13-24 months	Both male or female	56	0.61
2-5 years	Both male or female	44	0.70
6-11 years	Both male or female	40	1.17
12-16 years	Female	40	2.02
12-16 years	Male	34	1.82
16+	Adult male	18	1.14
at menopause	Female	18	0.96
Menstruating	Female	43	2.38
Lactating women	Female	24	1.31
Pregnant women	Female	1000mg required during whole pregnancy	

tissues and expand red cell mass. The women consume 1000mg iron during entire pregnancy: 1st trimester requires comparatively small iron (0.8mg/day), which increases substantially during 2nd and 3rd trimester to a value of 6.3mg/day (WHO, 1970; WHO, 1989).

Among WRA, adolescent girls and pregnant women are at the higher risk of developing IDA. Adolescent girls are vulnerable to anemia due to onset of menstruation and iron required for growth spurt, whist pregnant women the vulnerability to develop anemia is because of additional iron requirement of the body during pregnancy. The lactating mothers are vulnerable to IDA because blood loss during childbirth and depletion of iron in the body (Ross & Thomas, 1996). Anemia during pregnancy and/or inadequate nutritional intake increases the risk of postpartum anemia among lactating mothers (Sserunjogi et al., 2003; Lakew et al., 2015). The people who do not eat iron rich food, those suffering from diseases such as kidney failure or who have internal bleeding are also at the risk of developing IDA (NIH, 2011). The treatment of IDA includes utilization of iron rich diet and vitamin C for absorption of iron from food and iron supplements (NIH, 2011).

1.2.2 Folate deficiency anemia. Folic acid is a vitamin that helps in making normal blood cells in the body. The lack of folic acid in the blood causes Folate Deficiency Anemia (FDA) or megaloblastic anemia (RBCs grow larger than normal size). FDA decreases the DNA synthesis rate which impairs cell proliferation and causes intramedullary death of RBCs thereby shortening their lifespan (Tolentino & Friedman, (2007). Smoking and alcohol hinder the absorption of folate in the body (Batool, 2010) and can cause FDA.

1.2.3 Vitamin A deficiency anemia. Vitamin A Deficiency (VAD) is acknowledged as the cause of anemia (Oski, 1995), however, the hematological picture of VAD anemia is still vaguely defined. The VAD increases the risk of iron deficiency and causes severe infections by decreasing iron absorption and predispose anemia indirectly (Balarajan et al., 2011; West et al., 2007). The VAD is most prevalent in African and South Asian countries, particularly children and pregnant women are more vulnerable groups (Stevens et al., 2015).

1.2.4 Vitamin B_{12} deficiency anemia. Deficiency of vitamin B_{12} in the body causes vitamin B_{12} deficiency anemia or pernicious anemia. The vitamin B_{12} deficiency is caused when body is unable to absorb it from the food. Autoimmune, malabsorption and dietary insufficiency are three primary etiologies of developing vitamin B_{12} anemia (Ankar & Bhimji, 2018). The cut-offs for defining adequate vitamin B_{12} are 221 pmol/L (picomoles per liter), marginal B_{12} are 148-221 pmol/L and low serum/plasma B_{12} are less than 148pmol/L (Allen et al., 2018). Infants, young children, elderly people, pregnant and lactating women are at high risk of developing vitamin B_{12} deficiency (de Benoist, 2008). The strict vegetarians and those who consume low quantity of animal source foods because of cultural and economic reasons are at the risk of developing B_{12} deficiency (SPRING, 2017). Some studies have shown that approximately 1-2% anemia is due to B_{12} deficiency, while some other studies suggest that among patients suffering from clinical macrocytosis (MCV > 100), 18-20% anemia is caused by vitamin B_{12} deficiency (Ankar and Bhimji, 2018). Depending on the etiology of B_{12} deficiency, it is treated by adequate dietary intake or by an oral supplements of vitamin B_{12} for repletion.

1.2.5 Vitamin C deficiency anemia. Vitamin C (ascorbic acid) deficiency anemia is caused by the insufficient amount of vitamin C in the body. Bone marrow manufactures abnormally small RBCs due to vitamin C deficiency (Batool, 2010). Vitamin C is not made by the body and is mostly obtained from diet and supplements. Vitamin C and iron rich diets create ascorbic acid in the stomach due to which iron is absorbed in the body.

1.2.6 Infectious anemia. The infections caused by malaria, parasitic infestation and HIV are associated with iron deficiency and hence increase prevalence of anemia. Malaria, specially by the Plasmodium falciparum, causes anemia by breaking RBCs and decreasing their production (Onyemaobi & Onimawo, 2011). In the Sub-Saharan Africa and other regions where anemia is endemic, Plasmodium falciparum is the main cause of severe malaria (ACC/SCN, 2001). In Africa, 35% children with malaria are anemic (WHO, 2001b). About 0.2 to 0.5 million pregnant women became anemic due to malaria in Sub-Saharan Africa (WHO, 1992). The Plasmodium falciparum malaria is the primary cause of 10,000 maternal deaths during pregnancy in Sub-Saharan Africa annually (Steketee et al., 2001).

Parasitic infestations cause iron deficiency and chronic hemorrhage that increase the anemia prevalence (Chitsulo et al., 2000). Blood loss due to helminthiasis decrease iron stores of mother, fetus and child, which then leads to IDA (Hoque et al., 2009). The severe infections occurring due to the fluke ingestion cause significant urinary blood loss that results in anemia. Hookworm infestation predisposes long-term morbidity by causing IDA (Tolentino & Friedman, 2007). Numerous studies revealed that 51% of anemic children are iron deficient in developing countries, where IDA can be reduced to 31% and severe anemia to 73% by decreasing hookworm infections up to 25% (Onyemaobi & Onimawo, 2011; Stoltzfus et al., 1998).

According to Global Health Observatory (GHO) data, global prevalence of HIV among adults 15 to 49 years at the end of 2017 was 0.8% (0.6-0.9) (WHO, 2018). The prevalence of anemia in HIV infected persons is 20-80% (Belperio & Rhew, 2004) and it has multifactorial causes including infections, dietary deficiencies, neoplasm, antibodies, medications and blood loss (Moyle, 2002; Omoregie et al., 2008). The prime cause of anemia in the context of HIV is anemia of chronic disease, which is due to decrease in RBCs production (Tolentino & Friedman, 2007).

Anemia in HIV positive persons is associated with the rapid development of this disease and risk mortality (Belperio & Rhew, 2004).

1.2.7 Sickle cell anemia. Sickle Cell Anemia (SCA) is the heredity blood disorder in human beings causing body to produce defective Hb and deformed RBCs to a crescent shape. The deformed RCBs do not have enough Hb to nurture body tissues and are unable to pass through narrow blood vessels (Batool, 2010). Each year, about 300,000 children are born with SCA, majority of them are in Sub-Saharan Africa, where health facilities are inadequate and nonuniform (Piel et al., 2013a; Piel et al., 2013b; Piel & Williams, 2017). About 90% of world's population suffering from SCA lives in Nigeria, Democratic Republic of Congo and India, affecting up to 2% population in these countries and the carrier prevalence rate is 10% to 30% (Piel et al., 2013b; Kadima et al., 2015).

1.2.8 Thalassemia. Thalassemia is genetic disorder occurring due to defects in genes responsible for producing Hb. It causes excessive destruction of RCBs eventually resulting to anemia (Weatherall & Clegg, 1996). The bone marrow of people suffering thalassemia produces fewer RBCs and fewer healthy hemoglobin proteins. The deficiency of iodine in diet is the main reason of thalassemia (Batool, 2010). The prevalence of thalassemia is considerably high in the Middle Eastern, Mediterranean and Asian Countries (Greenberg, et al., 2001).

1.2.9 Hemolytic anemia. The life span of RBCs is about 120 days and body makes new RBCs to replace dead ones (NIH, 2011). Hemolytic anemia is a form of anemia that occurs due to the abnormal breakdown of RBCs before their life span either in the blood vessels or elsewhere in the body, and the body is unable to replace them (NIH, 2011). Hemolytic anemia is diagnosed based on its underlying cause of anemia. The hemolytic anemia can be inherited (problems related to genes) or acquired (RBCs are destroyed by body even they are normal) (NIH, 2011). Conditions that predispose to hemolytic anemia include inherited blood disorders (thalassemia or sickle cell disease), bone marrow failure, autoimmune disorders, infections, side effects of medicine and side effects of blood transfusions.

1.2.10 Aplastic anemia. Aplastic anemia can occur if bone marrow is unable to make enough blood cells such as RBCs, WBCs, and platelets (National Institute of Health [NIH], 2011). The aplastic anemia can be acquired or inherited and, in some cases, can be treated by bone marrow transplant. Aplastic anemia can be inborn or attained due to severe disease effects, anticancer drugs or other medications side effects due to long term exposure to industrial chemicals (Tisdale, et al.,2002).

1.3 Consequences of Anemia

Anemia badly affects the physical, mental and reproductive capabilities of the individuals. Among WRA, the consequences of anemia are enormous in adolescent girls and pregnant women. In developing countries, anemia is highly associated with poor pregnancy and birth outcomes predisposing premature delivery, increases fetal mortality risk, elevate prenatal and postnatal complications and increase maternal mortality during childbirth and postpartum period (Axemo et al., 1995). The severe anemia during pregnancy causes asphyxia (deficient oxygen delivery to fetus), impairs the fetus growth and cause low birth weight (LBW), still births and newborn deaths (Axemo et al., 1995; Brabin et al., 2001). Anemia is responsible of about 20% maternal deaths across the globe and about 50% of all maternal deaths are caused by this ailment (Rae et al., 2002). Severe anemia decreases immunity against infections, elevates risk of cardiac failure and decreases ability to survive in bleeding or labor complication. The children of the anemic mothers are at high risk of becoming anemic compared to the those of nonanemic mothers (Harding et al., 2017). Anemia decreases energy, working capacity (Axemo et al., 1995), and can therefore threaten family income and household food security. IDA causes 25 million disability-adjusted life years (DALYs) cases accounting for 2.4% of total global DALYs (Kaur & Kaur, 2015). It is the third leading cause of DALYs for female of reproductive age (15-45 years) (Tolentino & Friedman, 2007). The social and economic development of developing countries is badly affected because of physical and cognitive loss due to IDA costing up to 4.05% loss in GDP annually (Horton & Ross, 2003).

Adolescence is important phase in human life during which high nutritional and energy demands are required for rapid growth and development. The daily iron need increases from 0.7–0.9 mg in preadolescent level up to 2.2 mg during adolescence for boys and girls (Shak & Wondimagegne, 2018). After the menarche, iron demand remains high in adolescent girls due to blood loss during menstrual periods, which averages about 20 mg and may be as high as 58 mg per month in some girls (Beard, 2001) thereby increasing their susceptibility to develop IDA. Among adolescent girls, IDA affects the learning ability (cognitive development), productivity, disease resistance and well-being (Kaur & Kaur, 2015). It is explored in a study that non-anemic iron deficient girls using iron supplements performed better in verbal learning and memory tests compared to same status girls who received a placebo (Bruner, et al., 1996). A study of United States reported that iron deficient children had almost 50% scores in mathematics than the children who are not iron deficient (Halterman et al., 2001). Thus, iron deficiency can have negative implications on cognitive performance which become evident before the development of IDA in adolescents.

Iron deficiency can cause poor appetite thus little food and energy intake jeopardizes the adequate growth spurt during adolescence. The stunting can have negative long-lasting effects on cognitive growth, educational attainments, economic yield and reproductive health of female

(Dewey & Begum, 2011). Malnourished adolescents are noted to have short stature, thinness, contracted pelvis and unfavorable birth outcomes. The short stature and contracted pelvis mothers can suffer from cephalopelvic disproportion (head or body of the baby is too large to pass through mother's pelvis) that increases the risk of obstructed labor during delivery (Tsu, 1992). The obstructed labor is the contributor of 4% maternal deaths in Africa, 9% in Asia and 13% in Latin America and the Caribbean (Khan, 2006). The malnourished adolescent mothers give birth to low birthweight girls producing next generation of stunted women and thus continuing spiteful cycle of malnutrition (Teji et al., 2016). Adolescent mothers are at the high risk of perinatal mortality, death during delivery and postpartum period and their babies may suffer from intrauterine growth restriction (IUGR), premature delivery and LBW.

1.4 Risk Factors of Anemia

Anemia is a multifactorial health problem that instigates from biological as well as societal factors of illness. The biological factors of anemia include the bodily mechanism that are responsible for causing anemia, whereas, societal factors include social-cultural, nutritional and environmental risk factors. Generally, the causes of anemia are divided into primary and secondary risk factors of anemia (Batool, 2010).

1.4.1 Bodily mechanism. Three bodily mechanisms involved in generation of anemia are blood loss and inadequate production and excessive destruction of RBCs.

• **Blood loss.** The blood loss because of injury, surgery, clotting disorder (hemophilia) or intestinal bleeding due to ulcer or cancer and use of blood thinners (aspirin or heparin) can lead to anemia (Mandal, 2018). The damage of blood vessels, high blood pressure, endometriosis, trauma, broken bones, ectopic pregnancy and life style are major causes of internal bleeding (Rogers, 2017). The abnormally prolonged bleeding during menstruation is called menorrhagia which is the major cause of anemia in WRA. The parasitic infestations cause iron deficiency and chronic hemorrhage that increase the susceptibility of developing anemia (Chitsulo et al., 2000). The blood loss due to helminthiasis puts the mother, fetus and child at risk of IDA (Hoque et al., 2009). The severe infections occurring due to the fluke ingestion cause significant urinary blood loss that results in anemia. Hookworm infestation predisposes long-term morbidity by causing IDA (Tolentino & Friedman, 2007).

• **Inadequate production of RBCs.** The bone marrow produces RBC (erythrocyte) under the control of the hormone erythropoietin (EPO) (Braunstein, 2017). Beside EPO, the production of RBCs requires adequate supplies of iron, folate and vitamin B_{12}. The diseases of the bone marrow and stem cells, kidney disease, deficit iron, folate and vitamin B_{12} stores in the can cause inadequate production of RBCs. Anemia caused by the decrease of RBCs includes IDA, vitamin deficiency anemia, SCA, aplastic anemia and thalassemia. Reticulocyte count is an important parameter that may reveal the inapt RBCs production in the body.

• **Excessive destruction of RBCs.** The life span of RBCs delivered from bone marrow into circulatory system is about 120 days after which they are replaced with new ones (NIH, 2011). The excessive breakdown of RBCs before their life span either in the blood vessels or elsewhere in the body causes hemolytic anemia (NIH, 2011). Conditions that cause excessive destruction of RBCs include inherited blood disorders, bone marrow failure, autoimmune disorders, physical damage to RBC membranes, Pyruvate Kinase Deficiency, infections, side effects of medicine and blood transfusions (NIH, 2011, Kugler, 2018).

1.4.2 Societal risk factors. The societal risk factors of anemia are the social components of illness that are preventable (Batool, 2010). The socio-economic status, healthcare utilization, early marriage and communicable diseases are the major exogeneous factors of prevalence of the anemia.

- **Socio-economic status.** Socio-economic status directly influences social pleasure and economic wellbeing of an individual. It is a complex phenomenon usually determined by income, education, occupation or combination of these variables (Winkleby et al., 1992). Higher socio-economic status assessed based on education, economic well-being, occupation, employment opportunities, food and other essentials have strong link to the use of better diet and health services that affect mother and child health (Dhakal et al., 2006). Women and their husbands' education are significantly associated with lower prevalence of anemia during pregnancy (Lokare et al., 2012). The prevalence of anemia and iron deficiency is small among children of highly educated mothers compared to children of less educated mothers (Choi et al., 2011). Lower income is the predisposing factor to the anemia with lowest economic group has lowest hemoglobin level and vice versa (Sadeghian et al., 2013). Lower education and/or lower occupation are independent contributors in determining differences in the dietary habits (Galobardes et el., 2001). Anemia is less prevalent among adolescent girls with maternal occupation as service or business compared to those girls whose mothers are housewives or laborers (Kulkarni et al., 2013).

- **Healthcare**. Utilizing healthcare (prenatal and postnatal care) services by women is associated with the lower risk of anemia and adequate birth outcomes. Anemia is much higher for unattended births compared to attended births with adequate number of prenatal and/or postnatal visits (Lao et al. 1991). The distance to healthcare facility, time spent in travelling and related costs affect healthcare utilization (Winters et al., 2006).

- **Early marriage.** Early age marriage compounds reproductive health problems in women by introducing long period of exposure to pregnancy that leads to anemia in adolescent mother and her baby. Early marriage and inadequate awareness of adolescent mothers is the foremost determinant of anemia, preterm births, infant mortality, hemorrhage (bleeding) and disabilities (Batool, 2010). The teenage pregnancy and childbearing complications are the leading cause of mortality among adolescent girls across the globe and in developing countries situation is even worse (Batool, 2010). The teenagers have underdeveloped body to bear pregnancy stress and have poor pregnancy related complications and highly susceptible to develop iron deficiency anemia. Numerous clinical studies in America revealed that pregnant women aging more than 20 years have 50% lesser risk of becoming anemic than the pregnant women of more than 20 years (Batool, 2010).

• **Communicable diseases.** Communicable diseases affect immune system of body, some of which present symptoms at an early stage and others are hardboard for years before becoming active (Batool, 2010). As mentioned before, the infections caused by malaria, parasitic infestation and HIV are associated with iron deficiency and hence increase prevalence of anemia (Belperio & Rhew, 2004; Chitsulo et al., 2000; Hoque et al., 2009; Onyemaobi & Onimawo, 2011). Malaria causes anemia by rupturing RBCs and suppressing their production (Onyemaobi & Onimawo, 2011). The parasitic infestations cause iron deficiency and chronic hemorrhage that increase the susceptibility of developing anemia (Chitsulo et al., 2000). The anemia in HIV infected persons has multifactorial causes including infections, dietary deficiencies, neoplasm, medications, antibodies and blood loss (Moyle, 2002; Omoregie et al., 2008).

• **Repeated pregnancies.** Repeated pregnancies are the main reason of blood loss and nutritional deficiency among WRA that can lead to anemia. With repeated pregnancies, mother's iron stores are depleted, causing rapid malnutrition. Grand multiparity (parity ≥5 births) is significantly associated with higher risk of IDA, antepartum and postpartum hemorrhage, diabetes mellitus, malpresentation, cesarean section rate and perinatal mortality (Al, 2012). The pregnancies with parity >3 are 1.8 times more likely to suffer from anemia compared to those with a parity ≤3 (Taner et al., 2015). Multi-gravida and multiparous pregnant women are identified to have higher prevalence of anemia (Umar et al., 2015; Tayade et al., 2018). Anemia during pregnancy is associated with complicated pregnancy outcomes, fetal or infant mortality, increased maternal morbidity and mortality and risk of postpartum anemia.

• **Malnutrition.** Majority of women and adolescent girls are malnourished even before they are born. Among WRA, adolescent girls and pregnant women are at higher risk of IDA. Adolescent girls require additional iron for producing RBCs to balance the blood loss due to menstruation and iron required for growth spurt, whilst pregnant women require additional iron to meet body needs during pregnancy. Blood loss during child birth and iron depletion in the body increases the susceptibility of IDA among lactating mothers (Ross & Thomas, 1996). The anemia during pregnancy and/or inadequate nutritional intake increases the risk of postpartum anemia among lactating mothers (Sserunjogi et al., 2003; Lakew et al., 2015). Other nutritional anemia includes FDA, vitamin A and B12 deficiency anemia.

Smoking, drug addiction, intake of pica and violence are other predisposing factors of anemia among women. Smoking can cause numerous chronic diseases which can increase the susceptibility of anemia and related complications (Leifert, 2008). Different malignancies, gastric or duodenal ulcers are responsible for causing anemia among smokers. Addiction can cause tuberculosis and kidney anemia. The other factors of anemia can be lack of physical workout/walk, inherited diseases, chronic diseases, violence and use of pica.

1.5 Prevalence of Anemia

1.5.1 Global prevalence. Anemia is an endemic public health problem affecting people throughout the world with its consequences not only on the human health but also on the social and economic development. According to a WHO (2008) survey conducted between 1993-2000, 24.8% (95% CI: 22.9–26.7%) global population is anemic. Anemia prevalence is highest in Africa (47.5%), followed by South-East Asia (45.7%), Eastern Mediterranean (32.4%), Western Pacific (21.5%), Europe (19,0%) and America (17.8%) (WHO, 2008a). Based on population coverage anemia prevalence percentages are highest for preschool-age children (47.4%), followed by pregnant women (41.8%), non-pregnant women (30.2%), school-age children (25.4%), elderly people (23.9%) and men (12.7%).

According to 2011 WHO estimates, approximately 0.8 billion children and women are victims of anemia (WHO, 2015a). Table 1.3 shows the region wise and global estimates of Hb concentrations and anemia prevalence in children 6-59 months, non-pregnant women, pregnant women and all WRA (WHO, 2015a). The global average hemoglobin level is 11.1 g/dL in 6-59 months children, 12.6 g/dL in non-pregnant women and 11.4 g/dL in pregnant women revealing that all the population categories are well above the threshold of mild anemia (11.0 g/dL for children and pregnant women and 12.0 g/dL for non-pregnant women) (WHO, 2008a). The mean hemoglobin level and anemia prevalence vary substantially across the globe. The children of Africa have the lowest mean hemoglobin level 10.5 g/dL, followed by Asia 11.2 g/dL, Oceania 11.7 g/dL, Latin America and Caribbean 11.7g/dL, Europe 12.0g/dL and North America 12.4%. Almost similar trend has been observed for pregnant and non-pregnant women across different regions worldwide.

Anemia prevalence is the highest among all the age groups in Africa: 60.2% (57.0-63.1%) in children, 36.9% (31.5-42.6%) in non-pregnant women and 44.6% (39.3-49.0%) in pregnant women. Asia is the second highest region facing the burden of anemia across the globe: 42.0%

Table 1.3

United Nations region wise and global hemoglobin concentrations and prevalence of anemia (Stevens et al., 2013; WHO, 2015a)

United Nations Regions	Mean (95% confidence interval (CI)) hemoglobin concentration (g/dL)			
	Children (6-59 months)	Non-pregnant women (15–49 years)	Pregnant women (15–49 years)	All women (15–49 years)
Africa	10.5(10.3-10.6)	12.4(12.2-12.6)	11.2(11.0-11.4)	12.3(12.1-12.5)
Latin America and Caribbean	11.7(11.4-12.0)	13.1(12.7-13.4)	11.8(11.4-12.3)	13.0(126-134)
North America	12.4(12.2-12.5)	13.2(13.0-13.4)	12.1(11.9-12.5)	13.1(13.0-13.3)
Asia	11.2(10.9-11.5)	12.5(12.2-12.8)	11.3(12.7-13.4)	12.4(12.2-12.7)
Europe	12.0(11.6-12.3)	12.9(12.6-13.1)	11.8(11.5-12.2)	12.9(12.6-13.1)
Oceania	11.7(11.2-12.2)	12.9(12.3-13.3)	11.7(11.2-12.2)	12.8(12.3-13.2)
Global	11.1(11.0-11.3)	12.6(12.4-12.8)	11.4(11.2-11.6)	12.5(12.4-12.7)
Percentage (95% CI) anemic population				
Africa	60.2(57.0-63.1)	36.9(31.5-42.6)	44.6(39.3-49.0)	37.6(32.4-43.0)
Latin America and Caribbean	29.1(22.5-36.9)	18.7(12.7-29.4)	28.3(20.1-38.6)	19.1(13.1-29.4)
North America	7.0(4.9-12.3)	12.2(9.1-17.0)	17.1(11.8-21.8)	12.4(9.3-17.1)
Asia	42.0(34.1-49.9)	31.6(24.1-40.5)	39.3(31.8-46.5)	31.9(24.6-40.6)
Europe	19.3(10.9-30.7)	19.9(11.5-35.6)	24.5(17.8-33.8)	20.1(13.8-28.3)
Oceana	26.2(14.5-41.6)	19.5(11.5-34.8)	29.0(18.4-42.8)	20.0(12.0-35.5)
Global	42.6(37.7-47.4)	29.0(23.9-34.8)	38.2(33.5-42.6)	29.4(24.5-35.0

(34.1-49.9%) children, 31.6% (24.1-40.5%) non-pregnant women and 39.3% (31.8-46.5%) pregnant women suffer from this disease. The lowest prevalence of anemia is in the North America: for children 7.0% (4.9-12.3%), non-pregnant women 12.2% (9.1-17.0%) and pregnant 17.1% (11.8-21.8%). Mean Hb concentrations in regions of high-income, southern and tropical Latin America and central and eastern Europe were 6–13 g/dL above the relevant threshold of anemia and anemia prevalence was generally low in these regions in 2011 (Stevens et al., 2015).

The anemia prevalence in 2011 translates to 273.2 million children and 528.7 million WRA across the globe (Stevens et al., 2013; WHO, 2015a). Between 1995 and 2011, the global mean Hb improved from 10.9 g/dL to 11.1 g/dL in children, from 12.5 g/dL to 12.6 g/dL in non-pregnant women and from 11.2 g/dL to 11.4 g/dL in pregnant women (Stevens et al., 2013). Anemia prevalence decreased in children from 47% to 43, pregnant women 43% to 38% and non-pregnant women 33% to 29% between 1995 and 2011 (Stevens et al., 2013).

Table 1.4 presents region wise lowest mean Hb level and the highest anemia prevalence between 1995 and 2011. The mean Hb has increased in 2011 compared to 1995 for all three population categories, except the pregnant women in South Asia. Highest improvements were observed in the children with 3.5 g/dL or more increase in mean hemoglobin level per decade in these regions, however, mean hemoglobin remained lower than the threshold of anemia (Stevens et al., 2013). In 2011, largest number of children (102 million) and pregnant women (12 million) were suffering from anemia in the South Asia followed by 53 million children and 6 million pregnant women living in the central and west Africa (Stevens et al., 2013).

1.5.2 Prevalence in Pakistan. Anemia in South Asian region is a moderate or a severe public health problem among preschool children and WRA (WHO, 2011a; Stevens et al., 2013). Table 1.5 shows Hb concentrations and prevalence of anemia in children 6-59 months, nonpregnant & pregnant women and all WRA (15-49 years) in South Asia in 2011. In Maldives and Sri Lanka anemia is a moderate public-health problem, whereas, in Bangladesh, India and Pakistan it is a severe public-health problem in all three population categories (WHO, 2015a).

The data in Table 1.5 reveals that Pakistan has the lowest Hb level and highest prevalence of anemia among pregnant, non-pregnant all women of reproductive age. In Pakistan, nation-wise mean Hb level for non-pregnant women 11.7(11.5-12.0) g/dL, pregnant women 10.9(10.6-11.2)

Table 1.4

United Nations region wise and global mean Hb concentrations (95% CI) and prevalence of anemia (95% CI) (Stevens et al., 2013).

United Nations Regions	1995		2011	
	Hb(g/dL)	Anemia (%)	Hb(g/dL)	Anemia (%)
Children (6-59 months)				
Central and west Africa	9.5(9.2-9.8)	80(65-81)	10.0(9.9-10.2)	71(67-74)
Eastern Africa	9.6(9.3-10.0)	74(65-81)	10.7(10.5-10.8)	55(50-59)
South Asia	10.0(9.6-10.5)	70(59-78)	10.6(10.2-11.1)	58(44-69)
Non-pregnant women (15-49 years)				
Central and west Africa	11.8(11.4-12.3)	52(39-61)	11.9(11.5-12.3)	48(37-58)
Eastern Africa	12.3(12.0-12.7)	40(33-47)	12.8(12.6-13.1)	28(23-34)
South Asia	11.7(11.3-12.1)	53(42-64)	11.9(11.5-12.4)	47(33-59)
Pregnant women (15-49 years)				
Central and west Africa	10.5(10.3-10.9)	61(53-66)	10.8(10.5-11.1)	56(46-62)
Eastern Africa	11.1(10.9-11.4)	46(41-52)	11.6(11.3-11.8)	36(30-41)
South Asia	10.8(10.4-11.1)	53(43-63)	10.8(10.5-11.3)	52(40-63)

g/dL and all women 11.7(11.4-12.0) g/dL. The prevalence of anemia is 51% (43-59) in nonpregnant women, 50% (41-58) in pregnant women and 51%(43-58) in women revealing that anemia is a severe public-health problem among WRA in Pakistan.

According to the national nutritional survey (NNS, 2011), the prevalence of anemia in Sindh is 68%, Baluchistan (48.9%), Punjab (48.6%), AJK (41.0%), Khyber Pakhtunkhwa (KPK) (35.6%) and GB (23.3%). The survey revealed that anemia is equally prevalent among the pregnant women and non-pregnant women at national and provincial level. About 27% non-pregnant and 37% pregnant women are iron deficient in Pakistan. The percentage of iron deficiency among the

Table 1.5

Mean Hb concentrations and anemia prevalence in WRA (15-49 years) in South Asia in 2011 (WHO, 2015a)

Countries	Mean (95% CI) Hb concentration (g/dL)		
	Non-pregnant women	Pregnant women	All Women
Afghanistan	12.5(11.7-13.3)	11.1(10.4-11.9)	12.4(11.6-13.1)
Bangladesh	12.2(11.9-12.4)	11.0(10.7-11.3)	12.1(11.9-12.4)
Bhutan	12.1(11.2-12.9)	11.0(10.4-11.8)	13.1(13.0-13.3)
India	11.9(11.3-12.5)	10.8(10.4-11.3)	11.8(11.3-12.5)
Maldives	12.4(11.9-12.8)	11.3(10.5-11.9)	12.3(11.9-12.8)
Nepal	12.5(12.2-12.7)	11.1(10.8-11.5)	12.4(12.1-12.7)
Pakistan	11.7(11.5-12.0)	10.9(10.6-11.2)	11.7(11.4-12.0)
Sri Lanka	12.7(12.0-13.2)	11.8(11.2-12.4)	12.6(11.9-13.1)
	Percentage (95% CI) of anemic population		
Afghanistan	31(14-54) **	44(24-66)***	33(16-54)**
Bangladesh	43(35-50)***	48(73-58)***	43(35-50)***
Bhutan	44(21-63)***	46(25-67)***	44(22-63)***
India	48(29- 63)***	54(37-67)***	48(30-64)***
Maldives	37(20-52) **	39(21-63)**	37(21-51)**
Nepal	36(28-44) **	44(33-56)***	36(28-44)**
Pakistan	51(43-59) ***	50(41-58)***	51(43-58)***
Sri Lanka	26(12-46)**	25(15-42)**	26 (12-46)**

Public health significance level: * Mild (10.0–19.9%), **Moderate (20.0–39.9%), ***Severe (≥40%)

non-pregnant and pregnant women is 25% and 32% respectively in AJK. Hamdani et al. (1987) reported 30% prevalence of anemia among Pakistani women, while a study in Karachi showed an increase in the prevalence of 43.46% (Ansari et al., 2009). Batool (2010) aver that prevalence of mild, moderate and severe anemia was 33.3%, 42.3% and 11.1% respectively. Nazir et al. (2011) reported prevalence of anemia from 43% to 60% among pregnant women in Pakistan with 10% severe cases. According to WHO, currently anemia is equally prevalent among pregnant women (50%, 41 to 58) and non-pregnant women (51%, 43 to 59) in Pakistan (WHO, 2015a).

1.5.3 Prevalence in AJK. According to the national nutritional survey (NNS, 2011), the prevalence of anemia in AJK is 41.0%. The prevalence of iron deficiency among nonpregnant and pregnant women is 25% and 32% respectively in AJK. Few studies have been conducted in AJK to investigate the prevalence of anemia. Habib (2013) investigated the socio-cultural factors contributing to anemia in WRA with at least one child. The results showed high prevalence of moderate/severe anemia (55.2%) in the respondents and their children. In urban community, the prevalence of anemia (48.4) was significantly smaller than rural community (62%). Anemia prevalence was negatively associated with education of the respondent, age at marriage, socio-economic status, lesser number of pregnancies and adequate number of visits for prenatal care.

Atif et al. (2013) conducted a cross-sectional study for assessing the risk factors of low hemoglobin level among pregnant women in AJK. Age at marriage, respondent’s education, family monthly income, dietary habits, previous history of miscarriage and nature of exhaustive work were reported to be associated with hemoglobin level of the respondents. Another study reported 91% anemia prevalence among pregnant women in Muzaffarabad division, AJK (Haq & Asif, 2014). The above discussion reveals that anemia is a severe health problem in this region, which requires considerable efforts and resources to further investigate the unexplained factors.

1.6 Problem Statement

Women of Reproductive Age (WRA) are more susceptible to develop anemia at certain times in life due to poverty, low level of education, low socioeconomic status, gender prejudice, inability to avail healthcare services because of societal constraints, violence and poor household conditions. Among WRA, adolescent girls (due to onset of menstruation and iron required for growth spurt) and pregnant women (due to additional iron requirement of the body during pregnancy) are more vulnerable to develop anemia. Anemia in Pakistan is endemic health problem that is equally prevalent among pregnant and non-pregnant women. Despite global decreasing trend (12% decrease in anemia from 1995 to 2011), the prevalence of anemia in Pakistan has increased from 28% (National nutritional survey, 2001) to 50% (National nutritional survey, 2011) among WRA. Inadequate nutrition increases the vulnerability of anemia among adolescent girls and early pregnancy when growth period is not yet over doubles the risk of anemia that can continue to persist throughout the reproductive age. The high levels of anemia especially in non-pregnant women in Pakistan pose a significant challenge to meet global target of 50% reduction in anemia among WRA by 2025. To achieve this target, a better understanding of contributing factors of anemia in different parts of the country and appropriate large-scale interventions are needed right from adolescence period. Azad Jammu and Kashmir (AJK) is one of the areas where health coverage and facilities due to its mountainous topography and long distances from healthcare facilities are inadequate. The sources of livelihood to maintain financial requirements of the household are mainly livestock, horticulture, tourism, small business, collection of herbs for medicinal purposes, government and private sector jobs. The firing across the line of control and natural hazards such as earthquake 2005 badly affected infrastructure, tourism and hence the economic wellbeing of the people of AJK. The inadequate health facilities, limited job opportunities for economic well-being, inadequate diet, unawareness about dietary iron and micronutrients can increase the vulnerability of anemia in female population in AJK. The research in AJK mainly focused on the clinical factors and a few studies have been conducted for exploring the social determinants of the disease among female population that are preventable. Furthermore, nutritional efforts like other regions of country mainly focused on pregnancy and lactation in AJK while adolescence is a critical period of growth during which nutritional needs increase substantially, is mostly neglected. Thus, overlooking nutritional needs during this period can be predisposing factor of anemia among WRA. The present study is conducted to assess recent trends of anemia among adolescent girls and married women in Muzaffarabad division of AJK to identify more prevalent societal risk factors and their drivers that will be helpful for developing effective prevention strategies.

1.7 Significance of the Study

Evidence from numerous research studies suggest that like other public-health problems anemia originates from a broader background, which cannot be determined based on the biological factors only, but also requires societal determinants for understanding its etiology. The exploration of societal determinants of anemia among female population right from adolescence are helpful for understanding etiology of anemia and to take effective preventive measures timely. United nation has set 17 SDGs for the year 2030 that have replaced MDGs to provide a new insight for sustainable development. Reduction of anemia in WRA is one of the six targets of SDG2 (‘No hunger’) endorsed by world health assembly (WHA) (Korenromp, 2014). SDGs are an extension of millennium development goals (MDGs) and is an agenda of people centered development (Kumar et al., 2016). Pakistan has made substantial efforts in achieving MDGs, however, like many developing countries was off track to attain set targets due to political instability, economic crisis, terrorism and natural disasters. The prevalence of anemia is directly linked with nutrition (nutrient sufficiency and diet quality) (Webb, 2014). Diet quality, its diversity and access (affordability, availability, choices) are crucial to narrow down major contributors and take measures to prevent nutritional deficiencies right from adolescence to achieve the target of 50% reduction of anemia in WRA by the end of 2025. The study will be helpful for health professionals, health educators, nutritionists, and government to develop more holistic approaches for reducing anemia, which is an aggravated health problem in Pakistan, particularly in AJK. The identification of preventable major contributing factors of anemia will be helpful for improving women health status and to reduce the healthcare costs. The social and economic development of developing countries is badly affected because of physical and cognitive loss due to anemia costing up to 4.05% loss in GDP annually. The understanding of contributing factors of anemia helps to reduce anemia prevalence, years of lost to disability (YLD) percentage and economic costs in context of broader sustainable development.

1.8 Objectives

1. To study the socio-economic and demographic characteristics of the respondents.
2. To explore respondent's knowledge about balance diet, food supplements and regularity in food intake.
3. To find out the extent of anemia across different age groups and corresponding social determinants accordingly.
4. To investigate the relationships between social determinants of anemia and its severity determined based on Hb level.
5. To assess awareness of the respondents regarding complete profile of anemia.
6. To design a framework for reducing anemia to achieve the target of 50% reduction in WRA by the end of 2025.

1.9 Hypotheses

H1. Education is likely to be associated with the anemia prevalence.

1.1. Higher the education of the respondent, lower is the anemia among married women.

1.2. Higher the parental education, lower is the anemia prevalence among adolescent girls.

H2. Education of the respondents is likely to be associated with awareness about anemia.

2.1. Higher the education of the respondent, higher the awareness about anemia causes.

2.2. Higher the education of the respondent, higher the awareness about prevention of anemia.

2.3. Higher the education of the respondent, higher the awareness about barriers in the treatment of anemia.

H3. Economic wellbeing is likely to be associated with the lower prevalence of anemia.

3.1. Higher the respondent’s monthly income, lower is the anemia prevalence among married women.

3.2. Higher the family monthly income, lower is the anemia prevalence among married women.

3.3. Higher the parental monthly income, lower is the anemia prevalence among adolescent girls.

3.4. Higher the family monthly income, lower is the prevalence of anemia among adolescent girls.

H4. Occupation is likely to be associated with the anemia prevalence.

4.1. Occupations of married women and her husband are associated with the anemia prevalence among them.

4.2. Parental occupation is associated with the anemia among adolescent girls.

H5. Poor household and environmental factors are likely to be associated with anemia prevalence.

5.1. Respondents living in poor household and environmental conditions are more susceptible to develop anemia.

H6. Age at marriage is likely to be associated with the anemia prevalence and its severity.

6.1. Lower the age at marriage, higher is the anemia prevalence among married women.

H7. Body mass index (BMI) is likely to be associated with anemia prevalence.

7.1. Lower the BMI of the married women, higher is the anemia prevalence

7.2. Lower the BMI of the adolescent girls, higher is the anemia prevalence.

H8. Family size is likely to be associated with anemia prevalence.

8.1. Higher the family size, higher is the anemia prevalence among respondents.

H9. Menstruation is likely to be associated with anemia and its severity.

9.1. Menstruation for longer period is associated with the higher anemia among respondents.

9.2. Heavy blood loss during menstruation, higher is the anemia among respondents.

H10. Number of pregnancies and pregnancy related factors are likely to be associated with the anemia among married women.

10.1. More pregnancies are associated with the higher anemia among married women.

10.2. More number of live births are associated with higher anemia among married women.

10.3. Higher the number of abortions/still births, higher is the anemia prevalence.

10.4. Lower the average birth interval in all pregnancies, higher is the anemia in the married women.

H11. Utilization of healthcare services are likely to be associated with anemia.

11.1. Higher the number of prenatal and postnatal care visits, lower the anemia in the women.

11.2. Higher the number of healthcare visits of adolescent girls, lower is the anemia.

H12. Birth order is likely to be associated with the anemia among adolescents.

12.1. Higher the birth order, higher is the anemia prevalence among adolescent girls.

H13. Communicable diseases are likely to be associated with the prevalence of anemia.

13.1. Higher the prevalence of communicable diseases, higher is the anemia.

H14. Knowledge and attitude towards contraceptive behavior is likely to be associated with anemia prevalence.

14.1. Higher the knowledge about contraceptive behavior, lower is the anemia among women.

14.2. Higher the attitude towards contraceptive behavior, lower is the anemia among women.

H15. Gender bias is likely to be associated with prevalence of anemia

15.1. Higher the son preference, higher the prevalence of anemia.

15.2. Higher the gender preferences in food intake, higher the prevalence of anemia.

H16. Exercise is likely is associated with anemia among respondents.

16.1. Regular exercise is associated with the lower anemia prevalence

H17. Family type is likely to associated with the anemia prevalence of anemia.

17.1. Respondents living in nuclear family are less susceptible to develop anemia.

H18. Family relationships and violence are likely to be associated with anemia.

18.1. Good relationship with spouse and in-laws is associated with the lower anemia prevalence in married women.

18.2. Higher the violence on the respondent, higher is the anemia.

H19. Attitude towards cultural restriction of food during pregnancy and menstruation are likely to be associated with the anemia.

19.1. Higher attitude towards cultural restriction of utilizing certain foods during pregnancy and menstruation, higher the prevalence of anemia among married women.

19.2. Higher attitude towards cultural restriction of utilizing certain foods during menstruation, higher the prevalence of anemia among adolescent girls.

H20. Knowledge about anemia is likely to associated with the anemia.

20.1. Higher the knowledge that anemia is a health problem, lower is the anemia prevalence.

20.2. Higher the knowledge about the symptoms of anemia, lower is the anemia prevalence.

20.3. Higher the knowledge about the causes of anemia, lower is the anemia prevalence.

20.4. Higher the knowledge about the prevention of anemia, lower is the prevalence of anemia.

20.5. Higher the knowledge about the barriers about treatment of anemia, lower is the prevalence of anemia.

H21. Knowledge about balanced diet, regularity in food intake, use of food supplements, iron tablets and pica are likely to be associated with anemia prevalence.

21.1. Higher the knowledge about balance diet, lower the anemia prevalence.

21.2. Regularity in food intake, lower is the anemia prevalence.

21.3. Higher the utilization of food supplements, lower is the anemia prevalence.

21.4. Higher the utilization of iron tablets, lower is the anemia prevalence.

21.5. Utilization of pica increases the anemia prevalence.

1.10 Research Questions

1. What are the socio-economic and demographic characteristics of the respondents?
2. What is the etiology of anemia in women and adolescent girls?
3. What is the level of awareness of the respondents about anemia, its causes, prevention and treatment?
4. What is the respondent's knowledge about balance diet, food supplements and regularity in food intake?
5. What is the relationship of social determinants with anemia and its severity?
6. What measures should be taken to achieve the target of 50% reduction in anemia among WRA by the end of 2025?

1.11 Study Area Profile

The study area is Muzaffarabad division of Azad Jammu and Kashmir (AJK), Pakistan. The state of AJK is separated from Indian occupied Jammu and Kashmir to the east by line of control to east, KPK and Gilgit Baltistan to the west and Punjab province to the south (World Bank, 2017). The total area of AJK is approximately 13,297 square kilometers and its population as per census 2017 is 4.045 million (Hussain, 2017). AJK is a self-governing state and has elected president, prime minister, legislative assembly, high court and supreme court, but is informally part of the Pakistan under Pakistan's constitution. The altitude in AJK varies from 360 meters from South to 6325 meters in the north wide varied climate conditions. The climate of southern zone is subtropical, whereas northern zone is moist. Average maximum temperature in AJK varies from 20-32^{o}C and average minimum temperature varies from 4-7 ^{o}C. Based on the location, the land in AJK is categorized into mountain plateau, mountain slopes and inter-mountain valleys. The official language of AJK is urdu and other locally spoken languages include Kashmiri, Gojari, Hindko, Pahari, Hinduko and Punjabi (AJK Bureau of Statistics, 2017).

Administratively AJK is divided in to three divisions (Mirpur, Muzaffarabad and Ponch), 10 districts, 30 sub-divisions and 183 union councils (World Bank, 2014; AJK Bureau of Statistics, 2017). The infant mortality rate in AJK is 58/1,000 live births, 201/100,000 live births, life expectancy rate is 67.7% (65.8% male and 69.8% female), literacy rate is 76.6% (88.1% male and 64.9% female) and EPI coverage is 94%. Annual per capita income of AJK is US $1512. The population growth rate (PGR) of AJK is 2.41 (Muzaffarabad division, 2.80), which is higher than PGR is Pakistan (2.10). Muzaffarabad division has been randomly selected among three divisions

Table 1.6:

Districts, sub-divisions and number of union councils of Muzaffarabad division

Districts	Subdivision	No. of Union Councils
Muzaffarabad	Muzaffarabad	16
	Pattika (Naseerabad)	10
Neelum	Athmuqam	06
	Sharda	03
Hattian	Hattian Bala	08
	Leepa	02
	Chikar	02

of Azad Jammu and Kashmir. The districts, sub-divisions and union councils of the Muzaffarabad division are detailed in table 1.6.

1.12 Thesis Organization

The research reported in this thesis is organized into five chapters.

Chapter 1 (Introduction): This chapter highlights the information about anemia, its types and elaborates negative implications of anemia on the physical, mental and reproductive health of females. It discusses biological and socio-cultural factors associated with the development of anemia, its prevention and treatment. This chapter also provides an overview of anemia as global public health issue, its prevalence across the globe, in Pakistan and in AJK. In addition, it briefly describes the problem statement and significance of study, outlines study objectives, major research hypotheses tested, research questions and study area profile.

Chapter 2 (Literature Review): This chapter provides the detailed literature review of different societal factor of anemia and its etiology among married women and adolescent girls. In addition, this chapter highlights the theoretical framework to reveals appropriate theoretical structure and conceptual framework to design and explore veracities of the settings in terms of background variables, independent variables and a dependent variable.

Chapter 3 (Methodology): This chapter gives detailed depiction of each module of the proposed framework. It presents the detailed procedures followed for collecting data in terms of study design, universe of study, selection of respondent, sampling procedure used, sample size calculation and for developing and interview schedule. Moreover, it details data analysis tools and methodologies used to complete the research work.

Chapter 4 (Results): This chapter presents the results of the study and various types of analysis carried out for investigating the socio-cultural risk factors of anemia in married women and adolescent girls. It describes the findings of the study using univariate, bivariate and multiple linear regression (MLR) analysis as well as data mining techniques. Univariate analysis is performed to examine the frequency distribution of cases depending on a single variable. Bivariate analysis is performed to elucidate the association of anemia with socio-cultural risk factors. Multiple regression analysis is used to examine effects of more than two sociocultural factors on the prevalence of anemia and data mining techniques are used to delineate results for prediction and classification of anemia.

Chapter 5 (Major Findings, Conclusion and Recommendations): This chapter discusses the major contributions and conclusions extracted from the study. The findings of this research are presented to elucidate the socio-cultural risk factors of anemia in adolescent girls and married women. In addition, this chapter provides the brief discussion of the results to depict relevance of risk factors of anemia from theoretical perspective. It also highlights recommendations for the government, community and individuals to prevent anemia and regulate its treatment.

Chapter 2

Literature Review

Literature review is an important ingredient of a research work/thesis, in which researcher relates problem statement with already published literature to develop the scope of the study. It provides systematic summary of the research which is carried out on a specific topic illustrating the background and context of the research domain. It reveals appropriate theoretical structure of the study, identifies the short comings in research design and instrumentation of previous researches. In this chapter, literature review of different societal determinants of anemia and its etiology among married women and adolescent girls. In addition, the chapter highlights theoretical and conceptual framework for revealing theoretical structure of the study and to investigate societal determinants of anemia among adolescent girls and married women.

2.1 Socio-Economic Variables

Socio-economic variables play an important role in determining socio-economic status of an individual that directly influences social pleasure and economic wellbeing of an individual. Socio-economic status has two aspects: resources and status. Education and income represent resources whereas, occupation is an indicator of the social status (Fujishiro et al., 2010). The socio-economic status is a complex phenomenon usually determined by income, education, occupation or combination of these variables (Winkleby et al., 1992). Other socio-economic variables include household and environmental variables such as household structure, water quality, sanitation and garbage disposal.

2.1.1 Education. Education is a profound factor that has both direct and indirect impact on the female and her family. Direct impact influences the health by acquiring better medical facilities, better family relations, enhanced endurance and cognitive behavior. Indirect effects include encouraging health habits, return over education in terms of better household income and occupation. Higher education has shown positive effect on the Hb level (Bailey et al., 1997) and better health status during pregnancy (WHO, 2001).

Education of women and their husbands is significantly associated with the anemia prevalence during pregnancy (Lokare et al., 2012). According the study, anemia among women decreases with the education of husbands. Anemia is 3 and 16 times more prevalent among pregnant women whose husbands are illiterate than those whose husbands had education up to high school and intermediate respectively. Melku et al. (2014) reported that illiteracy is significantly linked with anemia among women during pregnancy.

Batool (2010) reported significant association of education with symptoms of anemia among WRA in Pakistan. Habib (2013) conducted a study in AJK and revealed significant association of anemia with education of the respondents (Chi square = 72.48 and significance level <0.0001). Dar and Afzal (2015) determined using Pakistan Demographic Health Survey for 2006, that women education is an important factor of seeking medical care in Pakistan.

Parental education plays a key role to know about best sources of iron rich diet (Lavender, 2003). Researchers reported significant association of parental interaction with the student grades (Barnard, 2004; Riaz et al., 2010). Riaz et al. (2010) found a significant association of maternal education, parental reading habits and their interest in children activities with academic performance of children. Mothers are more involved in academic activities of their children than fathers (Riaz et al., 2010). Children of highly educated mothers consume more protein and iron (meat, poultry, and derivatives) and are less likely to develop anemia and iron deficiency (Choi et al., 2011). Logistic regression analysis indicated significantly inverse relation between anemia prevalence and maternal education (odd ratio: 0.52).

Chand et al. (2016) reported that proportion of anemic adolescent girls is maximum with illiterate mothers (85.71%) and the least in mothers with high school education (37.5%). Upadhye & Upadhye (2017) conducted a study to estimate the anemia prevalence and its association with sociodemographic factors among adolescent girls, which reported significant association between anemia among girls and their parental socio-economic status.

Anemia during adolescence and reproductive period is associated with multi-factor socio-cultural and biological risk factors. To decrease anemia prevalence among female, they need to attain a good formal education, get economically empowered and avail affordable good quality antenatal care.

2.1.2 Income. Income plays an imperative role to acquire abundant and quality food, utilize adequate medical care and get access to lucrative resources which can affect the wellbeing of mother and her child. Women from eminent economic status get adequate nutrition and health facilities as compared to women who are poor (NNMB, 1980). The prevalence of anemia in low income countries is 56% as compared to 18% economically rich countries (Hyder, 2004).

Dhakal et al. (2006) reported that higher socio-economic status is strongly linked to better and diverse food choices, and accessibility to quality medical care, which can reduce maternal and child anemia. Family income is significantly correlated with prevalence of anemia in females and about 47 % of females suffering from mild to moderated anemia belonged to the earning groups having income between Rs. 2001 to Rs. 6000 (Sharma et al., 2007). In South Asia, poverty is the root cause of inadequate access to nutrient rich diet, where children and females are the victims of this paucity (Rao et al., 2007).

Sadeghian et al. (2013) reported that lower income is a predisposing factor behind anemia. The study revealed that lowest economic group has lowest hemoglobin level and vice versa. Habib

(2013), conducted a study to socio-cultural determinant of anemia among WRA in AJK, which revealed higher prevalence of severe and moderate anemia among respondents having no income. Harding et al. (2017) analyzed the household level and individual determinants of anemia among women and children belonging to Nepal (Demographic and health dataset) and Pakistan (National Nutritional Survey, 2011). The findings indicated higher occurrence of anemia among poorest women of Pakistan and Nepal, who lack sanitation facilities. The study also revealed that stunted children and the children of anemic mothers were victims of anemia in both countries.

Nguyen et al., (2018) examine the changes in Hb level and anemia among children and women in India from 2006 to 2016. They used multivariate regression for identifying drivers of Hb level and anemia and employed regression-based decomposition for estimating their contribution to changes in these outcomes over time. The findings revealed that there exist numerous common drivers of anemia decrease among women and children over time including socio-economic status, maternal education, coverage of nutrition and health interventions (NHIs), sanitation and use of animal protein.

Yang et al. (2018) reported prevalence of anemia has decreased among nonpregnant women and children in low and middle-income countries (LMICs), but most of the LMICs still suffer from paucity due to socio socioeconomic inequalities.

2.1.3 Occupation. Occupation (own, husband or parental for children) is strongly related to income and is directly associated with the material living standards and utilization of health facilities (Galobardes et al., 2006). Profession is an occupational position which is considered as an indicator of socio-economic status of an individual that is associated with health enhancing resources (Fujishiro et al., 2010). The social standing due to occupation is related to the easier access to better healthcare, education, and salubrious residential facilities. Occupation also reflects the social networks, control, autonomy and work-based stress affecting the health of an individual through psychosocial processes (Galobardes et al., 2006).

Galobardes et al. (2001) conducted a community-based study to investigate the association of diet and socioeconomic position (determined based on education and occupation). The authors reported that lower education and/or lower occupation are independent contributors in determining differences in the dietary habits. The women of low socio-economic class consume less food and nutrient intake is low among them. Shields (2001) reported that professional women consult with healthcare service providers more often and give proper attention to diet.

Kulkarni et al. (2013) reported that anemia is less prevalent among adolescent girls with maternal occupation as service or business compared to those girls whose mothers are housewives or laborers. Teji et al. (2016) pointed out that nutritional status and hence anemia among adolescent girls is independently associated with place of residence, age of adolescent, occupation of father and source of drinking water.

Ma et al. (2017) investigated the prevalence of severe anemia and its associated risk factors among non-pregnant women residing in rural areas of China. The findings revealed significantly higher severe anemia in farmers compared to workers in other occupations. Researchers pointed out the high anemia prevalence in farmers might be associated to their low socioeconomic status and exposure to occupational hazards (extreme weather conditions, hazardous chemicals and hookworm infections).

2.1.4 Household and environmental factors. The household and environmental factors such as nonconcrete houses, poor latrine facility, improper sewerage systems, unclean fuel and passive smoking are the major determinants of anemia (Baranwal et al., 2014). Baranwal et al. (2014) conducted a study to explore the association of household environment with the anemia prevalence among children under 5 years in India. The results demonstrated that anemia was high among children who have no toilet facility, lived in Kucha or semi Pucca house or used unclean fuel in the household compared to their counterparts who had these facilities. Clean drinking water, hygiene practices and maintenance of sanitation contribute toward decreasing anemia prevalence as they reduce parasitic infections among children. According to National Nutritional Survey (NNS) 2011of Pakistan, 64.2% families are living in houses made of concrete or bricks depicting an increase of 50% compared to findings of NNS 2001 (NNS, 2011).

Safe and clean drinking water is an important determinant of a healthy life. About 5 million children deaths in developing countries are attributed to poor water quality (Holgate, 2000). The increase in population and rapid urbanization has resulted into poor water quality management, which has further aggravated this issue. In Pakistan, about 40% mortality and 30% morbidity are due to the poor water quality (Country Report Pakistan, 2000). About 80,000 cases related to waterborne diseases were reported in Rawalpindi healthcare units only (Tahir et.al., 1994). In Diseases such as cholera, cryptosporidiosis, dysentery, hepatitis, guinea worm infections and giardiasis typhoid are responsible of causing about 80% of all morbidities and about 33% deaths (Tahir et al., 1994). In Pakistan 52% people do not have access to improved sanitation facilities, 23% people practice open defecation and 5% households have access to a municipal garbage collection system (Saeed, 2013). The poor water quality is responsible for causing diarrhea and about 100 million cases of this disease are reported annually in Pakistan. According to United Nation International Children Emergency Fund (UNICEF), 20-40% hospitals are filled with waterborne health related issues (Daud et al., 2017).

According to World Bank (2014) report, 85% of the urban population in Azad Jammu & Kashmir (AJK) has access to improved water, 99% households reported “proper hand washing” after toilet use and about 10% population defecates in the open. The 80% of rural population has access to improved water. Out of 7,500 water schemes in AJK, 82% are gravity based, 16% are pumping based and 1% are combined. Considerable difference exists between earthquake affected and earthquake non-affected areas in terms of improved drinking water and sanitary means of excreta disposal (55% non- affected and 29% in affected areas). Flush toilets connected to public sewerage (5.8% households in non-affected areas and 2% in affected areas), flush toilets connected with septic tanks (5.8% in non-affected areas and 36% in affected areas) and households reported to use open fields (30% in non-affected areas and 41.6% in affected areas). In AJK, due to the lack of any disposal system sewerage is discharged directly into the rivers, or on open ground which is percolated into the groundwater.

Diseases related to poor hygiene, poor water quality and inadequate sanitation are the major determinants of morbidity and mortality in developing countries. Safe collection and disposal of human waste using modern sanitation technologies and use of hygienic practices are mandatory for improved health status of the people residing in these countries (Haydar et al., 2009). Poor sanitation and hygiene have many other serious consequences. Children, particularly girls are deprived from their right to education due to the lack of private and proper toilet and sanitation facilities at schools (Saeed, 2013). Due to lack of sanitation and custom of privacy women and girls are not allowed to stay away from home. Poor sanitation annually costs PKR 343.7 billion which is equal to 3.94 percent of GDP (World Bank, 2014, UNICEF, 2015).

2.2 Demographic Variables

2.2.1 Age at marriage. Age at marriage especially of women is a vital issue for public health, which opens a gateway to new family roles and childbearing. Marriage from cultural perspective reflects status of women in society, whereas from public health perspective, it is associated with numerous biological, geographical and ecological factors (Marphatia et al., 2017). The marriage in which either both partners or one of them are children and take place with or without formal legalities under religious, civil or customary laws is early or child marriage. According to United Nations (UN), early marriage is one, which is conducted before the prescribed threshold of 18 years of age (UNIFPA, 2006). Below this prescribed threshold, girl is not physically, psychologically and physiologically mature for shouldering the responsibilities of marriage and reproduction. Early marriage is more common in developing countries where girls are married before they are bodily, physiologically and mentally developed to manage motherhood responsibilities.

Age at which motherhood instigates influences the child bearing rate of a woman during her fertile years. Early childbearing, particularly among teenagers has negative socio-economic, and cultural consequences (Abbasi, 2006; Abbasi et al., 2008). WHO (1990) reported that exposure to early pregnancy among adolescent mothers increases its related complications such as preterm delivery, LBW, or antenatal and postpartum deaths. Late marriage, availability and accessibility to contraception would improve likelihoods of existence for mother and her baby.

The complications related to teenage pregnancy are the major causes of mortality among adolescent girls of 15-19 years old worldwide and situation is worse in developing countries (Batool, 2010). They have poor knowledge about consequences of severe anemia, pregnancy complications, underdeveloped body to bear pregnancy stress and unawareness about family responsibilities. Early marriage and inadequate awareness of adolescent mothers is the major cause of preterm births, infant mortality, hemorrhage (bleeding) and disabilities (Batool, 2010).

Wagener et al. (2000) examined the anemia prevalence and its determinants among young mothers in Germany. The finding revealed that 9.5 % mothers had cellular iron deficit and 2.2 %

had mother's paucity anemia. Sharma et al. (2000) reported that occurrence of anemia is comparatively higher among 15-25 years women than other age groups. Early marriages, repeated pregnancies and childbirths and lack of control over their bodies are the major determinants of anemia, higher infant and maternal death rates during eighties in Pakistan (Batool, 2010).

Finly et al. (2011) reported age at first birth <27-29 years is associated with higher risk of infant mortality, stunting, underweight, diarrhea and moderate to severe anemia among women of low- and middle-income countries (LMICs). The children of adolescent girls aging (12-14 or 15-17 years) are at higher risk of mortality for first year compared to children of women aged 27-29 years.

Habib (2013) reported that prevalence of moderate to severe anemia among female married before the age of 18 years is significantly high in AJK, Pakistan. In a study conducted in India, Goli et al. (2015) reported that women who married and bear first child before 18 years were thin compared to women who married at higher ages. Like other South Asian countries, under age marriage is highly prevalence in Pakistan, which increase crude birth rate that leads to population growth (Marphatia et al., 2017). Thus, early marriage and age at first birth affects nutritional status and hence the prevalence of anemia among WRA.

2.2.2 Number of pregnancies. Pregnancy is a common cause of IDA and FDA, while increased iron requirements of fetus and placenta, and the increased volume of blood circulation in the woman body is direly needed. Early marriage compounds reproductive health problems of women by introducing longer period of exposure to pregnancy. Repeated pregnancies, extended breast-feeding, and usual household responsibilities impose a substantial stress on women that never let her to come out of this saturnine state. Repeated pregnancies not only exhaust the mother's iron stock in the body and cause rapid malnourishment but increase economic problems of the family.

WHO (1992) reported that repeated pregnancies are the main reasons of blood loss and VAD among WRA. Vora and Gruslin (1998) highlighted that high repeated pregnancies and miscarriages/abortions are detrimental factors of low Hb level and anemia among women residing in developing countries. They suffer from shortness of breath, heart palpitations, infections, dizziness, fatigue, lactation failure, depression, cognitive issues and prolonged hospital stay.

Anjum (2005) reported that anemia obstructs the daily physical activities of almost every WRA, whereby repeated pregnancies and smaller birth interval aggravates this problem. Batool (2010) identified that number of pregnancies are strongly linked to severe and moderate anemia symptoms among WRA in Pakistan. Habib (2013) reported that there exists a connection between repeated pregnancies and anemia severity among WRA in AJK.

Higher parity is documented in numerous studies as a cause of anemia in pregnancy (Barroso et al., 2011; Al, 2012; Taner et al., 2015). Barroso et al. (2011) aver that young maternal age, non-white ethnic origin and high parity are the predictors of anemia. Al (2012) investigated the incidence of antenatal and intrapartum and perinatal outcomes in grand multipara in a prosperous society with modern prenatal care facilities. The researcher reported that grand multiparity (parity ≥ 5 births) is significantly associated with higher risk of IDA, antepartum and postpartum hemorrhage, diabetes mellitus, malpresentation, cesarean section rate and perinatal mortality. Taner et al. (2015) reported that pregnancies with parity >3 have 1.8 times more probability of suffering from anemia than those with parity ≤ 3. Umar et al. (2015) found that multi-gravida pregnant females have higher risk of anemia. Tayade et al. (2018) identified multiparous women are at higher risk anemia during fertile life.

2.2.3 Prenatal care. Prenatal care is the healthcare received by pregnant to catch potential concerns early and to reduce pregnancy and birth related complications. Start of early and regular prenatal care is the best precondition for safe and healthy pregnancy outcomes. The prenatal care not only provides medical care rather it provides a chance to get awareness about numerous pregnancy related implications, knowledge about food, dietary diversity, parenting and infant caring throughout postpartum period (Kennedy et al., 2001; Abbasi et al., 2008a).

Globally, 86% pregnant women receive prenatal care at least once from a trained health professional once and 62% receive at least four prenatal care visits (UNICEF, 2018). In Sub-Saharan Africa and South Asia, 52% and 46% women received prenatal care four times respectively. Women of urban area have good opportunities to obtain prenatal care compared to ones living in rural areas. The urban women obtain 20% more ≥ 4 prenatal care visits than the rural women living in South Asia and Sub-Saharan Africa (UNICEF, 2018). Largest disparities in the coverage of prenatal care based on the wealth are found globally. Globally women from the richest 20% population in their countries are more likely to prenatal care than poorer women (UNICEF, 2018). In South Asia, women from richest population receive 5 times more prenatal care (67% vs 14%) compared to poorer women (UNICEF, 2018).

The number of deaths during pregnancy and childbirth fell from 523,000 to 289,000 between 1990 and 2013 depicting 45% decline in maternal deaths (UNICEF, 2015). Kuhnt and Vollmer (2017) investigated the association of prenatal care with mortality and nutritional outcomes using 193 demographic and health surveys of 69 LMICs for 15-45 years women, their children and household between 1990 to 2013. The findings of their study reported higher neonatal mortality among women who did not receive any prenatal (3.12%) compared with those attaining at least one prenatal care visit (1.67%). The neonatal mortality rate is 4.23% among women who did not receive any prenatal compared to 2.21% women who received prenatal at least once. To conclude, prenatal services in LMICs are directly linked to improved pregnancy and birth outcomes, decreased child mortality and undernourishment (Kuhnt and Vollmer, 2017).

The prenatal health care in Pakistan is poor and results in high morbidity and mortality rates (Majrooh, et al., 2013; Majrooh, et al., 2014). Distant locations from healthcare facility, lack of transport, lack of functional equipment, inconvenient working hours and uncertainty of staff availability are the major factors contributing to poor prenatal care in Pakistan (Majrooh, et al., 2013; Majrooh, et al., 2014). Lack of awareness, decisions making for attaining prenatal care, affordability, staff attitude at health facility and miscellaneous home services provided by indigenous birth attendants are major social factors of poor prenatal care (Majrooh, et al., 2014).

2.2.4 Postnatal care. Inadequate care during postnatal period may result in death or morbidity of both mother and newborn as well as missed prospects of various healthy behaviors beneficial for them (Lawn et al., 2005b). More than two third newborns die during the first week of delivery, while up to 50% die within the first 24 hours (Lawn, 2006). The highest risk of mortality for both mother and newborn is during delivery, followed by the first hour and next few days after childbirth (Sines, et al., 2007). The postnatal period is vital for the both mother and her newborns during which major changes occur and determine their well-being (WHO, 2013; Abbasi et al., 2008a).

In developed countries, postnatal care begins in the hospitals where women give birth. In United Kingdom, midwives continue postnatal care with home visits up to the 10th day of delivery, which can be extended to the 28th day in case of complications (MacArthur, 1999). In developing countries, however, postnatal care is mostly provided through home visits, because cultural, geographic and financial barriers delimit the postnatal care outside the home (Winch et al., 2005).

WHO (1998) published guidelines based on the best available evidence and the consensus of experts at that time related to the postal care of mother and her baby. These guidelines lack the recommendations on the optimal length of stay in the health facility, optimal number and timings of postnatal contacts, which seem to be important for managing and improving care. As a follow-up to the 1998 guidelines, WHO (2003) published more detailed guidelines for essential practice related to pregnancy, childbirth, postpartum and newborn care. The updated guidelines were related to skilled care at birth and guidance of health service providers. Based on the WHO recommendations updated guidelines were published in 2008 (WHO, 2008b). The updated guidelines focused on issues related to births taking place with skilled attendance, guidance for health care providers, guidance for providing care to woman and newborn at home, programmatic guidance for providing care and developing community activities (WHO, 2008c). The most recent guidelines were published by WHO in 2013 for the benefit of the newborn and mother, which is the updated version of WHO (2008c). WHO (2013), formulated 11 recommendations related to postnatal care and support evidences. These recommendations are related to the timings of discharge from healthcare facility, number and timing of postnatal visits, home visits, assessment of baby and mother, cord care, exclusive breast feeding, other postnatal care for baby, counselling of mother, IFA supplementation and prophylactic antibiotics.

In Pakistan, 48% births take place in a healthcare facility (15% at public facility and 34% at private facility), whereas 52% births take place at home (NIPS Pakistan and ICF International, 2013). The percentage of child births at health facility in Pakistan is different for different regions ranging from 18% in Baluchistan to 86% in Islamabad (NIPS Pakistan and ICF International, 2013). Assistance provided by skilled health professionals is the critical factor for reducing maternal and newborn risk of mortality. The deliveries conducted at home are without the assistance of skilled health professionals, which pose the risk of mother and/or child mortality due to unavailability of the emergency obstetric care. In Pakistan, 52% births take place under the assistance of skilled healthcare professionals, 41% births take place under the assistance of traditional birth attendants, 6% under the supervision of family and friends and 1% without any assistance (NIPS Pakistan and ICF International, 2013). The proportion of delivery at health facility has increased from 13% in 1990-91 to 34% in 2006-07 to 48% in 2012-13, whereas home delivery has decreased from 85% in 1990-91 to 65% in 2006-07 to 52% in 2012-13 (NIPS Pakistan and ICF International, 2013). Quantifiable measures are required to provide timely and adequate postnatal care to mother and baby of economically marginalized women according to WHO (2013) guidelines.

2.2.5 Menstrual periods and blood loss. Heavy menstrual blood loss (MBL) is common, affecting 25% of the female population across the globe (Fraser et al., 2015), which badly effects their quality of life. Heavy MBL is one of the main factors of IDA and affects approximately 2 million women across the globe (Vercellini et al., 1993). Out of these women, 20% suffer from anemia and anemia related problems. Menstrual disorders such as irregular, heavy, prolonged and/or painful periods are common in adolescent girls and can have a significant effect on daily activities like absence from school and compromised quality of life (Williams, C.E. & Creighton, 2012; Toheed et al., 2017). Heavy MBL is one of the major causes of IDA among adolescent girls (Barr et al. 1998; Toheed et al., 2017).

The abnormally prolonged bleeding during menstruation is called menorrhagia in medical terminology. Menorrhagia can be subjective, and definitions include; blood loss> 80ml per menstrual cycle or heavy MBL which confines the female's social, physical, emotional and/or quality of life (Karlsson et al., 2014; NICE, 2007; NICE, 2018). A female suffers from menorrhagia if following two or more criteria are met; 1. passing blood clots of large size, 2. requirement of double sanitary protection, 3. frequent changes of sanitary protection (12 sanitary items per period or changing frequency ≤2 hours) and 4. flooding through sanitary item (Fraser, et al., 2015).

In Pakistan, due to hesitation, female especially adolescent girls do not share menstruation related issues with family and healthcare providers, which worsens implications of menstrual dysfunction (Batool, 2010; Toheed et al., 2017). Batool (2010) identified that heavy MBL is significantly associated with anemia in Pakistan. Anemia prevalence was double in women suffering from heavy MBL than those who never faced this problem. (Toheed et al., 2017), reported that anemia prevalence among adolescent girls is 50.6% in Pakistan, having highly significant association with abnormally heavy BML, dysmenorrhea, worm infestation and bleeding from gums and nose.

2.2.6 Birth interval. Birth or inter-pregnancy interval refers to the time between the birth of a child and his/her sibling. Short birth intervals may increase the rivalry among siblings, distribute parental time and resources which being invested on children (Zajonc 1976; Blake 1989; Abbasi, 2006). Optimal birth spacing allows the women to recover from pregnancy, labor and lactation (Catalyst Consortium/Tahseen project, 2004), making occurrence of next pregnancy at full gestation and growth.

There exists a direct connection between birth spacing, birth order and morbidity (Gulatti, 1999). Smaller interval between increases the risk preterm birth, LBW, and child mortality (Conde-Agudelo et al. 2006; DaVanzo et al. 2008). Small birth interval is linked to malnourishment of the mother and/or her offspring (Dewey & Cohen, 2007). The birth interval is the best measure of mother’s chance to recuperate from the pregnancy and weakness. Numerous demographic and socio-economic characteristics affect women's birth spacing practices (Rasekh, & Momtaz, 2007; Ayanaw, 2008).

Poor pregnancy related implications have long-term effects on the socioeconomic accomplishments even in high-income countries (Barclay and Kolk, 2018). Barclay and Kolk (2018) examined that birth interval has very little independent association with long term health related implications for both men and women during adulthood.

2.2.7 Communicable diseases. These are infectious diseases which spread from one individual to another through physical contact, bodily fluids, breathing in airborne viruses or due to biting of an insect. Communicable diseases affect immune system of body, some of which present symptoms at an early stage and others are hardboard for years before becoming active (Batoool, 2010). The decreased immunity during pregnancy can cause miscarriage, pre-term birth and LBW and other adverse health outcome (Khan, 1995).

The prevalence of communicable diseases is directly linked with poor socio-economic conditions and nutritional deficiency. Children and pregnant women are the most vulnerable populations (Caulfield and Black 2004). Caulfield et al., (2004) reported that deficiencies of vitamin A, iron, folate, zinc and other micronutrients are responsible for a substantial proportion of morbidity and mortality due to malaria. Malaria causes anemia through cytokine-mediated suppression of hematopoiesis and when an individual infected with Plasmodium falciparum, the erythrocyte changes and causes anemia in the individual (Caulfield et al., 2004). The major communicable diseases causing anemia in Pakistan are pneumonia, influenzas tuberculosis, hepatitis C, and HIV/AIDS. These diseases reduce RBCs and cause sickle cell anemia in the mothers and their babies (Batool, 2010). Numerous studies have revealed a positive association between water born/communicable diseases and maternal as well as child anemia (Batool, 2010).

The endemicity of hepatitis B & C in Pakistan is 7.6% and the prevalence of drug resistant tuberculosis is 3.4% among new and 19.0% previously treated cases (WHO, 2018). Pakistan is ranked fifth highest facing tuberculosis burden and is focal geographical area of malaria (WHO, 2018).

2.3 Cultural Variables

2.3.1 Knowledge about anemia and its prevention. Understanding of the epidemiology of IDA and measures taken for preventing and controlling it has extended greatly during recent years. The approaches used to prevent IDA include iron supplementation, increasing dietary iron, controlling infections, and fortification of essential foods with iron. (Demaeyer et al., 1989).

Deficient knowledge, awareness about anemia and its related implications on the women health, unorganized supply and distribution of iron supplements, misapprehensions about biological consequences of iron supplements, infrequent and delayed use of prenatal healthcare and other cultural beliefs are recognized the barriers in taking iron supplements (Dreyfuss, 1998).

Persons having appropriate knowledge and awareness about anemia respond well and in timely manner, whereas, unawareness may be detrimental. Specifically, the negative implications of iron deficiency and maternal anemia on pregnancy outcomes are generally overlooked. Adequate knowledge about anemia, its causes and compulsory package of interventions to prevent its devastating effects are as vital as the treatment of this problem (Allen, 1998).

Rasmussen (2001) reported that inclusion of bioavailable iron rich foods in everyday dietary plan keeps the body in good physical shape and is helpful in preventing anemia. Lavender (2003) reported that deficiency of iron can have antagonistic effects on the working capability and cognitive growth in newborns, children and juveniles. Mayo (2007) highlighted that eating a healthy and diverse food involving iron rich diet, foliate and vitamin B-12 to prevent nutritional anemia.

A cross-sectional study conducted in Malawi for assessing maternal knowledge of anemia and iron supplementation in rural area revealed that 96.6% women had awareness about anemia, with at least 2/3 had knowledge about its causes, preventive measures and treatment strategy (Kalimbira, 2009). Souganidis et al. (2012) reported that maternal knowledge about anemia is strongly associated with utilization of iron supplements and consumption of fortified milk by the baby, however does not reveal significant association with maternal anemia and child deworming.

Knowledge of the anemia severity and its causes in adolescence is important because it opens a window of opportunity for school-based interventions for improving adolescent health (Tesfaye et al., 2015). The multiple causes of IDA among adolescent girls include increased iron requirements due to menstruation, insufficient intake of micronutrients, accelerated growth and hormonal changes (Dugdale, 2001; Halterman, et al., 2001). Many types of anemia are not preventable; however, IDA and vitamin deficiency anemias can be prevented utilizing the diet which includes iron, folate, vitamin B-12, and vitamin C (WHO, 2014; WHO, 2016). Better knowledge about etiology and risk factors of anemia, inclusion of iron dietary intake, availing healthcare facilities and knowledge of personal hygiene plays a critical role in preventing IDA. The health of adolescent girls can be improved by imparting health education to develop knowledge about preventive measures.

2.3.2 Gender prejudice. Gender bias is a situation in which someone is given more preference based on his/her sex, usually when a male family member is treated in a better than a female. Son preference is a form of gender bias existing worldwide and is a well-recognized fact. NNMB (1980) point out that food dissemination biasness prevailes even within the same house leading to dietary shortages among girls. Preference of male children, coupled with poverty result in lower caloric intakes by female children resulting in malnutrition, under nutrition and anemia (Kielmann et al. 1983). Ahmed (1990) found that girls face hurdles in acquiring health care services compared to adolescent boys. The newborn death rates in female was more than that of male infants (WHO, 1998). Marriages of girls at very young age, repetitive pregnancies, lesser control on their body weight and illiteracy badly effects women health (Abbasi et al., 2013).

Gender discriminations is a detrimental factor of anemia and malnutrition among female, which starts right from the womb of mother and continues in all aspects whether it is education, clothing or food throughout the life (Poureslami et al., 2004). South Asian countries are inherently patriarchal in nature and son preference is deeply rooted. (Basu and De Jong, 2010; Channon, 2015). Son preference is a complex phenomenon and it exists in various forms across different cultures in Pakistan (Abbasi et al., 2013; Atif et al., 2016). The sons are valued over daughters because women feel secure and earn more respect among family and society. The sons provide financial assistance, attract dowry and are considered helpful in old age.

Pakistan is ranked 143 (second lowest) on the list of 144 countries in the global gender report (GGR), (2017). The GGR quantifies the gender disparities across four important areas including economy, education, health and political empowerment. According to GGR (2017), Pakistan is ranked 143 in terms of economic participation, 136 in educational attainment, 140 in health & survival and 95 in terms of political empowerment.

2.3.3 Family type. Family is a social group of people sharing same residence, economic resources and consanguinity (Murdock, 1949). A family is a group of people sharing same residence, unified by bonds of marriage, blood or adoption, interact and intercommunicate with in their specific social roles of husband & wife, father & mother, son & daughter or brother & sister forming a communal culture. Family is the elementary unit of study in numerous social science and medical sciences disciplines (Sonawat, 2001).

Keeton (2007) reported that nuclear families have more opportunities perform better and children in nuclear families have easy access to parental earnings. Research evidences reveal that women in nuclear families have higher or equal status compared to those in the joint/extended family (Batool, 2010). Typically, these women have more financial control on household income and expenditures. The higher financial autonomy enables them to utilize better healthcare especially during pregnancy and after childbirth (Abbasi et al., 2008a). In a nuclear family parents and children relationship, affection and individual autonomy are emphasized. Bisoi et al., (2011) reported higher anemia prevalence among women residing in joint families compared to ones living in nuclear families. The females of nuclear family experience lesser domestic violence and higher amount of antenatal care compared to joint family women (Abbasi et al., 2008a; Bansal et al., 2014). Chand et al. (2016) reported that anemia among adolescent girls residing in joint family is higher than those living in nuclear. Tayade et al. (2018) found that anemia is more common among women belonging to joint family. According to them, the possible reason can be sharing of food among more family members in the joint family system and generally being last to take food due to cultural and traditional norms than women living in the nuclear family.

In Pakistan, nuclear and joint family system is most common, however, extended family system is also found in smaller number (Batool, 2010). Batool (2010) reported a strong association between family type and Hb level among the WRA in Pakistan. Women belonging to nuclear families had mild/normal level of hemoglobin compared to those living in joint families.

2.3.4 Contraceptive behavior and knowledge. The contraception plays a vital role in decreasing number of pregnancies and hence the number of kids, blood loss during delivery and improves reproductive health of women. Pakistan is ranked 6th most populous country with a fertility rate of 2.62 and contraceptive prevalence rate (CPR) of 34% (Jabeen et al., 2011; NIPS &ICF, 2018). The estimated population of Pakistan is 205 million (World Factbook, 2018) and it is expected to 335 million in the year 2050 (Jabeen et al., 2011). It will be difficult for Pakistan to keep pace between limited resources and growing population.

To limit the number of children for controlling population, contraceptive behavior needs to be improved (Abbasi et al., 2008b). All men of developed societies link the birth spacing with better health outcomes of the mothers and their children (Petal et al., 2006). Casterline et al. (2001) identified that two sets of factors directly influence the decision of family planning, namely the desire to avoid becoming pregnant and the costs of birth control in Pakistan. In another study, Khawaja et al. (2004) reported wide gap between knowledge (97%) and contraceptive prevalence rate (28%). Contraceptive prevalence is high among educated and urban area women compared to uneducated and rural area women (Zafar et al., 2003; Abbasi, 2006; NIPS &ICF, 2018).

The use of contraceptive methods by anemic women reduces the bleeding regarding safe maternity decisions and prevention (Behboudi-Gandevani et al., 2015; WHO, 2015d). Saydam et al. (2017), identified that 28.5% women are using cervical contraceptive tools (Copper T 380A) were anemic.

2.3.5 Women freedom to utilize health services. In rural areas of Pakistan, deliveries administered at home are given preference due to social norms, societal set-up, long distances from hospitals, economic burden along with efforts required for admittance to the healthcare facility. Scarce healthcare alternatives and poor awareness about delivery complications are main determinants of inadequate endowment and utilization of prenatal and postnatal healthcare services (Abbasi et al., 2008b). Jafarey & Korejo (1995) reported that 5 women who lived 5-10 kilometers from the healthcare service died due to delayed arrival to hospital. Khan (1998) identified that delayed arrival to hospitals cause of most of the preventable deaths in Pakistan, which can be attributed several economic and societal factors.

Customs and traditions play a vibrant role in accessing medical facility in Pakistan. Niaz (2004) reported that traditions, cultural practices and societal attitudes play a critical role in developing physical and mental health of women. In both India and Pakistan male members of the family receive hospital treatment, whereas females are at the mercy of traditional remedies, revealing social devaluing and attitude of self-neglect, which is linked to their lesser status (Rehman & Abbasi, 2013). Ali et al. (2008) explored that most acute infuriating factor is the lack of trained assistants in majority of home deliveries. In Pakistani community, still the concept of home of birth is practiced under the flag of cultural values that puts at risk not only life of mother but also of new born.

Utilization of health services is directly linked with timely access to healthcare facility. According to distance decay effect, the limited proportions of population travel between two locales as distance between them increases. The patients visit their physicians less frequently who had to travel more compared to those who had to travel shorter distances (Nemet & Bailey, 2000; Abbasi, 2006). The physical distance of hospital is one of the major determinants of underutilization of prenatal care in Pakistan (DMICS, 2004). The distance to healthcare facility, time spent in travelling and related costs affect healthcare utilization (Winters et al., 2006). In Pakistan, distant locations, lack of affordability and availability of transport services influences the utilization of healthcare services (Majrooh et al., 2013). The women under age 25 were most restricted in their freedom to go alone to a health facility (13.0% only), 46.0% of elderly women could do so in Pakistan (Batool, 2010). Adolescent married girls need to access proper health and family planning services, information on sexual activity, care during pregnancy and child birth. The bias against early age restricts them to go alone for utilization of health services even after marriage. In Pakistan, poverty, cultural, ethnic and religious factors badly affect women's ability to access healthcare services (Abbasi, 2006).

2.3.6 Breast feeding. Breast feeding is the best and the most economic food for an infant that fulfils all the nutritional needs (Thapa, 1988). Colostrum, the first milk boosts immune-stimulating factors such as carbohydrates, protein, low fat and antibodies which protect the baby from respiratory and gastrointestinal infections causing anemia. The breast feeding may induce prolonged lactation amenorrhea due to which the mother is unable to conceive, thus preserving hemoglobin stores and hence the risk of anemia (Abbasi, 2006; Lakew et al., 2015). Breastfeeding is generally protective, if the mother is not iron deficient (Abu-Ouf & Jan, 2015). Lactating mothers are vulnerable to anemia due to iron depletion during lactation and blood loss during childbearing (Domellöf et al., 2004).

Henly et al. (1995) identified that anemic mothers suffer from insufficient milk syndrome, have little period for full breastfeeding and their babies do not get enough weight compared to non-anemic mothers. Postpartum anemia is highest among mothers which are anemic during pregnancy (Sserunjogi et al., 2003). Maternal micronutrient deficiencies affect the quality of breastmilk. The lactating women require higher amounts of energy to produce adequate quantity and nutritional breastmilk. Inadequate energy and poor maternal nutrition during this period deplete mother’s own nutrient and iron stores. Zhao et al. (2014) reported that significant factors of anemia in lactating women are poverty, illiteracy, malnutrition and unclean drinking water. Antenatal follow up visits, alleviation of frequent births, dietary diversity and feeding practices need to be improved to reserve and prevent iron depletion during lactation (Alemayehu, 2017).

2.3.7 Violence. Domestic violence is any act of gender-based violence committed against female in public or private that victimizes or is likely victimize her physically, sexually or mentally including threats of such acts, coercion or subjective denial of liberty (United Nations, 2000; NIPS and ICF International, 2013; Karmaliani et al., 2017). Sexual violence increases exposure of female to multitude of gynecological complications such as pain during intercourse, sexually transmitted infections (STI), increased risk of HIV, poor perinatal and pregnancy related outcomes.

Patel et al. (1998) studied that violence affects reproductive health and causes psychosomatic disorders in women. The associations were noted for gynecological symptoms (lower abdominal pain, vaginal discharge, sores in the genital area, and dyspareunia), complaints of irregular menses and menstrual cramps. Ellsberg et al. (2001) highlighted that association domestic violence and malnutrition their effect on general health. Mental health problems such as substance abuse, depression, post-traumatic stress disorder and suicidal behaviors are associated with exposure to spousal violence (Jewkes, 2002; Abbasi et. al, 2015).

Domestic violence is a psychosocial factor that is responsible of causing anemia and nutritional deficiency among women and their children (Lel, 2008). According to UNICEF (2000) physical violence can have several consequences other than psychological problems such as severe injury, gynecological complications, miscarriage etc., causing heavy bleeding which can lead to anemia. Exposure to stress and violence also exerted negative influences on child’s physical and psychological development (Duncan & Magnuson, 2002; Batool et al., 2008). Violence on affects women’s mental health that can lead stress and stress-related illnesses, sleeping and eating disorders, drug abuse, blood pressure, panic attacks, post-traumatic stress syndrome, depression, and low self-esteem. Oxidative stress can destroy RBCs prematurely that can lead to hemolytic anemia. The women who are depressed and disgraced by abuser, which have no other option from escape the violent relationship apart from suicide (Sivilotti, 2004).

Physical injury is the visible form of violence which badly affects the women health. About 37% women who get medical care for violence-related injuries in hospital emergency rooms were injured by spouse or partner. Physical violence cause injuries ranging from bruises and fractures to chronic disabilities which may lead to physically disfigure. Majority women faced severe bleeding from injuries and extreme psychometric situations developed that resulting in menorrhea and morbidity. Leland et al. (2008) aver that about 19% women who were victims of domestic violence had higher anemia and malnutrition prevalence rates and general health problems. Among women who were anemic and malnourished, nearly one third were underweight 50% suffered from severe anemia.

Domestic violence on women is exercised in many forms throughout the world, however, its exposure is high in South Asia. Domestic violence is widespread in Pakistan, which is the most underreported form of violence committed against female (NIPS and ICF International, 2013). According to Pakistan demographic and health survey (PDHS) 2012-13, 32% WRA (15-49 years) have faced physical violence since the age of 15 years and 19% faced it during last year prior to survey (NIPS and ICF International, 2013). Women of age 15 to 19 years, divorced or widowed, belonging to rural area, low wealth quintile and who are uneducated are more likely to experience physical violence in Pakistan. The prevalence of physical violence is the highest 57% in Khyber Pakhtunkhwa, followed by 43% in Baluchistan, 25% in Punjab and 19% in Sind (NIPS and ICF International, 2013). About 10% of women reported facing violence during pregnancy and 52% of Pakistani women experiencing domestic violence never pursued for help or told about it to anyone (NIPS and ICF International, 2013).

Violence after infectious and parasitic diseases is the leading cause of mortality among adolescent girls (UNCF, 2014). UNCF (2014), about 10% of deaths among adolescent girls are caused due to violence (WHO, 2014c). The proportion of violent death intensifies as girls enter adolescence (UNCF, 2014). The proportion of deaths due to violence among adolescent girls raised from 0.4% at age 0 to 9, to 4% at age 10 to 14, and 13% at age 15 to 19 (UNCF, 2014). Stark et al. (2017) conducted a multi-country study to estimate the prevalence and predictors of violence among adolescent girls. The findings revealed that 51.62% girls reported to experience at least one form of violence during last one year, 36.79% reported shouting, 31.78% reported being beaten or hit and 26.67% faced unwanted body touching, sexual coercion and/or forced sex. Violence victimization represented serious physical and psychological health issues among adolescents (Olofsson, 2012). In Pakistan, adolescents experience different forms of physical and emotional violence victimizations at home and schools by parents, peers and teachers.

2.4. Nutritional Variables

2.4.1 Food intake Maternal and child anemia is highly prevalent in Pakistan due to the dietary deficiencies such as iron and folate deficiency. Diverse food with adequate nutrients is essential for a healthy and active life. Poor dietary practices are associated with decreased adult work productivity, developmental issues, vulnerability to illness, intrauterine deaths and adverse pregnancy outcomes (Lim et.al., 2012; WHO, 2015c). Dietary diversity is considered an important indicator for micronutrient adequacy in pregnant women. (Ali et al., 2014). Men compared to women and children benefit more in terms of diet diversity, because they eat lunch or dinner more frequently away from home. In general, women do not involve men to take part in household dietary decisions; involving men in household dietary decisions will improve the nutrition, (Ochieng et al., 2017).

Pregnancy is a critical period for the women during which she is nurturing not only herself but also her baby. During this period nutrient requirements are increased and 300 extra calories per day are recommended for adequately meeting demands of the pregnancy (Faria, 2011). Healthy and balanced diet is vitally important during pregnancy to fulfil the increased needs to support adequate fetal growth and development and to prevent mother from nutritional stress (Abbasi, 2006; Parmar et al., 2013). In Pakistani society, early age marriage, inappropriate birth spacing, lack of awareness about balanced diet and exclusive breastfeeding by malnourished mother increases the occurrence of anemia among women (Abbasy et al., 2013). Misconceptions about the use of certain foods during pregnancy have been part of subcontinent cultures since centuries. The incorrect knowledge and avoidance of certain food items during pregnancy usually results in the premature births, LBW, prenatal and postnatal mortality.

Diverse food with adequate nutrients is critical for adolescents as 50% weight, 20% height and 50% skeletal mass is gained during this period (Shahid et al., 2010; WHO, 2006). Globally, only 17% of adolescents consume diversified food (Duffy et al., 2015). The utilization of suboptimal and undiversified food results in the development of varied macro and micronutrient deficiencies (Worku et al., 2017; WHO, 2005b). The nutritional deficiencies cause delayed puberty, contracted pelvis and unfavorable fetal and birth outcomes among adolescent girls (Begum et al., 2017; Hossen et al., 2016). Maternal education, residence, school type, nutritional knowledge and socioeconomic status are associated with adolescent's dietary diversity (Birru, et al., 2017; Worku et al., 2017; Oldewage-Theron et al., 2016; Belachew et al., 2013; Belachew et al., 2008).

The utilization of fast food is the contributing factor of obesity and non-communicable health problems (Zafar et al., 2002) and adolescent girls are more prone to this compared to boys

(WHO, 2006b). In Pakistan, school going adolescents are not only exposed to fast foods at homes but also in Schools (Ahmed et al., 2016). In schools, canteens are providing fast foods, which contain mostly fried contents cooked in unhygienic environment, affecting their health badly.

In most parts of the world, menarche is the sign of developing sexuality among girls, which is negatively perceived and experienced by them (Dasgupta & Sarkar, 2008). Among many misconceptions, alternations in the dietary practices such as avoiding the hot and cold intensity foods based on their cultural and societal beliefs is observed (Rizvi & Ali, 2016). The perception about hot and cold effects of food has prevailed in Pakistan and is being practiced by almost all the sectors of the society (Inam, 2003). The foods such as dry fruits, eggs, meat, lentils, pickles, spices, and sour items are considered hot, whereas green leafy vegetable, yogurt, cold drinks, ice cream and cold water, are listed in cold category in Pakistan (Rizvi & Ali, 2016; Ali et al., 2006). Many of the foods avoided during menstruation are iron rich, which can increase the anemia among adolescent girls.

The knowledge of balance diets, and nutrient rich food is important for people of all age groups especially teenagers and WRA. Poor socioeconomic status, traditional eating habits and fear of gaining weight are the contributing factors of IDA development among girls (Balcı et al., 2014). The life style and behavior towards utilization of balanced diet is related to increasing trend of IDA among young girls in Pakistan (Shazad et al., 2017).

2.4.2 Dietary and iron supplements. Numerous interventions have been made for improving iron status including dietary improvement, iron supplementation, iron fortification of foods and other public health measures, such as helminth control to prevent anemia (Stoltzfus & Dreyfuss, 1998). Utilization of balanced diet provides necessary amount of folic acid, however, due to financial constraints accomplishing adequate dietary intake may be difficult for some women compared to food supplements (King, 2004). Dietary supplements are supportive for those women who are unwilling to utilize proper balanced diet (Barrett, 2005).

The eating habits of WRA allow the early detection of specific dietary deficiency, which can be consumed for avoiding complications during pregnancy (Sato et al., 2010). Dietary practices and utilization of natural and fortified sources of iron provides the scientific evidence to improve the quality of women health and pregnancy outcomes (Sato et al., 2010). Supplemental dietary intake is beneficial in deficiency conditions; however, they should be used with strong medically based cause (Mursu, et al., 2011). The usefulness of folic acid to prevent neural tube defects (NTDs) is well recognized (Czeizel, 1992; De-Regil et al., 2015). The WRA are usually recommended to use dietary supplements during preconception and pregnancy for decreasing the risk of negative pregnancy and fetal outcomes associated with nutritional deficiencies (WHO, 2016b, McKenna et al., 2017). In areas of anemia prevalence ≥20%, WHO (2011b) recommended the daily oral iron dose of 30–60 mg and folic acid supplementation 400μg for preventing anemia during pregnancy. For adolescent girls and non-pregnant women weekly iron and folic acid supplementation (WIFS) dose of 60mg iron and 2800μg folic acid to anemic girls is recommended in areas of anemia prevalence ≥20% (WHO, 2011b).

In Pakistan, 51% pregnant women are anemic, yet only 44% of them make use of antenatal iron-folic acid (IFA) supplements, where cultural and behavioral factors are the major barriers in its use (Nisar et al., 2014). Majority of women have awareness about IFA supplements during pregnancy in both urban and rural area, however, urban women have comparatively more information about these benefits. The reasons of better awareness among women of urban settings is knowledge of benefits, financial capacity, availability of IFA supplements, trust on healthcare providers, support from family and feeling better after use. (Nisar et al., 2014). In another study, Nisar and Dibley (2014) explored the effect of using IFA supplementation during pregnancy on early newborn deaths in Nepal and Pakistan, the findings revealed strong association between utilization of IFA supplements and decrease in early neonatal deaths in both countries.

2.4.3 Pica. Pica is derived from the Latin word for "magpie", a bird with unusual habits of eating. The disorder involving craving and eating of non-food items such as ice, paper, leaves, clay/mud and rice is termed as pica (Young et al., 2010). Beside iron deficiency, zinc and other minerals deficiency can be the cause of consuming pica (Crosby, 1976). Ellis & Schnoes (2002) identified that socioeconomic and cultural factors are major determinants pica consumption. Deficiency of folate, copper, calcium, other necessary nutrients such as niacin, thiamine, vitamins B and C and malnourishment are linked with pica utilization. In the context of treatment of pica, iron supplements led to stop pica in most of the children (Ellis & Schnoes, 2002; Scott & Dalton, 2004).

Miao et al. (2015), conducted a meta- analysis using data comprising populations of different age groups, geographic location, pica type and time period for understanding the noteworthy and biologically important associations of pica with micronutrient deficiency. The meta-analysis revealed that pica is associated with 2.4 times higher odds of anemia, lower Hb (−0.65 g/dL), lower Hct (−1.15%,) and lower Zn (−34.3 μg/dL) concentrations compared to individuals who do not consume pica.

The consumption of nonfood items is significantly associated with increased probability of anemia and low hemoglobin level (Miao et al., 2015). The respondents who were habitual to use pica had more symptoms of anemia. Pica affect the adolescents suffering from intellectual disability and/or severe iron deficiency (Berry, 2016). It also affects the children of age up to 6 years, pregnant women and girls of normal intellect due to malnutrition and craving of certain nutrients needed by body (Berry, 2016).

2.4.4. Hemoglobin level. Anemia is the lower level of hemoglobin in RBCs. According to WHO, anemia is a medical condition in which the number of RBCs and subsequently their oxygen-carrying capability is not enough to cope with the physiological requirements of the body (WHO, 2011). The physiological needs of the body vary with age, gender, stages of pregnancy, smoking behavior and residential altitude from sea level (WHO, 2011). The major causes of anemia are poor consumption of dietary iron, excessive destruction of RBCs due to malaria and helminth infection, nutritional deficits other than iron deficiency (folic acid, vitamins A and B-12), genetic disorders (thalassemia and sickle cell), reproduction related factor (obstetric complications, high fertility, contraceptives or practices that increase blood loss and infections (WHO, 196;, WHO, 1989; WHO, 2011). Pallor is the major clinical symptom of anemia and iron deficiency and fatigue or decreased working capacity are its physical symptoms.

The anemia cut-offs of hemoglobin level were published in 1968 by a WHO study group on nutritional anemias (WHO, 1968), while the cut-offs defining mild, moderate and severe anemia were published in 1989 (WHO, 1989). At the sea level, non-anemia cut-offs are 11.0g/dL or higher for children 6-59 months and pregnant women, 11.5g/dL or higher for children 5-11 years, 12.0g/dL or higher for children 14 years or above and nonpregnant women and 13.0g/dL or higher for men above fifteen years. The mild anemia cut-offs are 10-10.9 g/dL for children 6-59 months and pregnant women, 11-11.4 g/dL for children 5-11 years, 11-11.9 g/dL for children 14 years or above and nonpregnant women and 11-12.9 g/dL or higher for men above fifteen years. The moderate anemia cut-offs are 7-9.9 g/dL for children 6-59 months and pregnant women and 8-10.9 g/dL for male and female for 5 years or above. The severe anemia cut-offs are lower than

7 g/dL for children 6-59 months and pregnant women and lower than 8 g/dL for male and female 5 years or above. Adjustments of anemia at residential altitudes higher than sea level according to recommendations of WHO (WHO, 2011).

2.5. Theoretical Framework of Research

The theoretical framework acquaints with and describes the theory that explicates why the research problem under study exists. It is one of the most important aspects in the research process. The theoretical framework of the present study is based on the social model of health proposed by Dahlgren and Whiteheads (Dahlgren & Whiteheads, 1991).

2.5.1 Social model of health. The social model of health focuses on the societal level of health determining factors that are risk imposing or illness provoking. This model addresses general living and working conditions. The social model of health originated in a series of influential critiques published in 1970s and early 1980s, highlights shortcomings of biomedical model of health (Mckinlay, 1975; McKeown, 1979; Rose, 1985). Central to these critiques is the fact that medical treatment (services) is not the one and only driver of an individual's health, instead societal factors play a vital role in keeping people healthy (Mckinlay, 1975; McKeown, 1979). The social determinant of health (social, environmental and behavioral) account for 60% whereas genetics and healthcare account for 40% determinants of health (Schroeder, 2007).

The prevalence of anemia has been linked to its societal determinants based on different sociological theories such as theory of anemia (Robinson, 1972), theory of self-care management (Orem, 1971; Dorsey & Murdaugh, 2003), symbolic interaction theory (Goffmam, 1959) and functionalist approach (Parson, 1951). According to anemia theory, anemia is either acquired or genetic being responsible for porotic hyperostosis (Stuart-Macadam, 1987). Poor household structure, food preparation practices, nutritional deficiencies, blood loss, inadequate absorption of iron, infections, communicable disease, keeping domestic animals are numerous factors that reveal similarities in the development of IDA and porotic hyperostosis (Stuart-Macadam, 1987).

Theory of Self-Care Management (Orem, 1971; Dorsey & Murdaugh, 2003) focuses on the development of self-efficacy for improving healthcare and quality of mother-child health. Jenerette and Murdaugh (2008) aver that in sickle cell anemia patients, vulnerability factors are negatively associated with health care outcomes and self-care management resources.

According to symbolic interaction theory (Goffmam, 1959), the behavior of the individuals is determined based on their belief not just what is right or wrong. For example, mothers who are suffering from sickle cell should not have children. Due to low education and mistrust on the medical system they opt for the children despite of transferring the disease in their children. Human behavior is cultural in origin and social in its consequences. Symbolic factors profoundly affect the relationship between an individual and an illness. The interactions of individual suffering from sickle cell anemia with healthcare professionals and their families impact perceptions about this disease. It becomes difficult for family caretakers and sickle cell anemia patients to let others acknowledge, recognize, and share their suffering (Helman, 2007).

According to Talcott Parsons functionalist perspective (Parson, 1951), health is vital for the stability of the society and illness is a sanctioned form of deviance. Sick people are unable to accomplish their usual societal roles, which weakens the society. For performing their normal social roles sick people should be encouraged to get medical treatment to return to health. It is right of the sick to get exempted from routine social roles based on the medical diagnosis and treatment. The illness is beyond one's control and sick people should be provided necessary care during illness. Sick persons have certain responsibilities such as to get medical treatment and comply with it for recovery and to resume normal social duties. Based on the functionalist perspective, social conditions and social influence affects the well-being of anemic people, especially women of vulnerable areas. Multiple societal factors, such as education, income, occupation, social behavior, women specific concerns about reproductive health and pregnancy related problems are linked with anemia and their physio-mental health.

In the current study, social model of health (Dahlgren & Whitehead, 1991) is used that epitomizes the major health determining factors as the set of arcs around the individual range from specific life style factors to broad societal conditions through social and community networks. This model is not only the framework that researchers have developed for capturing social impacts on health, several other social models of health have also been developed to decipher the perception of social determinants of health. Evans and Stoddart health model (1990) was developed on multidisciplinary approach, elaborating how social, environmental, economic and genetic factors are contributing to differences in health status and opportunities to adequate health interventions. The social model of health proposed by Brunner and Marmot (Brunner & Marmot 1999) links social structure with health status via material, psychosocial and behavioral pathways. Najman's model of health (2001) demonstrates that health inequalities among societies can be better understood by identifying the causal pathways that link social contexts with the biological bases of disease.

Dahlgren and Whitehead's social model of health contributed to first health for all (HFA) strategy for Europe (Dahlgren & Whitehead, 1991). The model represents societal determinant of health as concentric arcs around the individual, mapping the relationship between the individual and the community, their environment and disease as shown in the Figure 2.1. The figure depicts that individual's age, sex and constitutional characteristics in the center that are largely fixed

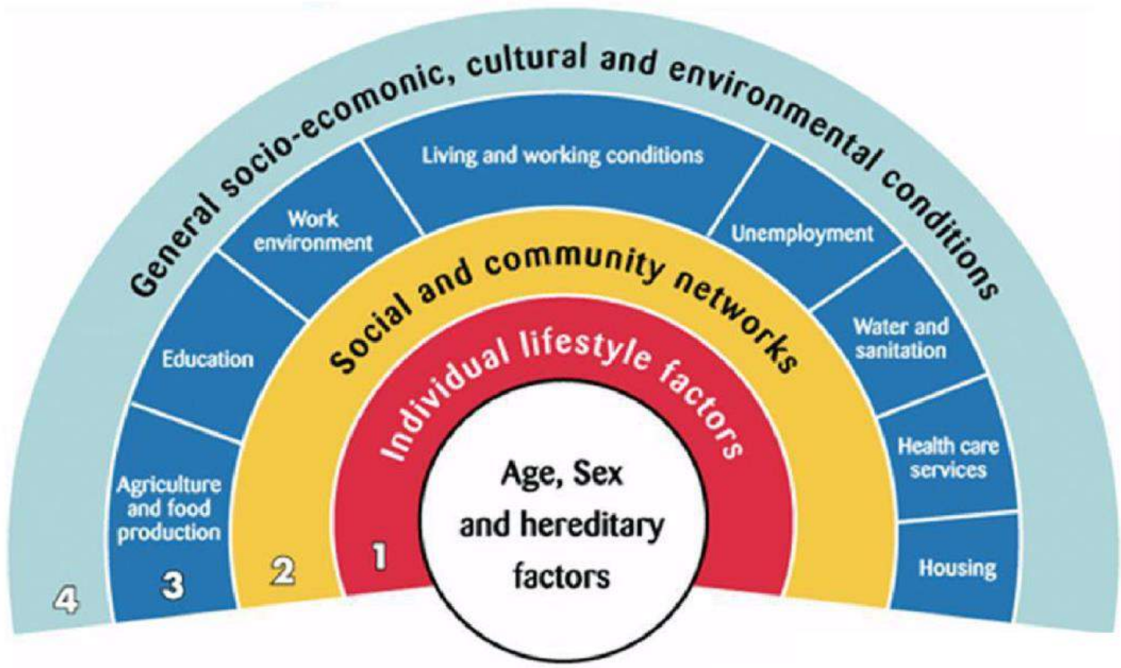

Figure 2.1: Social determinant of health (Dahlgren & Whitehead, 1991)

influencing their health and surrounded by influences that are modifiable. In arc1, life style factors of an individual, such as smoking habits and physical activity are shown. Arc2 of the model represents interaction of individuals with their peers and immediate community and is influenced by them. Arc 3 represents an individual's ability to maintain his/her health, which is influenced by residential and working environment, occupation, education, water and sanitation, food supply and access to essential goods and healthcare services. Finally, arc 4 represents economic, cultural and environmental impacts prevailing in the overall society as mediator of population health.

Anemia is a multi-causal health problem and its etiology cannot be understood based on biological factors only, but also includes societal determinants. In the present study, Dahlgren and Whitehead (1991) social model of health is used to capture the societal influences on the prevalence of anemia and its severity among respondents. The first arc of the model (Figure 2.1) includes individual and household factors contributing to anemia among the respondents. The factors include biological (hemoglobin level, blood loss) and household factors (life style, food intake, regularity in taking meals, food supplements, and taking nonfood items). The second arc of the model represents how the interaction of individual with peers and society (preference in food intake, violence and stress) affects prevalence of anemia. The third arc represents determinant factors contributing to anemia based on personal ability, such as, education, occupation, access to healthcare services, household structure, proper latrine facility etc. In the fourth arc, the general socio-economic status, cultural and environmental conditions influences are shown that depict the prevalence of anemia (household structure, sewerage system, knowledge about anemia and its cause, gender prejudice, perception about hot and cold food dichotomy etc.).

2.6 Conceptual Framework of Research

The conceptual framework is a key part of research design that supports and informs the system of concepts, assumptions and expectations, beliefs and theories about the research undertaken (Miles & Huberman, 1994; Robson, 2011). Conceptual framework is a visual or written product that shows the key variables, concepts or constructs to be studied and the presumed relationships between them (Miles & Huberman, 1994). The diagrams that are created clearly define the variables or constructs of the research topic and arrows are used to show their relationships. Latham (2017) aver that the whole methodology must agree with the variables and their relationships.

From statistical perspective, conceptual framework develops the link between the main concepts (variables) of the study. It demonstrates the sequence of activities a researcher intends for conducting a research work. Conceptual framework depicts an integrated way of viewing at a problem that one plans to study. It is mainly a model of what is going out there, what is going on with these things and why a faltering theory of phenomena under investigation exists. The function of this theory is to assess and refine the goals, develop accurate and pertinent research questions, select suitable methodology and identify probable validity threats to conclusion. The conceptual framework provides researchers:

- The skill to move beyond descriptions to explanations (what → why and how).
- A mechanism to develop an explanation set that may be used to define and make sense of the data.
- A filtering tool for opting suitable research questions and relevant data collection methodology.
- A reference point/structure for literature review, methodology and results.
- The boundaries of the research work.

The present study is an attempt to examine prevalence of social determinants of anemia among females in AJK and to identify more prevalent risk factors at different periods of life cycle that are helpful for developing effective prevention strategies. The pictorial representation of conceptual framework is shown in Figure 2.2.

To design and explore authenticities of the scenario, conceptual framework consisted of background variables, independent variables and a dependent variable. The Socio-economic variables including education, occupation, family income, household, environmental factors and personal hygiene are the background variables. There are three parts of the independent variables in the framework: demographic variables, cultural variables and nutritional variables. Demographic variables include age at marriage, number of pregnancies, prenatal care, post-natal care, number of living children, birth interval, heavy blood loss during menstrual periods and/or pregnancy. The cultural variables include knowledge about anemia, its causes and prevention, son preference, contraceptive behavior, freedom of health care utilization, violence, breast feeding and

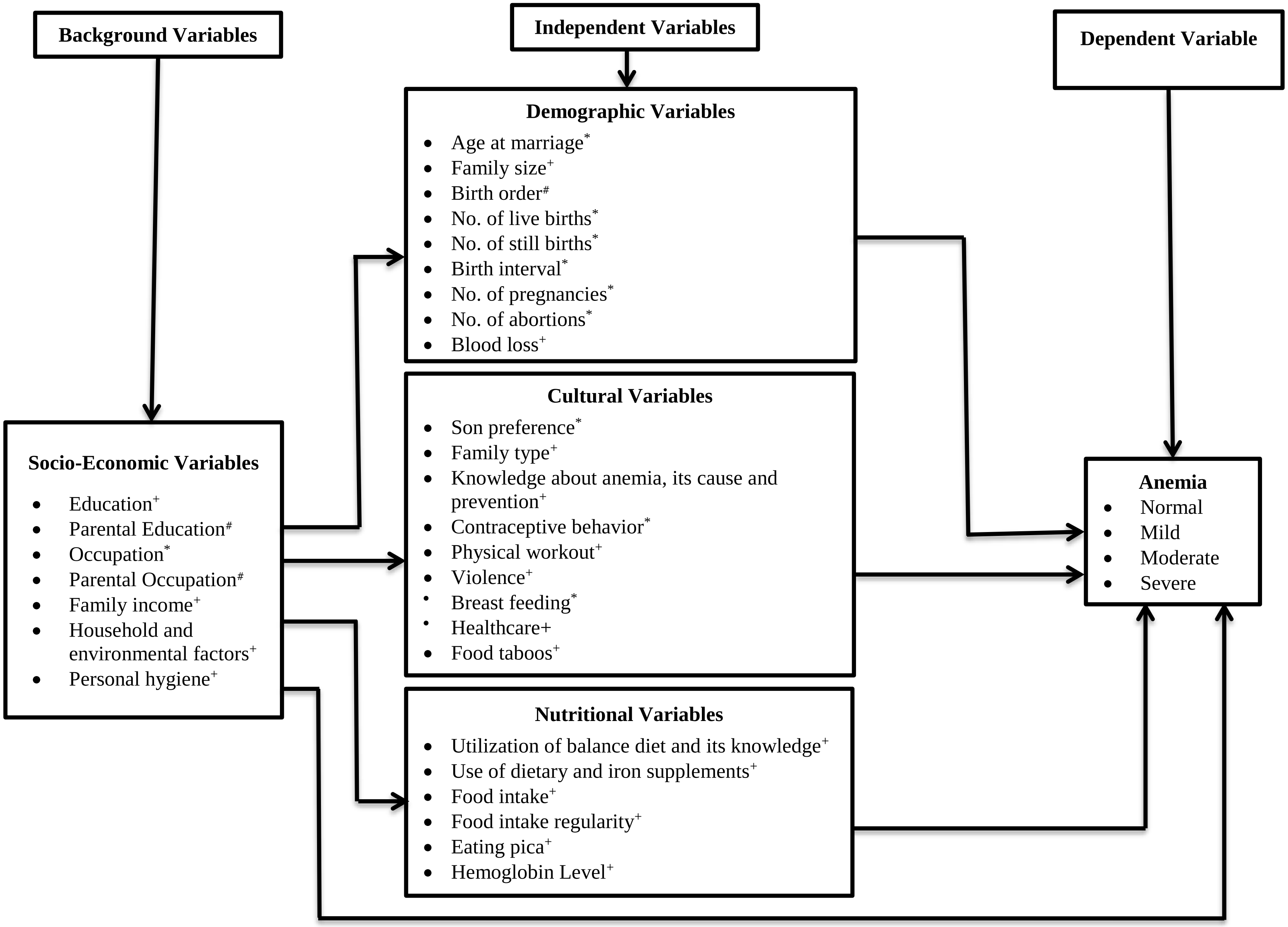

Figure 2.2: Conceptual framework (# for adolescent girls only, * married women only and + for both)

food taboos. These variables depict the cultural aspect of anemia prevailing in the society, extent of awareness about the anemia, health services and different health practices. The nutritional variables include utilization of balance diet and its knowledge, use of dietary and iron supplements, food intake regularity, eating pica and hemoglobin level.

Chapter 3

Methodology

Research is a systematized effort for exploring new knowledge and a methodology for analyzing or solving a research problem. Use of comprehensive research methodology is indispensably imperative for exploring in-depth knowledge and rational validation of hypothesis. The purpose of research methodology is to demonstrate various tools used for conducting meaningful and purposive research for analyzing research problem methodically. Researchers have used different research designs for inquiring diverse questions and for exploring specific knowledge. Qualitative research is an explanatory methodology that attempts to describe how and why individuals act and make appropriate decisions using nonnumerical data. Quantitative research strives to investigate the phenomena using numbers or anything that is measurable. This methodology typically ends with confirmation or disconfirmation of the research hypothesis to be tested. This study is carried out to analyze societal determinants of anemia among female of AJK using the quantitative approach. The research methodology for collection and estimation of data is demonstrated in terms of research design, population and sample size estimation, sampling design, construction of interview schedule, data collection, improving data quality and data analysis.

3.1 Research Design

The research design refers to the overall strategy undertaken to integrate different components of the study in a coherent and logical way to effectively address the research problem (De Vaus, 2001; Trochim, 2006). It constitutes the blueprint for the procedures used for data collection, instrument development and sampling process (Bhattacherjee, 2012). The suitable relevant research design is important for establishing reliability and validity of research findings

(Batool, 2010). Depending on the goal of scientific research, study designs are classified into positivist (theory testing) and interpretive (theory building) categories (Bhattacherjee, 2012).

The positivist research designs include field survey, field experiments, laboratory experiments, secondary data analysis and case research, whilst, interpretive designs include, phenomenology, ethnography and case research (Bhattacherjee, 2012). Irrespective of the research design employed, the researcher needs to collect quantitative and qualitative data using a combination of techniques such as interviews, questionnaires, documents, observations, or secondary data. Considering the research objectives, quantitative approach is used for data collection and estimation.

Numerous studies are available which analyze the factors of anemia etiology in all ages, however, this study is unique as it focuses on societal determinants of anemia and its effect on married women of 20-49 years and adolescent girls 10-19 years. A cross-sectional study was conducted in the Muzaffarabad division of AJK, Pakistan to understanding anemia and its societal determinants among women and adolescent girls. The direct information from respondents is collected through the interview schedule by asking open and close ended questions connected to the research objectives. Data sheet was prepared in SPSS 14.0 and responses were analyzed using univariate, bivariate, multivariable analysis. R-language was used to classify anemic and non-anemic groups using data mining techniques.

3.2 Population

The social determinants of anemia are investigated among female population of 10 to 19 years adolescent girls and 20-49 years married women having at least one child. As per 1998 census, the female population of 10-49 years is the projected female population aging 10 to 49 years in 2015. The formula used for computing projected population is

$$Projected\ Population = P\ (1+r)^n$$

Where P is the reference population in the specific year, r is the growth rate (2.80 for Muzaffarabad division) and n is the number of years from reference to the year for which projected population is computed.

Population of adolescent girls (10-19 years) as per census 1998 = $P_{adol}=87620$

Projected population of adolescent girls in 2015= $P_{adol}(1+r)^n$

Here:

$r = 2.8\% = 0.028$ *for Muzaffarabad division (AJK Bureau of Statistics, 2015).*

$n=17$ *years*

$\therefore$ *Projected population of adolescent girls in 2015=* $87620(1+.028)^{17}=140112$

Similarly:

Population of women (20-49 years) as per census 1998 = $P_{women}=126345$

Projected population of women in 2015= $P_{women}\,(1+r)^n = 126345(1+.028)^{17}=202038$

$\therefore$ *Target Population = Projected population of adolescent girls +Projected population of women*

$=140112+202038=342150$

3.3 Sample Size

Calculating and vindicating the sample size is a complicated and one of the most crucial part of the study. Sample size selection relies on countless features such as population size, population characteristics, time, available resources and the type of data analysis used to select a typical sample size. The sample size n of a given population size N is calculated using the formula (Krejcie & Morgan, 1970).

$$n = \frac{\chi^2 NP(1-P)}{d^2(N-1)+\chi^2 P(1-P)} \qquad 3.1$$

Where

$\chi^2 = 3.841$, the table value of $\chi^2$for 1 degree of freedom at desired confidence interval

$P = 0.50\ (population\ proportion)$

$d = 0.025(marginal\ error)$

N= 342150

$$n = \frac{3.841 \times 342150 \times 0.5(1 - 0.5)}{(0.025)^2 \times (342150 - 1) + 3.841 \times 0.5(1 - 0.5)} = 1529$$

3.4 Sampling Design

The target population comprising female of 10 to 49 years is 3, 42,150, which is the projected population in 2015 calculated as per population 1998 census. The Multistage stratified proportionate random sampling was used in the current study (Figure, 3.1).

Stage I: At first stage, Muzaffarabad division was randomly selected among three divisions (Muzaffarabad, Mirpur and Ponch) of AJK.

Stage II: At the second stage, the female population was divided into two strata based on age as indicated in the Figure 3.1.

Stage III: At the third stage, two districts, Muzaffarabad and Hattian of Muzaffarabad division, were selected randomly for each stratum.

Stage IV: At the fourth stage two sub-divisions (Hattian and Chikar) from district Hattian and sub-division Muzaffarabad from district Muzaffarabad were selected randomly.

Stage V: At the fifth stage, the union councils were selected randomly from sub-division Hattian, Chikar and Muzaffarabad.

At each stage proportional allocation based on the population of women and adolescent girls at the union council level is used to determine the sample size. Respondent were selected using simple random sampling technique from each Union Council.

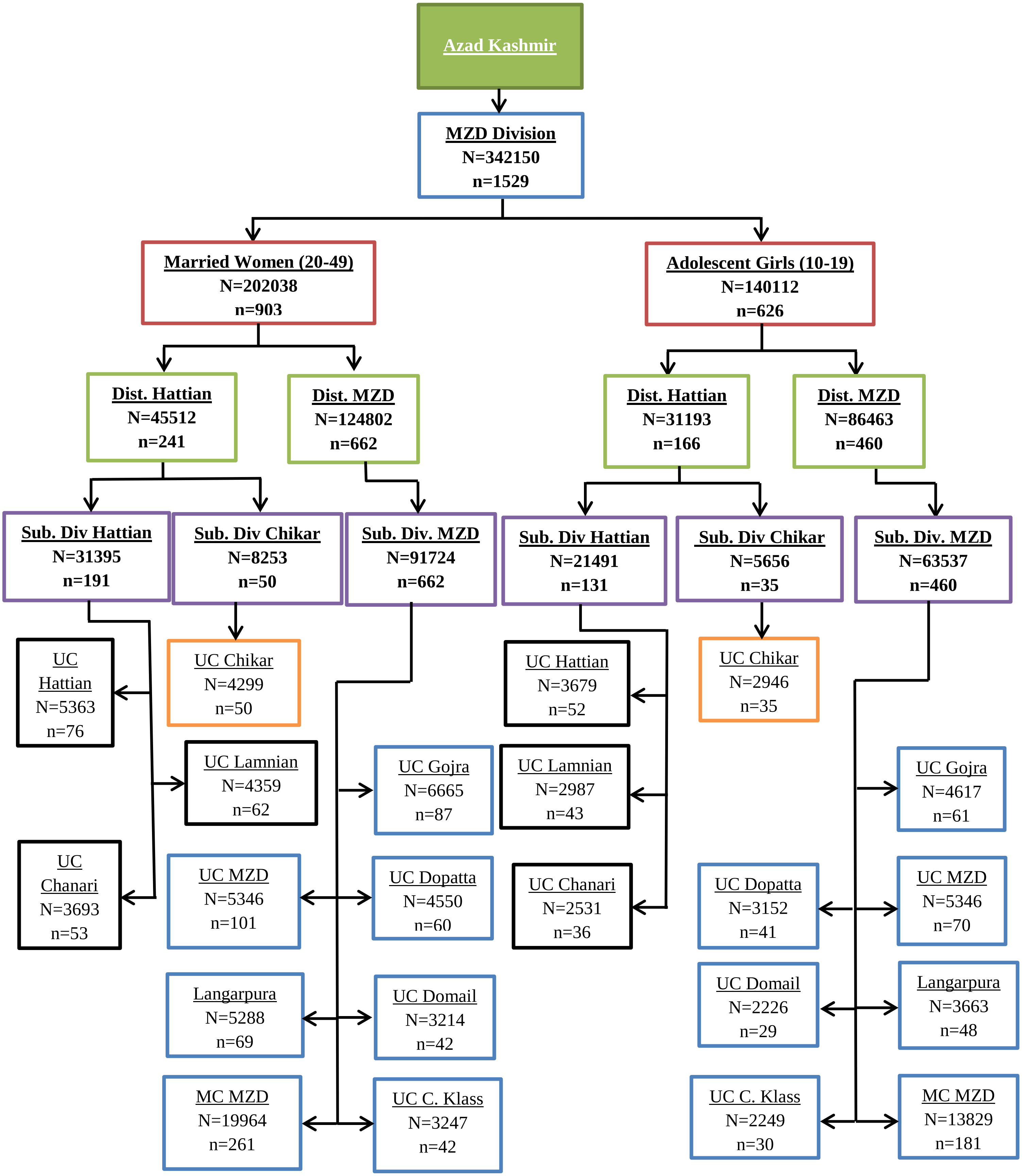

Figure 3.1: Sampling design of the study

3.5 Improving Data Quality

Ensuring the data quality is utmost important to present credible information. The valid, reliable, unambiguous, motivating and concise questionnaire design critically ensures that accurate data is collected (Jenn, 2006). Data quality can be improved while designing and developing a questionnaire by following the proper order of questions, time and relevancy of questions, coding, training and field supervision, pretesting and data editing (Fisher et al. 1983).

- **Sequence of Questions**. The questions were ordered to make flow in a logical sequence. In the commencement of questionnaire, personal information of the respondent was obtained first, following socio-economic, demographic, cultural and nutritional characteristics.
- **Time and Relevancy of questions**. To motivate the respondents for maximum information, questions should be prepared keeping the viewpoint of the respondents and biases should be avoided (Foddy, 1993). Double barreled and ambiguous questions should be avoided (Jenn, 2006). Time to administer interview depends on length of the questionnaire, relevancy and ambiguity of the questions. Questionnaire should be squeezed to reduce the time span for administering interview for sustaining interest of the respondents and to restrain the sinking of the responses (Fisher et al. 1983). The interview schedule used in this study was constructed by incorporating questions relevant to the research objectives to reduce time required for its administration. On average, the interviewers consumed 25 minutes for conducting interview from the respondents.
- **Coding**. The questionnaire comprised both open and close ended questions. Open ended questions are not restricted by the options, allowing the respondents to express their opinions freely, whereas, close ended questions comprise a set of options to express the

opinion of the respondents. The former is opted, if options are multiple and unknown, whereas latter is opted when opinions are limited and well known (Jenn, 2006). To ensure the quality and accuracy, close ended questions were pre-coded for saving data collection, its processing and analysis time. The open-ended questions were coded after administering the interview schedules. The software Statistical Package of Social Sciences (SPSS) 14.0 was used for preparing coding sheets to perform data analysis.

- **Training and field supervision**. The trained and skilled interviewers are vitally important for striving data quality. Before starting field work for data collection, twenty students from Sociology Department, University of Azad Jammu & Kashmir were chosen as interviewers. They were trained to understand the meaning and contents of the questions built in the interview schedule. The field work was supervised by the researcher herself and a University faculty member.
- **Pilot Study**. Pilot testing is a crucial step to detect flaws in the interview schedule in terms of content, grammar and format (Jenn, 2006). First, a faculty member from Health Sciences Department was given the interview schedule and questions were rephrased as per feedback. Then, one faculty member from Department of English checked for grammatical mistakes and format. Followed this, interview schedule was administered from twenty potential respondents. The interview schedule was modified by excluding the confusing or sensitive questions and some new questions were included in the light of experience gained in the pilot study. The interview schedule was then finalized with the consent of research supervisor.

3.6 Data Collection

Data was collected using a pretested self-constructed interview schedule, which comprised of open and close ended questions. The interview schedule contained questions related to the socio-economic, demographic, cultural and nutritional characteristics of the respondents. Before starting actual data collection, pre-field activities were ensured by examining the workability and understanding of the interview schedule. Married women (20-49) years who had at least one child and unmarried adolescent girls (10-14) were chosen for data collection.

Anthropometric measurements such as weight and height were measured using mechanical weighing scale with a height rod. To find out the Hb level of adolescent girls and married women blood was tested. HemoCue Hb 301 analyzer (manufactured by Ängelholm, Sweden), a pre-calibrated instrument designed for the measurement of Hb concentration was purchased from market for this purpose. Capillary blood was drawn, through microcuvettes, and inserted into the HemoCue Hb analyzer for recording Hb level. Two female lab technicians were hired for collecting blood samples to measure Hb level of respondents. Necessary precautionary measures were taken during blood collection. For non-pregnant women and adolescent girls 12 years or above Hb level up to 8.0 g/dL, 8.1-10.9 g/dL, 11-11.9 g/dL and ≥12g/dL were taken as severe, moderate, mild anemic and normal respectively. For adolescent girls 10-11 years Hb level up to 8.0 g/dL, 8.1-10.9 g/dL, 11-11.4 g/dL and ≥11.5g/dL were taken as severe, moderate, mild anemic and normal respectively. For pregnant women level of hemoglobin up to 7.0 g/dL, 7-9.9 g/dL, 10-10.9 g/dL and ≥11g/dL were taken as severe, moderate, mild anemic and normal respectively (WHO, 2011).

Hb concentration increases with altitude (Robalino et al., 2016, WHO, 2011) and must be adjusted for the altitude of residence. Following equation is used for the altitude adjustment of Hb.

in meters.

$$Hb_{Adjustment} = -0.32(altitude \times .0033) + 0.22(altitude \times .0033)^2 \qquad 3.2$$

3.7 Data Editing

The data editing is a crucial step to ensure the quality of data. The completed interview schedule was examined after the interview for errors, omissions and inconsistencies during field survey. The interview schedules were carefully examined and edited by the researcher on the day of interview. The cleaning of data was performed by matching the codes with coding sheets or by original interview schedule. The data was then entered in a computer and further data editing and cleaning were performed to rectify irregularities, unlikelihood and mismatching of codes. The cleaned data was then stored in a computer hard disk for further analysis and a backup copy was kept for safety perspective.

3.8 Data Analysis

The data evaluation process using statistical and analytical tools to extract valuable information and aid decision making is called data analysis, which is heart of the most social science experiments. It provides approximate solutions when the processes are extremely intricate or unknown. The quantitative data analysis was performed using univariate, bivariate, multivariate and data mining statistical analysis techniques. The univariate data analysis was used to examine the frequency distribution of cases depending on a single variable at a time. The bivariate analysis was used to determine empirical relationship between the anemia severity and its societal determinants. We also used two advanced statistical techniques multiple linear regression (MLR) and data mining for analyzing data. The bivariate analysis reveals the association between two variables i.e. a predictor variable and a dependent variable, whereas, MLR reveals effect of more than one independent variables on the dependent variable. In this study, MLR was used to assess influence of more than one societal determinant on the Hb level of respondents. The data mining techniques were used to perform classification analysis using societal determinants as the feature sets. In this study, different machine learning algorithms were used for classification of anemic and non-anemic subjects using feature sets drawn from societal determinants of anemia. Statistical package for social science (SPSS) was used for univariate, bivariate and multivariable data analysis, whereas, R language was used as a data mining tool for classification analysis.

3.9 Data Analysis Tools

3.9.1 SPSS. Statistical Package for Social Science (SPSS) was developed by Hull and Bent in 1968 for the analysis of large amount of social science data. SPSS was first time used at Stanford University. It has eased the researches to store large volume of data collected on computers and save time to analyze data with little effort. SPSS is chosen because it is most widely used package in academia and business circles. It takes very short computational time even for a huge scale of data. It is a versatile package that allows many different types of analyses and adequately serves the research purposes (Arkkelin, 2014).

3.9.2 R Language. R is a programming language and interactive environment used for statistical analysis and computing. R is influenced by two languages S and Scheme: its syntax is similar to that of S and its implementation and semantics are derived from Scheme (Ihaka & Gentleman, 1996). R is open source programming language and a good choice for small or large statistical projects. It has been extensively used in academic environments and by statisticians due to its zero cost, extensibility and flexibility. The comprehensive R archive network (CRAN) and R development core team are at the center of user community. CRAN is a repository of additional functionalities called packages. RStudio provides an integrated development environment that provides a provision to R users to write fast and efficient R code. R language is good for implementing simple and fast machine learning algorithms.

3.10 Data Analysis Techniques

3.10.1 Univariate analysis. It is the method used for analyzing a single variable data at a time and explores each variable in the data set separately. Univariate analysis is the simplest form of statistical analysis that it can be inferential or descriptive. The univariate analysis does not answer about relationships between variables, rather it describes how one characteristic or attribute varies from observation to observation. The main purpose of univariate analysis is to summarize the data and to find patterns in it. In univariate analyses, the parameters such as the mean, median and standard deviation (SD) are used for describing quantitative data (continuous variables), whereas, frequencies and percentages are used to describe categorical variables (Valveny & Gilliver, 2016). The researchers use univariate analysis to determine numerous measures about the data distribution such as mean, median, mode, standard deviation, minimum and maximum values. These values allow the researchers to perform several tests for establishing a clearer picture of the data distribution.

The most commonly used illustration to summarize univariate data describes the data's center and spread including frequency distributions, histograms, box and whisker plots, stem and leaf plots and pie charts. Frequency distribution of different variables is performed by identifying the minimum values of the variable. Frequencies distribution can also be presented in the form of percentage distributions and cumulative percentages. The univariate analysis of different societal determinants of anemia used in this study are computed using frequency and percentage distributions, mean and SD.

3.10.2 Bivariate analysis. Bivariate analysis is used for determining the empirical relationship between two variables (Babbie, 2009). It is helpful in testing hypotheses of association between two variables. Bivariate is a special case of multivariate analysis and like univariate analysis, it can be descriptive or inferential (Babbie, 2009). In this study, bivariate analysis is used to explore an association of anemia with socio-cultural risk factors and the strength of this association. For this purpose, cross tabulation is worked out for exploring the relationship of dependent variable 'anemia' with independent variables (sociocultural risk factors). Chi-square is used to check the association and testing hypotheses of association of two variables and results are considered statistically significant for significance level ≤ 0.05. Gamma test is used to determine the strength of association.

3.10.2.1 Reliability analysis. The interview schedule comprised both single statement questions as well as matrix of questions. The matrix of questions represents a variable with more than one statement and response category. The cross tabulation of dependent variable with each statement of matrix questions is tedious, long and imprudent. To resolve this problem, an index variable was constructed by combining all the items in the matrix to represent their joint effect.

Before the construction of index variable, a reliability test was applied, and Cronbach alpha (α) was estimated to ensure the consistency within all the statements in the matrix question. The Cronbach alpha is the most widely used and unbiased estimator of reliability (Cronbach, 1951). Cronbach's alpha is an internal consistency estimate of reliability of test scores which increases with the increase in intercorrelations among test items (Keszei et al., 2010; Kottner et al., 2011). The value of α varies from 0 to 1 (Cunha et al., 2016; Malacarne et al., 2017) and there is no consensus on its interpretation (Souza et al., 2017). Some studies established that value of α≥0.70 is ideal (Nunnally, 1994; Terwee, et al., 2007), however, some other studies considered values of α≥0.60 as satisfactory (Streiner, 2003; Balbinotti & Barbosa, 2008). The reliability classification of Cronbach alpha (Malacarne et al., 2017; Gottems, et al., 2018) is shown in the table 3.1.

3.10.2.2 Chi square (χ^2) test. Chi Square test is absolutely the most imperative and most used member of the nonparametric family of statistical tests. The formula calculation of Chi-square statistic is

Table 3.1

Reliability classification of Cronbach alpha

Cronbach alpha	Reliability classification
α > 0.9	Very high
0.9 ≥ α > 0.75	High
0.75 ≥ α > 0.6	Moderate
0.6 ≥ α > 0.3	Low
0.3 ≥ α	Very low

$$\chi^2 = \sum_{i=1}^{n} \frac{(f_o - f_e)^2}{f_e} \qquad 3.3$$

Where f_o is the observed frequency and f_e is the expected frequency. The value of χ^2 depends on the difference between observed and expected frequencies. Greater the difference between two frequencies, larger will be the χ^2 value. Larger χ^2 value determines the strong association between two variables. Following are the steps for calculation of χ^2 value.

a. Find the difference between each f_o and f_e i.e., $(f_o - f_e)$ for each cell in the table.
b. Take the square of each difference $(f_o - f_e)^2$.
c. Divide each squared difference by the respective expected frequency i.e. $\frac{(f_o - f_e)^2}{f_e}$
d. Take sum of all resulting divisions to compute the value of χ^2

3.9.2.3 Gamma test. Goodman and Kruskal's gamma test or simply gamma test is a symmetrical measure of strength of association/relationship suitable for use with ordinal or dichotomous nominal variables (Sheskin, 2007). Its value varies from - 1.0 to + 1.0, providing an indication of the strength of association between two variables. The value -1.0 indicates 100% negative association, the zero value shows absence of association and +1.0 means 100% positive association in the variables. Following formula is used to calculate gamma (G)

$$G = \frac{N_c - N_d}{N_c + N_d} \qquad 3.4$$

Where N_c is the number concordant pairs (same rank pairs) and N_d is the number of discordant pairs (pairs that don't rank the same). Depending on the values of N_c and N_d, the value of γ indicates the relationship between variables.

- When $N_s = 0$, the 3.2 becomes

$$G = \frac{0 - N_d}{0 + N_d} = \frac{-N_d}{N_d} = -1$$

This indicates perfect negative relationship between independent and dependent variables.

- When $N_d = 0$, the 3.2 becomes

$$G = \frac{N_s - 0}{N_s + 0} = \frac{N_s}{N_s} = 1$$

This indicates perfect positive relationship between independent and dependent variables.

- When $N_c = N_d$, the 3.2 becomes

$$G = \frac{N_c - N_c}{N_c + N_c} = \frac{0}{2N_c} = 0$$

This indicates that independent and dependent variables are not associated with each other. Like other statistical tests, significance is calculated by finding a test statistic and then comparing it to a table value. The formula for the gamma test statistic is:

$$z = \sqrt[G]{\frac{N_c + N_d}{N(1 - G^2)}} \qquad 3.5$$

3.10.2.4 Odd ratio (OR). Logistic regression can be used to calculate the odd ratio (OR) for each of the independent variable (Alexopoulos, 2010), which is the exponential function of regression coefficients (Szumilas M., 2010). The multiple logistic regression model is indicated using the equation

$$logit(P) = b_o + \sum_{i=1}^{p} b_i X_i$$

$$logit(P) = b_o + b_1X_1 + b_2X_2 + \cdots + b_pX_P \qquad 3.6$$

But $$logit(P) = \ln\left(\frac{P}{1-P}\right) \qquad 3.7$$

Hence $$\ln\left(\frac{P}{1-P}\right) = b_o + b_1X_1 + b_2X_2 + \cdots + b_pX_P \qquad 3.8$$

$$\frac{P}{1-P} = e^{b_0+b_1X_1+b_2X_2+\cdots+b_pX_P} \qquad 3.9$$

But $$Odds = \frac{P}{1-P} = \frac{Probability\ of\ occuring\ of\ an\ event}{Probability\ of\ not\ occuring\ an\ event}$$

Hence $$Odds = e^{b_0+b_1X_1+b_2X_2+\cdots+b_pX_P} \qquad 3.10$$

The odd ratio (OR) is defined as

$$OR = \frac{odds\ of\ an\ event\ occurring\ in\ the\ test\ group}{Odds\ of\ an\ event\ occurring\ in\ the\ reference\ group} \qquad 3.11$$

From equations 3.10 and 3.11, it is evident that logistic regression model, odd ratio is the exponential function of regression coefficients (e^b).

OR=1, when odds of event occurring in the test and reference groups are same.

OR>1, when odds of event occurring in the test group are higher than reference group.

OR<1, when odds of event occurring in the test group are lower than reference group.

3.10.3 Multivariable analysis. Majority of the real-world problems are multivariate or multivariable in nature, i.e. many variables are contributing them. The purpose of multivariate and multivariable analyses is to probe the relationships between more than two (multivariable) variables. Multivariate analysis should not be confused with multivariable analysis (Valveny & Gilliver, 2016). The multivariable analysis assesses the relationship of two or more independent variable with a single dependent variable, whereas multivariate analysis assesses the relation of two or more independent variable with two or more dependent variables (Valveny & Gilliver, 2016). Similarly, multiple and multivariate regressions are not the same. Multiple regression involves only one dependent variable, whist multivariate regression involves more than one dependent variable (Valveny & Gilliver, 2016).

The most commonly used multivariable analysis techniques include multiple linear regression/multiple analysis of variance (MANOVA)/analysis of covariance (ANCOVA), multiple logistic regression and multiple Cox regression. Table 3.2 details the types of commonly used multivariable models. In case of multiple linear regression, MANOVA and ANCOVA, the results are significant for those b coefficients for which 95% CI does not include zero. If $b<0$ for a factor, then that factor is negatively associated with outcome and vice versa. For logistic regression, odd ratios (OR) and for Cox regression hazard risk (HR) are used for interpretation of results. For ORs and HRs results are significant, when 95% CI does not include 1. The value <1 implies that factor is negatively associated with the outcome of dependent variable and vice versa (Valveny & Gilliver, 2016).

3.10.3.1 Multiple linear regression. Regression analysis is a collective name for the techniques used for the modeling and analysis of quantitative data comprising a dependent variable and one or more independent variables (Berk, 2004). The linear regression analysis was used to estimate the relationship between one dependent and one independent variables. The term of multiple linear regression analysis was first used by Pearson (1908) that assesses the association of more than one independent variable and a dependent variable (Jaccard et al., 2006). The multiple

Table 3.2

Types of commonly used multivariable models

	MLR/MANOVA/ ANCOVA	Multiple Logistic Regression	Multiple Cox Regression
Dependent Variable	**Quantitative** e.g. hemoglobin level	**Dichotomous** (without timepoint information) e.g. response (yes/no)	**Time event** Dichotomous (with timepoint information) e.g. Survival
Independent Variable	Two or more categorical or quantitative variables (at least one categorical for MANOVA or ANCOVA)	Two or more categorical or quantitative variables	Two or more categorical or quantitative variables
Equation	$\hat{Y} = b_o + \sum_{i=1}^{p} b_i X_i$	$logit(P) = b_o + \sum_{i=1}^{p} b_i X_i$	$log(h_i(t) = b_o + \sum_{i=1}^{p} b_i X_i$
Parameter	$\beta\ (= b)$	$OR(= e^b)$	$HR(= e^b)$
Interpretation	**Effect on the outcome** • Categorical independent variable (Category X vs reference category) • Quantitative independent variable (1-unit increase)	**Hazard risk** • Categorical independent variable (Category X vs reference category) • Quantitative independent variable (1-unit increase)	**Odd for:** • Categorical independent variable (Category X vs reference category) • Quantitative independent variable (1-unit increase)

linear regression model was indicated using the equation:

$$\hat{Y} = b_o + \textstyle\sum_{i=1}^{p} b_i X_i \qquad 3.12$$

$$\hat{Y} = b_o + b_1 X_1 + b_2 X_2 + \cdots + b_p X_P \qquad 3.13$$

where $\hat{Y}$ is the predicted value of dependent variable, X_1, $X_{2,} \dots, X_P$ are independent variables and b_o is the value of $\hat{Y}$, when all X's are zero and b_1, $b_{2,} \dots, b_P$ are the regression coefficients. Like other statistical procedures, the correct use multiple linear regression requires critical assumptions to be satisfied for ensuring validity of the model (Poole and O’Farrell, 1971).

Linearity, normality, collinearity and homoscedasticity are the assumptions of primary concern for multiple linear regression analysis. The multiple linear regression requires that relationship between the independent and dependent variables is linear, the violation of this assumption may lead to type-I, type-II errors and under or over estimation of significance (Osborne and Waters, 2002). Residual are very useful in detecting linearity violations (Stevens, 2009). The multiple linear regression requires that data should follow normal distribution because non-normality can distort relationships between dependent and independent variables which can influence overall accuracy of results (Osborne and Waters, 2002). Multicollinearity assumption occurs when independent variables are not correlated (Keith, 2006). It produces misleading and unusual results, extravagant standard errors and decreased regression coefficients. Multicollinearity can be prevented by combining overlapping variables and avoid including multiple measures of the same construct in the regression model (Keith, 2006). Homoscedasticity refers to same variance of errors across all levels of the independent variables (Osborne and Waters, 2002). The marked heteroscedasticity deteriorates statistical power of the analysis and findings, resulting in Type I error, unreliable and untrustworthy F-test results, and wrong conclusions (Osborne & Waters, 2002). Scatterplots of residuals with independent variables is a good method for investigating homoscedasticity (Keith, 2006).

Multiple linear regression is used to find the relationships of different socio-economic, demographic, cultural and nutritional variables (independent variables) with hemoglobin level (dependent variable) of the respondents. Anemia is determined by levels of hemoglobin for married women and adolescent girls. Based on the hemoglobin level, respondents were categorized as normal, mild, moderate and severe anemic. Stepwise regression method was used for model building that combines advantages of forward and backward selection. This approach uses automatic procedure for the selection of predictive variables. Two significance levels: one for adding one for removing variables are required. The stepwise regression is used to measure three coefficients (standardized regression coefficients, unstandardized regression coefficient and coefficient of determination R^2, which were then used to identify the relative importance of each of the independent variable in the regression model.

3.10.4 Data mining. Data mining is an interdisciplinary research field integrating the concepts of statistics, machine learning and natural language processing (NLP) for information extraction (Sanap et al., 2011). It is the collection of algorithmic techniques used for extracting hidden predictive information from large amounts of data (Dirthy & Priya, 2018). The recent advancements in development of information and communication technologies (ICT) and availability at cheaper rates resulted in the development of various data mining techniques (Lashari et al., 2018). Generally, data mining techniques are classified into descriptive and predictive modelling. The descriptive data mining techniques uncover patterns in the data and identify the associations between attributes signified by the data, whereas, predictive techniques largely predict the future outcomes than prevailing behavior (Sondwale, 2015).

Clinical decisions are made based on physician's perception and experience rather than the predictive information hidden in the data. This may cause unwanted biases, errors and unnecessary medical costs which can affect the quality of service given to patients (Chang and Chen, 2009). Data Mining has been used to explore meaningful and hidden patterns in the medical data that can be helpful for improving the quality decision making in the fled of medical science (Shrivastava and Sant, 2014). Successful applications of data mining in numerous fields have provided the impetus health care industry to fully utilize it in the acquisition of valuable information (Lashari et al., 2018).

Allayous et al. (2008) used data mining techniques for accurate prediction of the severe acute splenic sequestration crisis (ASSC), which is a serious symptom of sickle cell anemia. Markos et al. (2011) used data mining techniques to predict the nutritional status of under-five children. The results revealed that PART pruned rule induction model was robust with prediction accuracy 92.6% and area under receiver ROC 0.98. Sanap et al. (2011), used data mining techniques for prediction and classification of anemia. The findings indicated that decision tree classifiers are robust for classification of anemia based on complete blood count (CBC) reports along with anemia severity. Ahmed and Sitara (2012) collected the data of low income and second and third trimester pregnancy of female in Pakistan and used data mining algorithms to explore the correlation of depression and anemia. The results demonstrated the correlation between depression and anemia and its adverse effect on the pregnancy outcomes. Yu et al. (2017), used multilayer perceptron model for estimating missing values and to predict post-operative anemia.

Both supervised and unsupervised machine learning techniques can be used in data mining. In supervised learning training dataset is provided to the classification algorithm. Examples include linear discriminant analysis (LDA) (Fisher, 1936), support vector machines (SVMs) with its linear, radial, polynomial, sigmoid kernels, k-nearest neighbor (k-NN) algorithm, decision tree algorithms etc. Unsupervised learning tries to find patterns in the dataset pre-existing labels. It can be used to search data for similarities, pattern matching, or for identifying outliers within a dataset. In the present study LDA, SVM with its linear (SVML), radial (SVMR), polynomial (SVMP), sigmoid (SVMS) kernels, k-NN and random forest (RF) learning algorithms are used for classifying anemic and non-anemic groups.

3.10.4.1. Linear discriminant analysis (LDA). LDA is a generalization of Fisher's linear discriminant (FDA), is a classifier that was formulated by Ronald A. Fisher in 1936 (Fisher, 1936). LDA models the distribution of predictors in each of the response classes separately and then estimates the probability using Bayes' theorem.

$$P_n(X) = \frac{\pi_n f_n(x)}{\sum_{i=1}^{n} \pi_i f_i(x)} \qquad 3.14$$

Where π_n represents the probability of occurrence of an observation in class n ($n \geq 2$) and $f_n(x)$ is the density function x belonging to class n. LDA assumes that each class is normally distributed with class-specific mean and a common variance. LDA used as binary classifier to separate two samples is shown in the figure 3.2.

3.10.4.2. Support vector machines (SVM). SVM is a supervised machine learning (ML) procedure that is used for regression, classification and other tasks such as outlier detection. SVM algorithms conceptually implement the idea that input vectors can be nonlinear mapped to constructs a hyperplane or set of hyperplanes in a high or infinite dimensional space (Cortes & Vapnik, 1995). Intuitively, a hyperplane achieves a good separation if it is at maximum distance

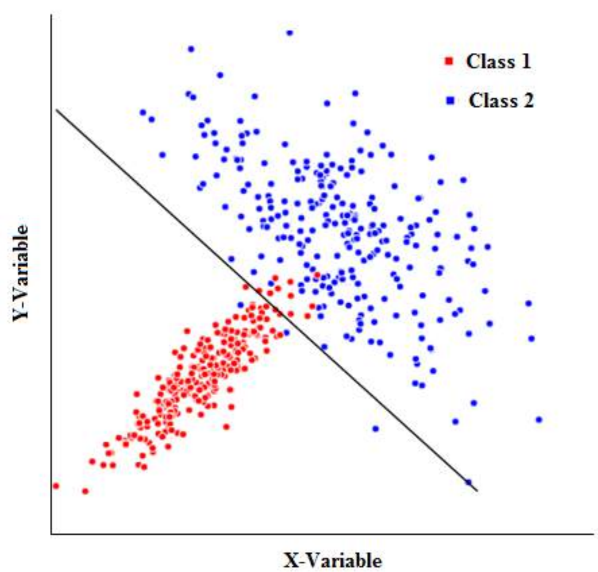

Figure 3.2: LDA used as binary classifier

from points of different instances on either side. In general, larger the decision boundary (maximum margin), lower is the generalization error of the classifier (Hastie, 2008). A linear SVM classifier separates a n-dimensional vector into (n-1) dimensional hyperplane. Figure 3.3 shows an example of a group of instances, with a hyperplane (midway between the two margins) and the maximum margin on either side of the hyperplane.

Given a training set $\{(\vec{x}_1, y_i), (\vec{x}_2, y_2), \ldots, (\vec{x}_n, y_n)\}$ comprising n points, where $\vec{x}_i$ is a p-dimensional real vector, , $y_i \in \{-1, 1\}$ indicates the class of the point $\vec{x}_i$. The hyperplane can be written as the set points $\vec{x}$ satisfying the relation

$$\vec{w}.\vec{x} - b = 0 \qquad 3.15$$

Where $\vec{w}$ is the normal vector to the hyperplane. For linearly separable normalized training set, two hyperplanes separating binary class data can be described as

$\vec{w}.\vec{x} - b = 1$ (Data point above the hyperplane is class 1 with label 1)

$\vec{w}.\vec{x} - b = -1$ (Data point below the hyperplane is class 2 with label -1)

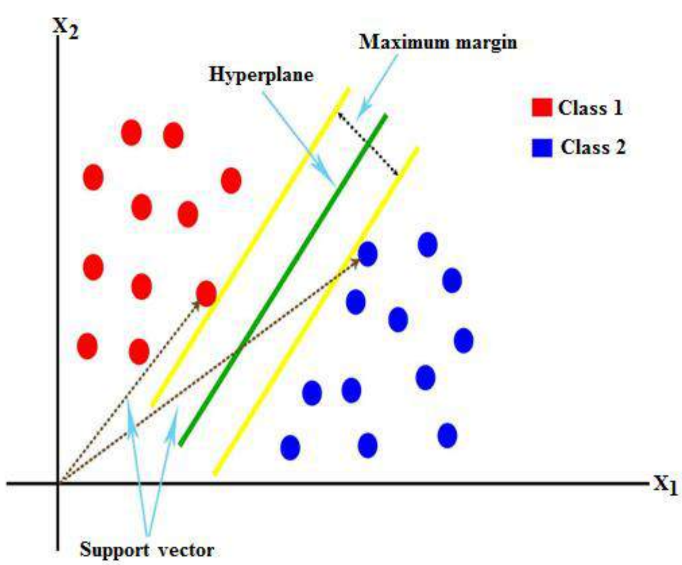

Figure 3.3: An example of SVM classifier.

To ensure that each data point must lie on the correct side of the margin, the optimal boundary is obtained by minimizing the objective function with the constraint

$$\vec{w}.\vec{x} - b \geq 1 \; for \; y_i = 1 \qquad 3.16$$

$$\vec{w}.\vec{x} - b \leq 1 \; for \; y_i = -1 \qquad 3.17$$

It can be rewritten as

$$(\vec{w}.\vec{x} - b)y_i \geq 1, \forall \; 1 \leq i \leq n \qquad 3.18$$

The original SVM proposed by Vapnik in 1963 constructs a linear classifier. Bernhard et al. (1992) however, suggested a way for creating nonlinear classifiers by applying the kernel trick to maximum-margin hyperplanes. Some common kernels include

- Homogenous polynomial kernel: $k(\vec{x}_i, \; \vec{x}_j) = (\vec{x}_i.\vec{x}_j)^d$
- Inhomogeneous polynomial kernel: $k(\vec{x}_i, \; \vec{x}_j) = (\vec{x}_i.\vec{x}_j + 1)^d$
- Radial basis function: $k(\vec{x}_i, \; \vec{x}_j) = e^{-}(\gamma\|\vec{x}_i - \vec{x}_j\|)^2, \gamma > 0$
- Sigmoid kernel: $k(\vec{x}_i, \; \vec{x}_j) = \tanh(\mathrm{k}\vec{x}_i.\vec{x}_j + c) \neg\forall \; k > 0 \; and \; C > 0$

3.10.4.3. k nearest neighbor (k-NN) algorithm. k-NN algorithm is a non-parametric method used for regression and classification (Altman, 1992). In k-NN input is the k closest training samples in the feature space whereas, output depends on whether this algorithm is used for regression or classification. In k-NN classification, an object is classified by majority voting of its neighbors and the object is assigned to the class that is most common among its k nearest neighbors. The procedure of kNN algorithm is detailed below.

1. Given a training set $\{(\vec{x}_1, y_1), (\vec{x}_2, y_2), \ldots, (\vec{x}_n, y_n)\}$ comprising n points, where $\vec{x}_i$ is a p-dimensional real vector, $y_i \in \{-1, 1\}$ indicates the class label of x.
2. For continuous variables Euclidean distance and for discrete variables hamming distance are used as the distance metrics

3. Using the distance metric, i.e. $d_i \leq d_i + 1,$ values are sorted, where $1 \leq i \leq k.$
4. The voting or means are applied according to the nature of data
5. The number of nearest Neighbors i.e. value of k depends upon the nature and volume of data provided to KNN. For larger data the k value is kept larger while for smaller data the k value is kept smaller.

For single nearest neighbor (k = 1), the object is simply assigned to that specific class. In Figure 3.4, an example of k-NN classification is illustrated. In solid circle the green dot is a test sample that should be classified either to red triangles or blue squares. In dashed line circle k=7 (3 red triangles and 4 blue squares), in this case green dot is assigned to the blue squares.

3.10.4.4. Random forest (RF). Random forest (RF) generates several classifiers and acquires their outcomes by creating classification and regression trees (CART) (Breiman, 2001). Each tree is trained on the bootstrap sample of the original training data and finds and separates the input variable subset that is randomly selected. The RF starts with a typical machine learning technique called a decision tree, in which an input is entered at the top as it traverses down the tree. The output can be an average or a weighted average of all the terminal nodes that are reached, or, for categorical variables, a majority with the right to vote. This process is depicted in Figure 3.5.

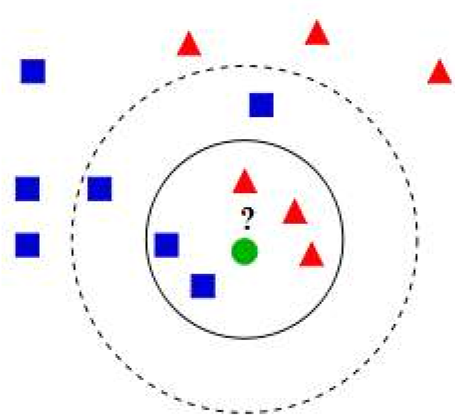

Figure 3.4: k-NN classification example

RF classifier is based on a family of classifiers $h(\mathbf{x}|\Theta_1),\ldots,h(\mathbf{x}|\Theta_k)$ with parameters Θ_k that are randomly selected from a model random vector Θ. For the final classification $f(\mathbf{x})$, each tree casts a vote for the most popular class at input **x**, and the class with maximum votes wins.

3.9.4.5. Performance evaluation of classifiers. In the field of machine learning (ML) confusion matrix provides a fundamental bases for evaluating the performance of the classifiers. As shown in Table 3.3, confusion matric is a table comprising of two rows and two columns that reports

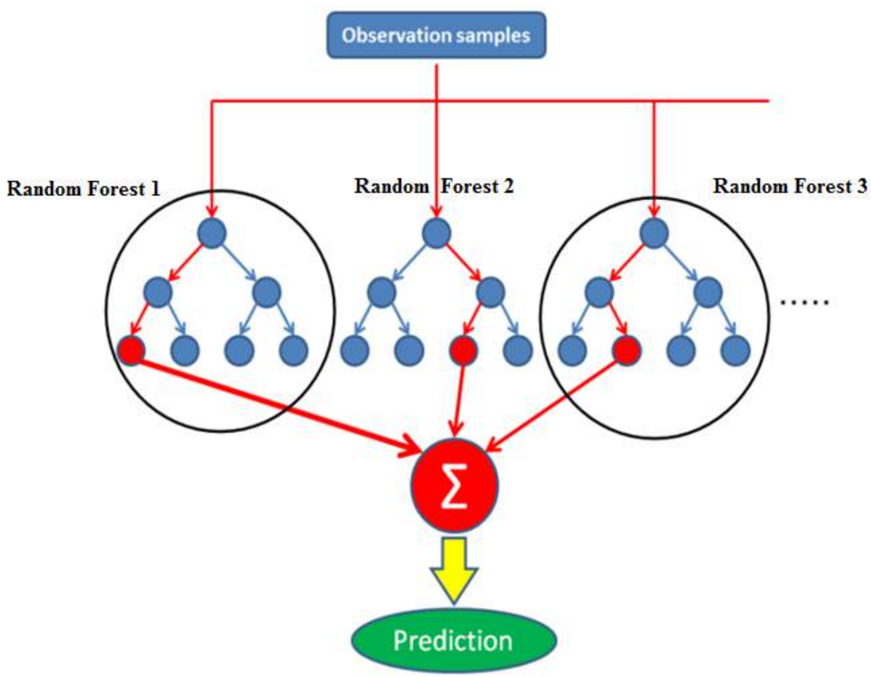

Figure 3.5: Random forest classification Process

- **True positives (TP):** Both actual and predicted values are positive.
- **False Positive (FP):** Actual value is negative, but it is predicted as positive.
- **False Negative (FN):** Actual value is positive, but it is predicted as negative.
- **True negatives (TN):** Actual value is negative and it is predicted as positive.

Table 3.3

Confusion matrix of actual and predicted values

		Predicted Values	
		Positive	Negative
Actual Values	Positive	True Positive (TP)	False Negative (FN)
	Negative	False Positive (FP)	True Negative (TN)

The evaluation metrics and their terminologies derived from the confusion matrix are detailed below.

- **Sensitivity:** It is also called true positive rate (TPR) or recall. Sensitivity is defined as the ratio of true positive assessments (TP) to the total number of positive assessments (TP+FN) (Powers, 2011). Mathematically,

$$Sensitivity = \frac{TP}{(TP+FN)} \qquad 3.19$$

- **Specificity:** It is also called true negative rate (TNR). Specificity is defined as the ratio of true negative assessments (TN) to the total number of negative assessments (FP+TN) (Powers, 2011). Mathematically,

$$Specificity = \frac{TN}{(FP+TN)} \qquad 3.20$$

- **Precision:** Precision or positive predictive value (PPV) is the proportion of predicted positive assessments that are correctly real positives (Powers, 2011). Mathematically

$$Precision = \frac{TP}{(FP+TP)} \qquad 3.21$$

- **Accuracy:** Precision or positive predictive value (PPV) is the proportion of predicted positive assessments that are correctly real positives (Powers, 2011). Mathematically

$$Accuracy = \frac{Accuate\ predictions}{Total\ prediction} \qquad 3.22$$

$$Accuracy = \frac{TP+TN}{(TP+FP+TN+FN)} \qquad 3.23$$

- **F_1 Score:** It is an evaluation metric that considers both FP and FN to compute the score (Powers, 2011). It is the harmonic mean of precision and recall. Mathematically

$$F_1 Score = 2 \times \left(\frac{Precision \times Recall}{Precision+Recall}\right) \qquad 3.24$$

- **Kappa:** It is the most commonly used measure in the medical Sciences for assessing interobserver agreement (Viera & Garret, 2005). Kappa is a metric that compares an observed accuracy with an expected Accuracy. Mathematically

$$Kappa = \frac{Predicted\ accuracy - Expected\ accuracy}{1 - Expected\ accuracy} \qquad 3.25$$

The value of Kappa varies between 0 and 1 revealing chance to perfect agreement respectively (Viera & Garret, 2005).

Chapter 4

Results and Discussion

This chapter describes results of the study and various types of analysis carried out using data collected through field survey from June 5 to August 18, 2016 for investigating the socio-cultural risk factors of anemia in married women (aged 20-49 years) and adolescent girls (aged 10-19 years). This chapter is divided into four parts. The first part of the chapter describes univariate data analysis, which is used to examine the frequency distribution of cases depending on a single variable at a time. The second part of the chapter presents the result of bivariate analysis to determine empirical relationship between the anemia severity and its societal determinants. The third part of the chapter discusses the results of the multivariable statistical analysis to examine effects of more than two sociocultural factors on the hemoglobin level of the respondents. The fourth part of this chapter delineates results for classification of anemic and non-anemic subjects using data mining techniques.

4.1 Univariate Analysis

Univariate analysis is the simplest form of data analysis techniques, which summarizes the data to find out patterns in it and does not deal with relationships/causes. In univariate analysis percentages, frequency (f) distributions, mean and standard deviation (SD) are calculated to explicate different risk factors of anemia. Following sections present the results of the univariate analysis for summarizing different socio-economic, demographic, cultural and nutritional variables.

4.1.1 Married women

4.1.1.1 Respondent's age at the time of interview and age at marriage. Age is very important variable and especially the growing age is of vital importance as it brings rationality and maturity. With the increasing age women autonomy and authority in decision making also improves. She may get more control over household financial matters. It means growing age may improve women social and economic status within family and community.

Table 4.1 shows data on age of the respondents at the time of interview, their age at marriage and duration of married life. During analysis of data current age of the respondents was divided into five different groups. This table comprised three data sets; first three columns exclusively show data collected from District Muzaffarabad, next three columns comprised data

Table 4. 1

Respondent's age at the time of interview and marriage

Age (years)	District Muzaffarabad			District Hattian			Total		
	%(f)	Mean	SD	%(f)	Mean	SD	%(f)	Mean	SD
Age at the time of interview									
20-25	12.4(82)	23.16	1.80	19.5(47)	23.36	2.19	14.3(129)	23.24	1.95
26-30	27.0(179)	28.45	1.51	22.4(54)	28.93	2.24	25.8(233)	28.56	1.71
31-35	23.3(154)	33.47	1.49	21.8(52)	33.38	1.52	22.8(206)	33.45	1.50
36-40	18.0 (119)	38.50	1.55	23.2(56)	38.39	1.70	19.4(175)	38.46	1.59
40+	19.3(128)	44.95	2.07	13.3(32)	44.88	2.81	17.7(160)	44.93	2.23
Total	100(662)	33.96	7.25	100(241)	33.12	7.19	100(903)	33.68	7.24
Age at marriage									
Up to 18	37.5(248)	16.62	1.49	41.5(100)	16.41	1.61	38.5(348)	16.56	1.53
19-25	51.2(339)	21.79	1.99	48.1(116)	21.50	1.96	50.4(455)	21.72	1.99
26 -30	10.1(67)	27.40	1.42	8.7(21)	27.76	1.48	9.7(88)	27.49	1.43
30+	1.2(8)	32.13	3.98	1.7(4)	34.25	2.22	1.3(13)	32.83	3.54
Total	100(662)	20.55	4.03	100 (241)	20.15	4.27	100(903)	20.44	4.09

gathered from the respondents from district Hattian Bala and the last part of the table shows results of total data set (combined data of both districts). District-wise analysis followed by combined analysis enables the readers to better judge the situation within each district as well as overall situation. It is appropriate to mention here that during field survey data was collected from the respondent women belonging to the age group 20 to 49 years having at least one child.

Most of the respondents (27%) from District Muzaffarabad were of 26-30 years old followed by 23.3% of 31-35 years old. There were 19.3%, 18.0% and 12.4 % belonging to age groups, above 40, 36-40 and 20-25 years, respectively. The mean age in Muzaffarabad district was calculated as 33.96 and SD was 7.25 years. The results of data collected from District Hattian Bala revealed that most of the respondents (23.2%) were 36-40 years and almost same percentage were 26-30 years at the time of interview. From the remaining, 21.8%, 19.5% and 13.3% were from age categories 31-35, 20-25 and above 40 years, respectively. Respondent's mean age in District Hattian Bala was 33.12 and SD was 7.19 years. The combined analysis of the data collected from both the districts shows that 25.8% and little less than this (22.8%) fall in age group 26-30 and 31-35 years, respectively. All the remaining age groups have less than 20% respondents with first lowest percentage (14.3%) in first age group, followed by second lowest 17.7% in last age group and 19.4% in fourth age group i.e. 36-40 year. The mean age of overall data was calculated as 33.68 and SD was 7.24.

The age at marriage has complex association with educational attainment, reproductive health and societal status of the women, all of which impact the public health (Marphatia et al., 2017). Early marriage is the doorway to the early childbirth, numerous health complications associated with the timing of childbirth and increased number of pregnancies. It deprives women from getting equitable education, developing social links, grabbing employment opportunities and broadening societal engagements. Furthermore, early marriage is associated with preterm births, low birth weight, intrauterine deaths, maternal morbidity and mortality (Marphatia et al., 2017).

The second part of the table 4.1, shows results of univariate analysis about age of the respondents at marriage. Respondents were divided into four groups based on the age at marriage. In Muzaffarabad district, most of the respondents (51.2%) were married at the age between 19-25 years and 37.5% respondent were married on or before the age of 18 years, the 10.1% of the respondent were married between 26-30 years and only a small fraction (1.2%) married after the age of 30 years. Mean age at marriage was 20.55 years and SD was 4.03 years. Majority of the respondents from Hattian Bala district (48.1%) were married at the age between 19-25 years, followed by 41.5% respondent who married on or before the age of 18 years. The remaining respondents (8.7%) and (1.7%) were married at the ages between 26-30 and 30+ years respectively. The mean age and SD of the respondent's age at marriage are 20.55 and 4.27 respectively.

Overall, half of the women (50%) were married between 19-25years, followed by 38.5% were married on or before the age of 18 years, 9.7% got married in 26-30 years and 1.3% were married after the age of above 30 years. The average age at the time of marriage for the respondents of the AJK was 20.44 with SD of 4.09 years. Thus, average age at marriage is less in Azad Kashmir than the average age at marriage (22 years) in Pakistan (Batool, 2010). In South Asian countries, marriage is main context of sexual intercourse, which increases the exposure of women becoming pregnant. The increased conjugal period (duration of marriage) because of young age marriage increases this exposure during their reproductive careers. The long duration of marriage is associated with increased number of pregnancies and childbirths (Konishi et al. 2013), escalating the anemia prevalence among respondents.

4.1.1.2. Body mass index (BMI). It is an index of weight-for-height, which is an important maternal indicator for determining malnutrition in children (Kalk et al., 2009). It is defined as the weight in kilograms divided by the square of the height in meters (kg/m^2). According to WHO criteria (WHO, 2009), respondents can be categorized into underweight (BMI<18.5kg/m2), normal (18.5≤BMI<25kg/m2), overweight (25.0≤BMI<30 kg/m2) and obese (BMI≥30 kg/m2).The underweight mothers (*BMI< 18.5* kg/m^2) in early days of pregnancy are at higher risk of intrauterine growth restriction (IUGR) and preterm births (Kalk et al., 2009; Kramer, 2003). The IUGR in turn causes stunting in infants and risk of coronary artery disease in later life (Kramer, 2003; Dewey & Begum, 2011; Aziz et al., 2012; Aziz et al., 2013). On the other hand, maternal BMI ≥ 25 kg/m^2 is associated with intrauterine deaths, infant mortality and childhood obesity (Cnattingius & Lambe, 2002; Whitaker, 2004; Baeten et al., 2001).

Table 4.2 reveals percentage distribution of married women based on the BMI. In Muzaffarabad district, 6.6% of the respondents were underweight, 39.1% had normal BMI, 31.7% were overweight, and 22.5% were obese. Majority of the respondents (48.1%) in the Hattian district were of normal weight, followed by 27.4% overweight, 17.4% obese and 7.1% underweight. In Muzaffarabad district 54% of the respondents were overweight or obese compared to 44.8% in district Hattian Bala. Overall 41.5% of the respondents were of normal weight, 30.6% over weight, 21.2% obese and 6.8% respondents were underweight. The average BMI of the respondents from Muzaffarabad district was 25.97 kg/m^2 and SD was 5.21 kg/m^2, whilst average BMI and its SD for respondents from Hattian district were 24.99 kg/m^2 and 5.08 kg/m^2 respectively. The combined average BMI for both districts were 25.70 kg/m^2 and SD is 5.19 kg/m^2.

4.1.1.3. Educational attainments of the respondents and their husbands. Education of the woman and her husband are equally important for making the couple receptive to the timely health

Table 4. 2

Distribution of the respondents based on their BMI

BMI	District Muzaffarabad			District Hattian			Total		
	%(f)	Mean	SD	%(f)	Mean	SD	%(f)	Mean	SD
Married women									
Underweight	6.6(44)	17.17	1.04	7.1(17)	17.39	0.94	6.8(61)	17.23	1.01
Normal	39.1(259)	22.20	1.78	48.1(116)	21.76	1.82	41.5(375)	22.06	1.80
Overweight	31.7(210)	27.36	1.34	27.4(66)	27.42	1.37	30.6(276)	27.38	1.34
Obese	22.5(149)	33.18	3.15	17.4(42)	33.14	2.69	21.2(191)	33.17	3.04
Total	100(662)	25.97	5.21	100(241)	24.99	5.08	100(903)	25.70	5.19

care, utilization of healthy and balanced diet, availing antenatal and postnatal care to tackle issue of anemia among women. In table 4.3, distribution of the women and their husbands based on the years of schooling is elucidated.

The illiterate respondents from Muzaffarabad were 19.3%, 8.6% had 1-5 years of school, 13.0% had 6-8 years, 25.8% 9-2 years and 33.2% more than12 years. In Hattian district, less than 1/3 of women (30.3%) were illiterate, followed by 26.6% with more than 12 years of schooling. About 16.6% women had 6-8 years of schooling, same percentage of respondents had 9-12 years of schooling and reaming 10.0% had 1-5 years of schooling. The combined data analysis of both the districts revealed that majority of the respondents 31.4% have more than 12 years of schooling and 23.4% had9-12 years. The remaining 22.3% were illiterate, 9.0% and 13.9% were educated up to 1-5 and 6-8 years respectively. The education of women belonging to Muzaffarabad was higher (mean =8.75 and standard deviation = 5.21) than women of Hattian Bala district (mean =6.94 and SD = 5.57). Overall, average years of schooling for the respondents belonging to both districts were 8.14 years and SD 5.35 years.

Table 4.3

Educational attainments of the respondents and their husbands.

Education (Years of Schooling)	District Muzaffarabad			District Hattian			Total		
	%(f)	Mean	SD	%(f)	Mean	SD	%(f)	Mean	SD
Education of the respondent									
Illiterate	19.3(128)	0.00	0.00	30.3(73)	0.00	0.00	22.3(201)	0.00	0.00
1-5	8.6(57)	4.46	1.03	10.0(24)	4.04	1.23	9.0(81)	4.33	1.11
6-8	13.0(86)	7.49	0.81	16.6(40)	7.25	0.95	13.9(126)	7.41	0.86
9-12	25.8(171)	9.94	0.29	16.6(40)	9.85	0.36	23.4(211)	9.92	0.31
12+	33.2(220)	14.00	1.58	26.6(64)	13.92	1.69	31.4(284)	13.98	1.61
Total	100(662)	8.57	5.21	100(241)	6.94	5.57	100(903)	8.14	5.35
Education of the respondent's husband									
Illiterate	9.5(63)	0.00	0.00	9.1(22)	0.00	0.00	9.4(85)	0.00	0.00
1-5	7.3(48)	4.33	1.33	6.2(15)	4.00	1.00	7.0(63)	4.25	1.26
6-8	12.1(80)	7.34	0.81	15.4(37)	7.35	0.86	12.9(117)	7.34	0.82
9-12	36.0(238)	9.98	0.233	36.1(87)	9.95	0.30	36.0 (325)	9.97	0.25
12+	35.2(233)	13.91	1.63	33.2(80)	13.89	1.57	34.7(313)	13.91	1.61
Total	100(662)	9.69	4.38	100(241)	9.58	4.29	100(903)	9.66	4.35

The second part of the table 4.3, reveals results of the univariate analysis for the years of schooling of the respondent's husbands. In Muzaffarabad district, highest percentage of the respondent's husbands (36.0%) had years of schooling between 9-12 and almost same percentage had more than 12 years of schooling. The 12.1% respondent's husbands were educated up to middle level (6-8 years), 7.3% up to primary level (1-5) and remaining 9.5% were illiterate. The mean years of schooling are 9.69 years with SD 4.38 years. In the Hattian district, most of the respondent's husbands, (36.1%) had 9-12 years of schooling, followed by 33.2% more than 12 years of schooling, 15.4% respondent's husbands were educated up to middle, 6.2% up to primary and 9.1% were illiterate. The mean years of schooling are 9.58 years with SD 4.29 years. Overall 9.4% respondent's husbands were illiterate, 7.0% were educated up to primary level, 12.9% had middle standard, 36.0% had 9-12 years of schooling and 34.7% had 12+ years of schooling.

More than 1/5 (22.3%) of women were illiterate compared to 9.4% of their husband. Mean education of women for years of schooling is 8.14 years and standard deviation 5.35 years whilst that of their husbands mean is 9.66 years and SD was 4.35 years respectively. The education of women belonging to Muzaffarabad is higher (mean =8.75 and SD = 5.21) than women of Hattian Bala district (mean =6.94 and standard deviation = 5.57). However, spouses of the respondents have had almost similar mean and SD in both districts. The table does not reflect massive disparity between wife and husband's years of schooling in the Azad Kashmir.

4.1.1.4. Monthly income. Income is an indicator of socio-economic status in the society, which determines health status of an individual and their families. Wealthier women enjoy twice better health compared to those of lower income women (Shield 2001). Table 4.4 reveals the results of univariate analysis for the respondent's monthly income, husband monthly income and family monthly income in Pakistani rupees (PKR). The first part of the table shows the findings of the study for respondent's monthly income, where 78.1% of the respondents (78.1% from Muzaffarabad and 78.0% from Hattian) had no monthly income, 9.5% earned up to 10,000 rupees (9.8% from Muzaffarabad and 10.4% from Hattian), 5.3% (5.7% from Muzaffarabad and 4.4% from Hattian) earned between 10001 to 20000 rupees, 6.1% earned between 20,001 to 50,000 rupees and only 1.0% had income more than 50,000 rupees.

Table 4.4

Monthly income of the respondents, their husbands and family

Monthly Income (PKR)	District Muzaffarabad		District Hattian		Total	
	f	%age	f	%age	f	%age
Respondent monthly income						
No Income	517	78.1	188	78.0	705	78.1
Up to 10,000	61	9.8	25	10.4	86	9.5
10,001 to 20,000	38	5.7	10	4.4	48	5.3
20,001 to 50,000	38	5.7	17	7.1	55	6.1
50,000+	8	1.2	1	0.4	9	1.0
Total	662	100	241	100	903	100
Husband monthly income						
No Income	34	5.1	18	7.5	52	5.8
Up to 20,000	280	42.3	103	42.7	383	42.4
20,001 to 50,000	256	38.7	94	39.0	350	38.8
50,001 to 100,000	70	10.6	22	9.1	92	10.2
100,000+	22	3.3	4	1.7	26	2.9
Total	662	100	241	100	903	100
Family monthly income						
No Income	2	0.3	1	0.4	3	0.3
Up to 20,000	209	31.6	91	37.8	300	33.2
20,001 to 50,000	253	38.2	97	40.2	350	38.8
50,001 to 100,000	139	21.0	38	15.8	177	19.6
100,000+	59	8.9	14	5.8	73	8.1
Total	662	100	241	100	903	100

The second part of the table 4.4 shows monthly income of the respondent's husbands in Pakistani rupees. About 5.1% of the respondent's husbands had no monthly income and are economically dependent on the respondent, his family and/or societal support. Majority of the respondent's husbands 42.4% (42.3% from Muzaffarabad and 42.7% from Hattian) had monthly income up to 20,000 followed by 38.8% with monthly income between PKR 20,001 to 50,000. From remaining distribution, 10.2% and 2.9% earn 50,001 to 100,000 and above 100,000 rupees respectively.

Third part of the table 4.4 reveals distribution of the respondents based on family monthly earning. Negligibly small percentage of the respondents (0.3%) had no family income. Majority of the respondents 38.8% (38.2.6% from Muzaffarabad and 40.2% from Hattian) had the family monthly income between 20,001 to 50,000 rupees followed by 33.2% (31.6% from Muzaffarabad and 37.8% from Hattian) earn up to 20,000 rupees. Remaining distribution of 19.6% and 8.1% had family monthly income between 50,001 to 100,000 and more than 100,000 rupees respectively. The results reveal that despite good percentage of the respondents with the above higher secondary education, male members have more control over economic resources and women are economically dependent on their husbands or their families.

4.1.1.5. Occupation of the respondent and her husband. Occupation is personal engagement in an activity to generate income for their livelihood. Occupation of the respondent and her husband is an indicator of social position in the family as well as in the society. The social status governs the medical care utilization practices of that individual and his/her family. In Pakistan women contribution in income generation is quite negligible and their traditional role is performing household chores, bearing and rearing children and conjugal loyalty (Batool, 2010).

In table 4.5, results of univariate analysis based on the occupation of the respondent and her husband are shown. Respondents were categorized into house wives, government servant, self-employed, laborers and domestic workers based on their occupation. The percentage of the respondents within each group belonging to both districts was almost same. Majority of the respondents (78.1%) were house wives, 9.3% government servants, 6.2% were private servants, 5.4% were self-employed and 1.0% were laborer/others. Both districts follow same trend in terms of percentage distribution of the respondents involved in different professions. The results highlight

Table 4.5

Occupation of the respondents and their husbands

Occupation	District Muzaffarabad		District Hattian		Total	
	f	%age	f	%age	f	%age
Occupation of the respondents						
House Wife	517	78.1	188	78.0	705	78.1
Government Servant	65	9.8	19	7.9	84	9.3
Private Service	36	5.4	20	8.3	56	6.2
Self Employed	37	5.6	12	5.0	49	5.4
Laborer/others	7	1.1	2	0.8	9	1.0
Total	662	100	241	100	903	100
Occupation of the respondent's husbands						
Government Servant	238	36.0	70	29.0	308	34.1
Private Service	166	25.1	58	24.1	224	24.8
Businessman	120	18.1	61	25.3	181	20.0
Skilled Laborer	64	9.7	17	7.1	81	9.0
Laborer/others	74	11.1	35	14.5	109	12.1
Total	662	100	241	100	903	100

the lesser involvement of women to generate income which are in line with the study of Batool (2010). The results indicate that due to lesser involvement of women in income generating activities, they are economically dependent on their husbands, which affects their healthcare decision making.

The second part of the table reveals distribution of the married women based on the occupation of their husbands. Majority of them 34.1% (36.0% from Muzaffarabad and 29.0% from Hattian) were government employees, 24.8% (almost same percentages from both districts) were working in the private sector (mostly private schools). One fifth 20.0% (18.1% from Muzaffarabad and 25.3% from Hattian) were businessmen, 9.0% (9.7% from Muzaffarabad and 7.1% from Hattian) were skilled labor (bakers, masons, carpenters and auto mechanics) and remaining 12.1% (11.1% from Muzaffarabad and 14.5% from Hattian) were daily wage laborers/others. The findings indicate that majority of respondent's husbands were engaged in the government and private sector jobs, whilst remaining were engaged in the business, skilled labor and labor professions.

4.1.1.6. Household head. A household comprises all the people who co-reside a housing unit. Household head is the person who is involved in the economic and household decision making and is designated by other members as the head (Hedman et al., 1996). Due to host of traditional cultural, economic and political institutions, the household decision-making is primarily the domain of the male head in Pakistan (Hakim and Aziz, 1998). On the other hand, a recent study conducted by Xiaohui (2011) reported that women's roles have improved both inside and outside households by financial growth and efforts for empowering women in Pakistan. The improved control on household is associated with better healthcare utilization.

The table 4.6 shows the results of univariate analysis about distribution of household heads. Among the respondents belonging to Muzaffarabad district, little more than 60% household heads were husbands, followed by 15.9% father-in-law, 13.4% mother-in-law, 8.5% respondents and 1.7% others. In Hattian district, 54.8% household heads were respondent's husbands, 21.2% father-in-law, 7.1% mother-in-law, 14.5% respondents themselves and 2.5% others. Overall, majority of household heads 76.3% (59.0% husbands and 17.3% father-in-law) were male and one-fifth were female (10.1% respondent herself and 11.7% mother-in-law). The results elucidate male household control in the Azad Kashmir, which reflects a conservative attitude towards economic and household decision making. Education and the measures taken in Azad Kashmir to empower women have changed mindset of people towards engaging female in income generating activities which resulted in their unrestricted mobility and involvement in the household decision making.

Table 4.6

Respondent's distribution according to household heads

Household Head	District Muzaffarabad		District Hattian		Total	
	f	%age	f	%age	f	%age
Respondent	56	8.5	35	14.5	91	10.1
Husband	401	60.6	132	54.8	533	59.0
Father-in-Law	105	15.9	51	21.2	156	17.3
Mother-in-Law	89	13.4	17	7.1	106	11.7
Others	11	1.7	6	2.5	17	1.9
Total	662	100	241	100	903	100

4.1.1.7. Family structure and size. Family is the fundamental unit of study in numerous disciplines of social and medical sciences (Sonawat, 2001). Family is a social group who live together, share economic resources and consanguinity (Murdock, 1949). In a family group of people are unified by ties of marriage, blood or adoption, share same residence, interact and inter-communicate with each other in their specific social roles of father and mother, son and daughter, brother and sister, husband and wife giving rise to a common culture (Burgess and Lock,1963). Like other Asian countries, the Pakistani society is collectivistic, that is more inclined to interdependence and co-operation among family members.

In Pakistan, nuclear and joint family system prevails, however, extended family system is also found in smaller number (Batool, 2010). Research evidences reveal that women in nuclear families have higher or equal status compared to those in the joint/extended family (Batool, 2010). In the table 4.7, respondent's distribution according to family structure and size is presented. More than fifty percent women (54.9%) reside in the nuclear family and 45.1 % in the joint/extended family. In both districts number of respondents residing in the nuclear family were higher than joint/extended families. In Muzaffarabad district (54.4%) of the respondents lived in the nuclear family and 45.6% live in joint/extended families. In Hattian district 56.4% respondents lived in the nuclear family and 43.6 % in the joint/extended family. Previously, joint family system was dominant in Pakistan, but due to globalization and urbanization, the joint/extended family system disintegrated into nuclear families. The results indicate that in Azad Kashmir more respondents are living in nuclear families than in the joint families. The disintegration of joint families and emergence of nuclear families in Azad Kashmir is the result of radical change in the social fabric after devastating earthquake of October 2005.

Table 4.7 also shows distribution of the respondents based on their family size. Only 15.8% respondents had family size “up to 4 members”, majority of the respondents (58.3%) had family size of 5-8 members and 25.9% had family size of “8+ members”. In Muzaffarabad district, 14.4% were living in family comprising 4 members, 59.7% in a family of 4 to 8 members and 26.0% live in a family of 8+ members. On the other hand, in the Hattian Bala District 19.9% live in the family size of 4 members, 54.5% in the family of 5-8 members and 25.7% in the 8+ family size.

The results clearly elucidate, even though majority of the respondents were residing in the nuclear setup, 84.2% of the respondents were residing in a family size of 5 or more members. In figure 4.1, the bar chart with error bars for three family sizes in the Muzaffarabad, Hatain and total number of respondents is shown. Bars represent average values and error bars represent SD with in each family size. It is evident from the figure; average family size was more than 7 members in both districts.

Table 4.7

Distribution of the respondents based on the family structure and size

Family Structure and Size	District Muzaffarabad		District Hattian Bala		Total	
	f	%age	f	%age	f	%age
Family structure						
Nuclear	360	54.4	136	56.4	496	54.9
Joint/Extended	302	45.6	105	43.6	407	45.1
Total	662	100	241	100	903	100
Family size						
Up to 4 family members	95	14.4	48	19.9	143	15.8
5-8 family members	395	59.7	131	54.4	526	58.3
8+ family Members	172	26.0	62	25.7	234	25.9
Total	662	100	241	100	903	100

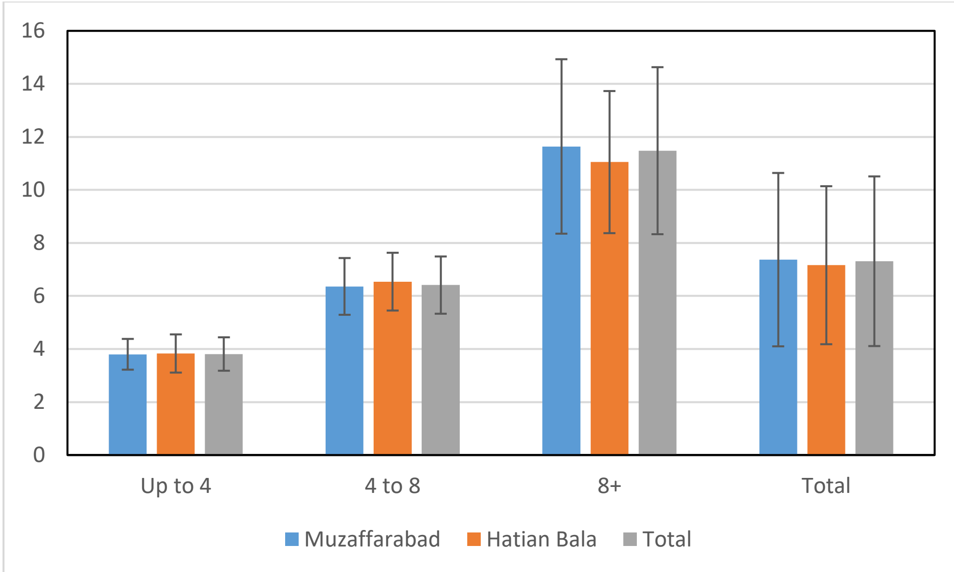

Figure 4.1: Mean ± Standard deviation of family sizes of married women.

4.1.1.8. Household and environmental factors. The household and environmental factors such as nonconcrete houses, poor latrine facility, improper sewerage systems, unclean fuel and passive smoking are the major determinants of anemia (Baranwal et al., 2014). According to National nutritional survey (NNS) 2011of Pakistan, 64.2% families are living in houses made of concrete or bricks depicting an increase of 50% compared to findings of NNS 2001 (NNS, 2011).

In the table 4.8, percentage distribution of the women based on community household factors such as house structure, latrine facility, sewerage system and garbage disposal are elucidated. Majority of the respondents (60.2%) were residing in the concrete houses, 33.1% living in the shelters, 5.1% in mud houses and 1.6% of people were living in the wooden houses. More than one-third (36.1%) of the respondents in the Muzaffarabad were living in the shelters compared to 24.8% in Hattian Bala district. The percentage of the mud houses (11.6%) and wooden houses (4.6%) in Hattian Bala was higher than the Muzaffarabad district, i.e., 2.7% and 0.5% respectively. Overall, majority of the houses in both districts had RCC structure.

The second part of table 4.8 shows that 88.4% respondents had proper latrine facility, while 11.6% had no proper latrine facility. The facility of proper latrine was comparatively higher

(90.0%) for the respondents of Muzaffarabad district than Hattian Bala district (83.8%). The third part of the table 4.8 reveals the distribution of the respondents based on type of the sewerage system facility. Majority of the respondents (84.2%) had the facility of underground sewerage

Table4.8

Distribution of women according to household living conditions

Housing Environment	Muzaffarabad		Hattian		Total	
	f	%age	f	%age	f	%age
Type of Household Structure						
Concrete	402	60.7	142	58.9	544	60.2
Mud houses	18	2.7	28	11.6	46	5.1
Wooden houses	3	0.5	11	4.6	14	1.6
Shelters	239	36.1	60	24.9	299	33.1
Total	662	100	241	100	903	100
Latrine Facility						
Yes	596	90.0	202	83.8	798	88.4
No	66	10.0	39	16.2	105	11.6
Total	662	100	241	100	903	100
Sewerage System						
Open System	93	14.0	50	20.7	143	15.8
Underground	569	86.0	191	79.3	760	84.2
Total	662	100	241	100	903	100
Garbage Disposal						
Burn	304	45.9	110	45.6	414	45.8
Burry	21	3.2	10	4.1	31	3.4
Municipality Drum	37	5.6	14	5.8	51	5.6
Collect Outside	198	29.9	65	27.0	263	29.1
Throw in rivers/streams	102	15.4	42	17.4	144	15.9
Total	662	100	241	100	903	100

system and 15.8% had open sewerage system. In both districts, majority of the respondents 86.0% in Muzaffarabad and 79.3% in Hattian Bala had underground sewerage system. The fourth part of the table 4.8 shows the results of garbage disposal by burning, burying, collecting in municipality drums, collecting outside the house and throwing in rivers/streams. Little less than (45.8%) respondents burn, 29.1% collect outside, 15.9% throw in rivers/streams, 5.6% collect in municipality drums and 3.4% bury the garbage. Almost similar trend was found among respondents of both districts regarding the garbage disposal.

4.1.1.9. Drinking water and its quality. Safe and clean drinking water is an important determinant of a healthy life. Poor water quality is responsible for about 5 million children deaths in developing countries (Holgate, 2000). The increase in the population and rapid urbanization has resulted into poor water quality management, which has further aggravated this issue. In Pakistan, about 40% mortality and 30% morbidity are due to the poor water quality (Country Report Pakistan, 2000). The poor water quality is responsible of causing diarrhea and about 100 million cases of this disease are reported annually in Pakistan. According to United Nation International Children Emergency Fund (UNICEF), 20-40% hospitals are filled with waterborne health related issues (Daud et al., 2017). About 80,000 cases related to the waterborne diseases were reported in Rawalpindi healthcare units only (Tahir et al., 1994).

Table 4.9 presents respondent distribution according to the main sources of drinking water and their satisfaction about water quality. The first part of table reveals that 22.6% respondents use tape water, 70.2% use spring water, 0.8% use mineral water and 1.7% use other sources such as tube wells and hand pumps for drinking. In both districts majority of the respondents use spring water for drinking (70.2% Muzaffarabad and 70.1% in Hattian Bala). Just 0.9% of the respondents use bottled water due to unaffordability of purchasing. The 1.5-liter bottled water costs 50 rupees,

Table 4.9

Drinking water sources and satisfaction about its quality

Drinking Water	Muzaffarabad		Hattian Bala		Total	
	Frequency	%age	Frequency	%age	Frequency	%age
Source of Drinking Water						
Tape water	139	21.0	65	27.0	204	22.6
Spring water	465	70.2	169	70.1	634	70.2
Filtered water	35	5.3	14	2.9	42	4.7
Mineral/Bottled water	8	1.2	0	0.0	8	0.9
Others	15	2.3	0	0.0	15	1.7
Total	662	100	241	100	903	100
Satisfaction						
Yes	603	91.1	229	95.0	832	92.1
No	59	8.9	12	5.0	31	7.9
Total	662	100	241	100	903	100

which is unaffordable for low-income and large family size respondents. High percentage of the respondents (92.1%) were satisfied with the water quality and according to their point of view, spring water is good in quality and safer than tape water. Due to the low pace of industrialization and urbanization in AJK, underground water is less contaminated. Secondly, people are not aware about the different parameters which affect water quality and contaminate it. Thus, respondents are not taking into consideration these parameters for determining water quality.

4.1.1.10. Symptoms of anemia. Anemia is a neglected health problem in Pakistan, where women are more susceptible to develop iron deficiency at certain times in life due to numerous societal and economic problems (Batool, 2010). In Pakistan 50% of women between age group 15 to 49 were anemic (Batool, 2010). The poor socioeconomic conditions in this region are its main causes (World Fact Book, 2008). Anemia badly affects the health of WRA and restricts their daily routine activities (Lone et al., 2004). Generally, symptoms of anemia vary with its type and other medicinal conditions (Batool, 2010). Due to human body's substantial ability to cope with early stage of anemia, its symptoms may not be observed. Easy fatigability, tiredness, shortness of breath, cardiac arrhythmias, reduced working capacity, depression and headache are major symptoms of anemia. The table 4.10 shows the response of the questions about different symptoms of anemia asked from respondents.

Table 4.10

Respondent's distribution according to symptoms of anemia

Statement	To great extent		To some extent		Not at all	
	f	%age	f	%age	f	%age
Tiredness	400	44.3	415	46.0	88	9.7
Weakness	362	40.1	413	45.7	128	14.2
Pale skin	166	18.4	242	26.8	495	54.8
Decreased Pinkness in lips and gums	134	14.8	272	30.2	497	55.0
Decreased pinkness in nail beds	124	13.7	201	22.3	578	64.3
Feel dizziness	109	12.1	319	35.3	475	52.6
Shortness of breath	123	13.6	375	41.5	405	44.9
Heart palpitation	145	16.1	385	42.6	373	41.3
Feel depressed	290	32.1	397	44.0	216	23.9
Decreased working capacity	286	31.7	465	51.5	152	16.8
Feel unusually cold	143	15.8	318	35.2	442	48.9

Less than half (44.3%) of the respondents felt tiredness to great extent, 46.0% to some extent and 9.7 did not feel any tiredness. Nearly 40% respondents noted weakness to great extent, 45.7 to some extent and 14.2 did not feel any weakness. The response about pale skin reflected that 18.4% respondents had this symptom to great extent, 26.8% had to some extent and 54.8% did not have pale skin problem. Most of the respondents (55%) did not notice decreased pinkness in lips and gums, 30.2% notice to some extent and 14.8% to great extent. In response to great extent, table 4.10 shows that 13.7, 12.1, 13.6, 16.1, 23.1, 31.7 and 15.8% respondents told about the problems of decreased pinkness in nails, feel dizziness, shortness of breath, heart palpitation, depression, decreased working capacity and feel unusually cold respectively.

In response to the problems of decreased pinkness in nails, feel dizziness, shortness of breath, heart palpitation, depression, decreased working capacity and feel unusually cold 22.3, 35.3, 41.5, 42.6, 44.0, 51.5 and 35.2% respondents reported to some extent respectively. While, 64.3, 52.6,44.9, 41.3, 23.9, 16.8 and 48.9% respondents told that they did not face these problems.

4.1.1.11. Preventive measures taken after feeling symptoms of anemia. In table 4.11, preventive measures taken by the respondents after feeling different symptoms of anemia. The respondents reported that 79.8% take rest and 20.2% did not take rest after feeling symptoms of anemia, 74.2% respondents take food, 60.6% visit doctor, 10.9% visit Hakeem, 14.2% visit for spiritual treatment and 25.4% take multivitamins. It was evident from results that almost 40% of the respondents did not consult doctors for proper checkup. Few (10.9%) of women visited the conventional Hakeems and about 15% prefer to treat symptoms by visiting spiritual leaders and institutions. Some of the respondents were of the view that spiritual practices have positive effect on their wellbeing.

Table 4.11

Preventive measures after feeling different symptoms of anemia

Preventive Measures	**Yes**		**No**	
	f	**%age**	**F**	**%age**
Rest	721	79.8	182	20.2
Take Food	670	74.2	233	25.8
Visit Doctor	547	60.6	356	39.4
Visit Hakeem	98	10.9	805	89.1
Spiritual Treatment	128	14.2	775	85.8
Take Multivitamins	229	25.4	674	74.6

***4.1.1.12. Number of pregnancies and pregnancy related outcomes*.** In Pakistan, child bearing is the basic aim of marriage due to societal beliefs. The position of women becomes strong when she gets pregnant and gives birth to a child in a Pakistani society (Abbasi, 2006; Batool, 2010). Multiparity and repeated pregnancies increase the prevalence of anemia during and/or after pregnancy. In table 4.12, respondent's distribution according to the number of pregnancies and pregnancy related outcomes such as number of live births, number of miscarriages, number of still births and average birth interval are presented. In Muzaffarabad district 42.9% respondents conceived 1-3 times, 42.6% reported 4-6 times and 14.5% conceived more than six times. On the other hand, in Hattian Bala district 34.9% respondents conceived 1-3 times, 46.5% reported 4-6 times and remaining 18.7 conceived more than 6 times. Overall, the number of 1-3 pregnancies was 40.8%, 4-6 pregnancies was 43.6% and 6+ pregnancies was 15.6%. Average number of pregnancies as shown in the Figure 4.2 in Hattian Bala district (4.56) were comparatively higher

Table 4.12

Distribution of women based on the number of pregnancies and related factors

Pregnancies	Muzaffarabad		Hattian Bala		Total	
	f	%age	f	%age	f	%age
1-3	284	42.9	84	34.9	368	40.8
4-6	282	42.6	112	46.5	394	43.6
6+	96	14.5	45	18.7	141	15.6
Total	662	100	241	100	903	100
Number of abortions/miscarriages						
Zero	416	62.8	157	65.1	578	63.5
One	150	22.7	47	19.5	197	21.8
More than one	96	14.5	37	15.4	133	14.7
Total	662	100	241	100	903	100
Number of live births						
1-2	227	34.3	75	31.1	302	33.4
3-4	274	41.4	93	38.6	367	40.6
4+	161	24.3	73	30.3	234	26.0
Total	662	100	241	100	903	100
Number of still births						
Zero	567	85.6	187	77.4	754	83.8
One	65	9.8	38	15.8	103	11.4
More than one	30	4.5	16	6.6	46	5.1
Total	662	100	241	100	903	100
Birth interval						
Less than 1 year	39	5.9	16	6.6	55	6.1
1-2 years	358	54.1	134	55.6	492	54.5
2+ years	208	31.4	71	29.5	279	30.9
NA	57	8.6	20	8.3	77	8.5
Total	662	100	241	100	903	100

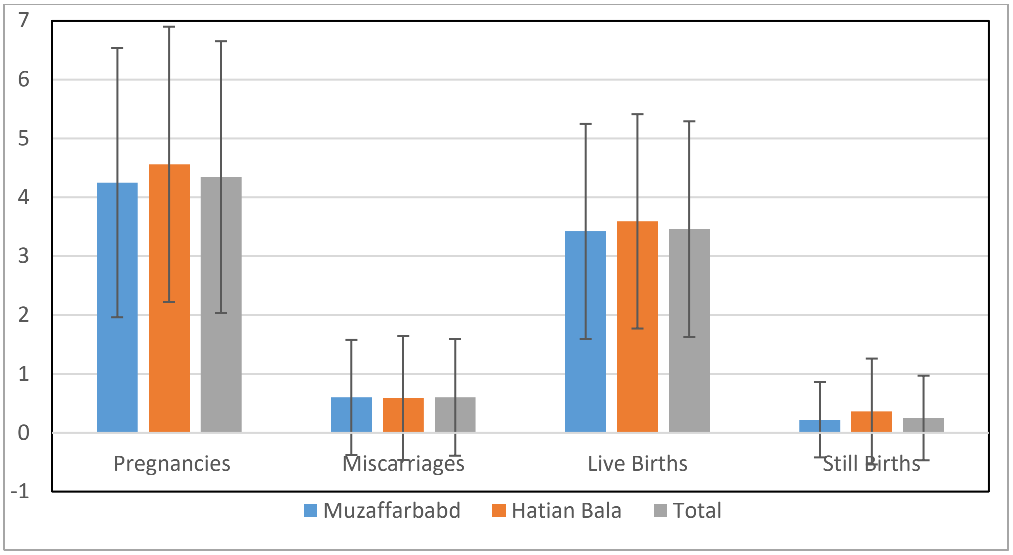

Figure 4.2: Mean ± standard deviation of number of pregnancies, miscarriages/ abortions, live births and birth intervals

than Muzaffarabad district (4.25). The trend of a greater number of pregnancies in both districts was an indicator of higher fertility rate in the region.

The second part of the table 4.12 reveals results for both abortions and miscarriages. An abortion involves the ending of pregnancy by forcing out underdeveloped embryo, whereas, miscarriage is the natural death of embryo up to 20th week of pregnancy in the womb. After the 20th week the death of embryo in the womb is considered as still birth. History of miscarriages in pregnant women (twenty or more weeks of pregnancy) are more likely to develop iron deficiency anemia (Camargo et al., 2013). The prevalence of miscarriages in female is 15-20% (Batool, 2010). In Muzaffarabad district 62.8% had no abortions/miscarriages, 22.7% had one and remaining 14.5% had two or more abortions. Almost similar trend was found in the Hattian district with 65.1% had no abortions/miscarriages, 19.5% had one and 14.5% had two or more abortions/miscarriages. The mean and SD of number of abortions/miscarriages for Muzaffarabad district were (0.60, 0.98), Hattian (0.59, 1.05) and in total (0.60, 0.99). Overall 63.5% respondents have not experienced the abortions/miscarriages, about 21.8% had one and 14.7% had experienced two or more abortions/miscarriages.

Karaoglu, et al. (2010) aver that prevalence of anemia increases in women with ≥ 4 live births and ≥ 4living children. In Pakistan, estimated birth rate is 21.9 births/1,000 population and total fertility rate is 2.62 children/women (World Fact Book, 2018). The desire of son, lack of education, lack of contraceptive knowledge, ambiguous contraceptive behavior and unplanned pregnancies are the major reasons for bearing more children (Abbasi, 2006; Batool, 2010). The table 4.12 shows that 33.4% respondents delivered 1-2 children, 40.6% delivered 3-4 children and 25.9% delivered more than 4 children. In Muzaffarabad district 34.3% respondents delivered 1-2 children, 41.4% delivered 3-4 and 24.3% delivered more than 4 children. On other hand, 31.1%, 38.6% and 30.3% respondents delivered 1-2, 3-4 and 4+ children in the Hattian district respectively. The mean and standard deviation of number of live births for Muzaffarabad district were (3.42, 1.83), Hattian (3.59, 1.82) and in total (3.46, 1.83). The results revealed that fertility rate in Azad Kashmir is higher than the fertility rate of Pakistan (2.62 children/women).

Stillbirth or intrauterine death signifies the adverse outcomes of pregnancy (Lawn, et al., 2011) and is defined as the baby born without signs of life after the 20^{th} week of pregnancy (Tikmani & Zahid, 2016). Annually, 3.3 million stillbirths are reported and 97% of which occur in the developing countries (Lawn, et al., 2011). Numerous studies aver that stillbirth rates vary from 36/1000 to 70 or more/1000 in some rural areas (Lawn, et al., 2005a; Jokhio, et al., 2005; WHO, 1996; WHO 2005; Fikree et al., 1996; Fikree et al., 2002). In contrast, WHO reported a stillbirth rate of 22/1000 births in Pakistan (WHO, 2006). In a systematic review conducted by Tikmani and Zahid (2016) reported an estimated average stillbirth rate of 52.5/1000 births ranging from 17.7 to 99/1000 births. The stillbirth rate in Southeast Asia and even in sub-Saharan Africa is low compared to Pakistan (Tikmani & Zahid, 2016). Lack of health care facilities, poor quality of obstetric care and antenatal services are the major risk factors of stillbirth in Pakistan (McClure, et al., 2015). It is evident from the table 4.12, 83.8% of the respondents did not experience still birth, 11.4 experienced still birth one time and remaining 5.1% experienced still births 2 or more times. In Muzaffarabad district stillbirth number was smaller (9.8% onetime stillbirth and 4.5% two or more still births) compared to Hattian (15.8% one stillbirth and 6.6% two more still births). The results revealed that still birth rate in AJK is higher than the estimated stillbirth rate of Pakistan.

Birth interval provides the woman time and opportunity to recover from the nutritional deficiency after a pregnancy. Birth interval affects the population size, family resources as well as mother and her child health status. The shorter birth interval is related to the high infant and child mortality, being small for gestational age (SGA), LBW, increased risk for preterm birth, labor dystocia, and maternal morbidity and mortality (USAID, 2005; Abbasi, 2006; Central Statistical Agency, 2011). The short birth intervals are also linked to increased risk of third-trimester bleeding, premature rupture of membranes, anemia and hemorrhage which is major cause of maternal death (WHO, 2005; USAID, 2005). The table 4.12 shows that 6.1% respondents had birth interval less than 1 year, majority 54.5% had 1-2 years and 30.9% had more than 2 years. Both districts follow the similar trend in terms of birth interval.

***4.1.1.13. Contraception knowledge, attitude towards its use and Obstacles*.** The deliberate use of various artificial methods to prevent pregnancy is called contraception. The contraception plays vital role in decreasing number of pregnancies and hence the number of kids, blood loss during delivery and improves reproductive health of women. The percentage of women (15-49 years only) or whose life partners are using any form of contraception is called contraceptive prevalence rate (CPR). The CPR is calculated using the relation.

$$CPR(\%) = \frac{Contraception\ users}{Reproductive\ age\ married\ women} \times 100\%$$

In Pakistan, CPR is reported to be 34% (NIPS & ICF, 2018). Table 4.13 displays respondent's knowledge of contraception, source of information, use and reasons of not using contraceptives. Table shows that high percentage of the respondents 94.8% (96.4% from Muzaffarabad and 90.5% from Hattian) had the knowledge about contraception and 5.2% respondents (3.6% from Muzaffarabad and 9.5% from Hattian) had no such knowledge. Majority of the respondents, 48.7% got knowledge from LHV/LHW, followed by 18.3% from family, 12.3% from doctors, 7.9% from friends and 7.6% from media. The results indicate that family planning centers established in Azad Kashmir were the highest source of information and were providing contraception awareness among the community. Half (50.9%) of the respondents (53.2% from Muzaffarabad and 44.8% from Hattian) had used contraceptive measures for family planning and 49.1% (46.8% from Muzaffarabad and 55.2% from Hattian) did not use any of the contraceptive methods. This shows that CPR is higher in Azad Kashmir compared to Pakistan. Among the users of contraceptives, condoms use accounted for the higher figure 54.1% (55.4% from the Muzaffarabad and 50.0% from Hattian), while 22.4, 16.5 and 7.0% use IUD/Copper T, injections and oral pills respectively.

Previous research evidences identified that non-supportive attitude of Pakistani husbands and families is the major obstacles for not using contraception for family planning (Abbasi et al., 2008b; Peter et al., 2010). In this study, majority of the respondents (53.3%) did not used contraceptive measures because of 'no need'. The respondents reported that external ejaculation,

Table 4.13

Contraception knowledge, its sources and prevalence rate

Knowledge	Muzaffarabad		Hattian		Total	
	f	%age	f	%age	f	%age
Yes	638	96.4	218	90.5	856	94.8
No	24	3.6	23	9.5	47	5.2
Total	662	100	241	100	903	100
Sources of Knowledge						
No Information	24	3.6	23	9.5	47	5.2
Family	114	17.2	51	21.2	165	18.3
Friends	49	7.4	22	9.1	71	7.9
Doctor	81	12.2	30	12.4	111	12.3
LHV/LHW	339	51.2	101	41.9	440	48.7
Media	55	8.3	14	5.8	69	7.6
Total	662	100	241	100	903	100
Contraceptive method used						
Yes	352	53.2	108	44.8	460	50.9
No	310	46.8	133	55.2	443	49.1
Total	662	100	241	100	903	100
If yes, which contraceptive method used						
Oral pills	24	6.8	8	7.4	32	7.0
Condoms	195	55.4	54	50.0	249	54.1
Injections	43	12.2	33	30.6	76	16.5
IUD Copper T	90	25.6	13	12.0	103	22.4
Total	352	100	108	100	460	100
If no, reason for not using						
Religious beliefs	13	4.2	16	12.0	29	6.5
Family restriction	6	1.9	2	1.5	8	1.8
Fear of side effects	41	13.2	28	21.0	69	15.6
Husband dislike	54	17.5	38	28.6	92	20.8
Non-availability	6	1.9	3	2.3	9	2.0
No Need	190	61.3	46	34.6	236	53.3
Total	310	100	133	100	443	100

not interested in family planning due to lesser number of kids and menopause are reasons of 'no' need' for contraception. Remaining 20.8, 15.6, 6.5, 2.0 and 1.8% respondents did not use contraception because of husband dislike, fear of side effects, religious beliefs, non-availability and family restrictions respectively. The smaller percentage of the respondents who are not using contraceptives due to family restrictions and religious beliefs elucidate that role of both factors has now diminished for not adopting family planning. The stimulating media campaigns, awareness created by LHVs, education, economic problems due to large family size are main motivators of this social change among respondents.

4.1.1.14. Menstruation, blood loss and bleeding disorder. The abnormally prolonged bleeding during menstruation is called menorrhagia in medical terminology. Menorrhagia is one of the major causes of IDA affecting nearly two million women across the globe, out of which 20% suffer from anemia and its related health problems (Vercellini et al., 1993). In women of reproductive age, heavy menstruation and repeated pregnancies are major risk factors of developing IDA (Kurz & Johnson, 1996). Hemorrhoid bleeding and blood loss with stool also causes deficiency of red blood cells (RBCs).

In table 4.14, respondent's distribution based on menstrual periods, duration of menstruation, heavy blood loss, hemorrhoid bleeding, blood loss with stool and bleeding disorder are detailed. The first part of table shows distribution of women according to their menstrual status. Majority of the respondents 93.9% (93.4% from Muzaffarabad district and 95.4% from Hattian district) were having menstrual period. The second part of table 4.14 reveals distribution of women according to menstruation duration. Little less than one-fourth (23.1%) of women (24.3% from Muzaffarabad and 20.0% from Hattian district) reported to menstruate 2-3 days, 43.2% (41.7% from Muzaffarabad and 47.0% from Hattian district) for 4-5 days and remaining 33.7% (34.0%

Table 4.14

Status of menstrual periods, duration of menstruation and bleeding disorders

Menstrual Periods	Muzaffarabad		Hattian		Total	
	f	%age	f	%age	f	%age
Yes	618	93.4	230	95.4	848	93.9
No	44	6.6	11	4.6	55	6.1
Total	662	100	241	100	903	100
Menstruation Duration						
2 -3 days	150	24.3	46	20.0	196	23.1
4-5 days	258	41.7	108	47.0	366	43.2
More than 5 days	210	34.0	76	33.0	286	33.7
Total	618	100	230	100	848	100
Heavy Blood Loss during menstruation						
Yes	163	26.4	81	35.2	244	28.8
No	455	73.6	149	64.8	604	71.2
Total	618	100	230	100	848	100
Bleeding Disorder						
Yes	56	9.1	23	10.0	79	9.3
No	562	90.9	207	90.0	769	90.7
Total	618	100	230	100	848	100
Hemorrhoid Bleeding						
Yes	63	9.5	10	4.1	73	8.1
No	599	90.5	231	95.9	830	91.9
Total	662	100	241	100	903	100
Blood Loss with Stool						
Yes	43	6.5	12	5.0	55	6.1
No	619	93.5	229	95.0	848	93.9
Total	662	100	241	100	903	100

from Muzaffarabad and 33.0% from Hattian district) for more than 5 days.

Third part of the table shows distribution of women according to heavy blood loss (HBL) during menstruation. More than one-fourth (28.8%) of the respondents reported HBL during menstruation, which was higher among women of Hattian district (35.2%) than women of the Muzaffarabad (26.4%). The fifth and sixth parts of table 4.14 revealed distribution of women according to bleeding disorder, hemorrhoid bleeding and blood loss with stool. About 9.3% (9.1% Muzaffarabad and 10.0% Hattian), 8.1% (9.5% Muzaffarabad and 4.1% Hattian) and 6.1% (6.5% Muzaffarabad and 5.0% Hattian) complained about bleeding disorder, hemorrhoid bleeding and blood loss with stool respectively.

4.1.1.15. Eating nonfood items and current utilization of pica. The consumption of nonfood items is significantly linked with anemia and low Hb level (Miao et al., 2015). The disorder involving craving and consumption of pica such as ice, paper, leaves, clay/mud and uncooked rice is termed as pica (Young et al., 2010). Pica is derived from the Latin word “magpie”, a bird with unusual habits of eating. Miao et al. (2015), conducted a meta- analysis using data from numerous studies comprising populations of different age groups, geographic locations, pica type and duration of pica use for understanding biologically important associations of pica with the micronutrient deficiency. The meta-analysis revealed that pica is linked to 2.4 times greater odds of anemia and lower concentrations of Hb (-0.65 g/dL), hematocrit (-1.15%,) and Zinc (-34.3 μg/dL), compared to individuals not consuming pica.

Table 4.15 presents respondent’s distribution based on consumption of nonfood items (pica) during last pregnancy and current utilization. The results indicated that 32.7% (32.2% from Muzaffarabad and 34.0% from Hattian) consumed nonfood items during pregnancy, whereas, 67.3% (67.8% from Muzaffarabad and 66.0% from Hattian) did not consume nonfood items. The

Table 4.15

Eating nonfood items during last pregnancy/currently

Eating Nonfood Items During	Muzaffarabad		Hattian		Total	
	f	%age	f	%age	f	%age
Yes	213	32.2	82	34.0	295	32.7
No	449	67.8	159	66.0	608	67.3
Total	662	100	241	100	903	100
Eating ice						
Yes	61	9.2	36	14.9	97	10.7
No	601	90.8	205	85.1	806	89.3
Total	662	100	241	100	903	100
Eating paper						
Yes	15	2.3	5	2.1	20	2.2
No	647	97.7	236	97.9	883	97.8
Total	662	100	241	100	903	100
Eating leaves						
Yes	5	0.8	5	2.1	10	1.1
No	657	99.2	236	97.9	893	98.9
Total	662	100	241	100	903	100
Eating clay/mud						
Yes	43	6.5	12	5.0	55	6.1
No	615	92.9	215	89.2	830	91.9
Total	662	100	241	100	903	100
Eating uncooked rice						
Yes	11	1.7	7	2.9	18	2.8
No	651	98.3	234	97.1	8	98.0
Total	662	100	241	100	903	100

table shows that 2.2% respondents were currently consuming paper, 1.1% leaves, 6.1% mud/clay and 2.8% uncooked rice. The consumption of ice, paper and uncooked rice was comparatively more among respondents of Hattian district. The utilization of clay/mud was marginally higher among the respondents of Muzaffarabad district.

4.1.1.16. Complications during last pregnancy. In less developed countries, pregnancy and childbirth related complications are the major determinant of mortality and disability among WRA (Burkhalter, 2000). Globally, 141 million women give birth to a child every year (Roser, 2018) and 50% of them suffer from some sort of complications during pregnancy. The complications during pregnancy increase the risk of mother and child mortality/morbidity, damage to the nervous system and reproductive organs, preterm birth and/or LBW baby, infertility and chronic pain. The poor socio-economic conditions, limited facilities for prenatal care, inadequate diet, ignorance and early age marriages are major causes of pregnancy complications in Pakistan (Batool, 2010). Approximately 30,000 women in Pakistan die every year due to pregnancy and childbirth related complications (Khan et al., 2009).

Table 4.16 shows distribution of the respondents according to the occurrence of complications during last pregnancy. Majority of the respondents (58.4%) suffered from anemia during last pregnancy. The prevalence of vaginal bleeding was 23.8%, 47.4% respondents suffered from hand and facial swelling and 48.9% respondents complained about cramps/abdominal pains. The prevalence of water bag leakage, hypertension, diabetes, fits, urinary complications and prolonged/difficult labor among respondents were 25.5, 31.7, 4.1, 7.3, 31.0 and 19.7% respectively. Table further reveals these complications were equally prevalent among respondents of both districts.

Table 4.16:

Complications during last pregnancy

Vaginal Bleeding	Muzaffarabad		Hattian		Total	
	Frequency	%age	Frequency	%age	Frequency	%age
Yes	146	22.1	69	28.6	215	23.8
No	516	77.9	172	71.4	668	76.2
Total	662	100	241	100	903	100
Hand and facial swelling						
Yes	317	47.9	111	46.1	428	47.4
No	345	52.1	130	53.9	475	52.6
Anemia						
Yes	374	56.5	153	63.5	527	58.4
No	288	43.5	88	36.5	376	41.6
Cramps/abdominal pain						
Yes	338	51.1	112	46.5	450	48.9
No	324	48.9	129	53.5	453	50.2
Water Bag Leakage						
Yes	175	26.4	55	22.8	230	25.5
No	487	73.6	186	77.2	673	74.5
High BP						
Yes	203	30.7	83	34.4	286	31.7
No	459	69.3	158	65.6	617	68.3
Diabetes						
Yes	24	3.6	13	5.4	37	4.1
No	638	96.4	228	94.6	866	95.9
Fits						
Yes	43	6.5	23	9.5	66	7.3
No	619	93.5	218	90.5	837	92.7
Urinary complication						
Yes	202	30.5	78	32.4	280	31.0
No	460	69.5	163	67.6	623	69.0
Prolonged/difficult labor						
Yes	122	18.4	56	23.2	178	19.7
No	540	81.6	185	76.8	725	80.3
Total	662	100	241	100	903	100

4.1.1.17. Distance of the respondent's residence from healthcare facility. Utilization of health services is directly associated with timely access to healthcare units. According to distance decay effect, the limited proportions of population travel between two locales as distance between them increases. Those patients visit their physicians less frequently who had to travel more compared to those who had to travel shorter distances (Nemet and Bailey, 2000). The distance from healthcare facility, time spent in travelling and related cost affects healthcare utilization (Winters et al., 2006). In Pakistan, poverty, cultural, ethnic and religious factors badly affect women's ability to access healthcare services. The physical distance of hospital is one of the major factors related with the underutilization of prenatal care in Pakistan (DMICS, 2004). In Pakistan distant locations, lack of affordability and convenience of transport influences the utilization of healthcare facilities (Majrooh et al., 2013).

Table 4.17 shows distribution of the respondents based on the distance from healthcare facility. Majority of respondents (33.4%) were residing at more than 10km away from healthcare facility, 18.6% respondents live at less than 1 km away from healthcare facility, 30.2% live between 1 to 5 km and remaining 17.7% live at 6 to 10 km far from the healthcare facility.

Table 4.17

Respondent's residence distance from healthcare facility

Distance	Muzaffarabad		Hattian Bala		Total	
	f	%age	f	%age	f	%age
Less than 1 km	114	17.2	54	22.4	168	18.6
1 to 5 km	218	32.9	55	20.1	273	30.2
6 to 10 km	128	19.3	32	13.3	160	17.7
10+ km	202	30.5	100	41.5	302	33.4
Total	662	100	241	100	903	100

4.1.1.18. Prenatal care visits, place of visit and attention provided. The utilization of prenatal care is essential for reduction of maternal and newborn death through early detection of high-risk pregnancy related complications (Majrooh et al., 2013). In developing countries utilization of prenatal care is 65% compared to 99% in the developed countries (Say, 2007). In Punjab Pakistan, only 53% of pregnant women utilize prenatal care once during their pregnancies from medical professionals (DMICS, 2004). In Pakistan, poor (46%) and less educated (33%) pregnant women are not utilizing any or less than the nationally and WHO recommended prenatal care (Fatmi & Awan, 2002). The prenatal care visits help women to get advice from the healthcare professionals for utilization of food and food supplements, pregnancy related complications, birth interval, importance of breastfeed and use of contraception for preventing repeated pregnancies (Batool, 2010). Majrooh et al. (2013) identified that lack of transport, distant locations from healthcare facility, lack of coordination between routine and healthcare services and vertical programs, availability of human resource and inconvenient working are major hurdles in the utilization of prenatal visits in Pakistan. The social factors such as unawareness, lack of decision making, influence of spiritual healers further exacerbated this issue in Pakistan (Majrooh et al., 2013).

The table 4.18 shows distribution of the respondents according to utilization of prenatal care, place of prenatal care and attention provided by health professionals. The table reveals that most of the respondents 40.8% (44.1% from Muzaffarabad and 31.5% from Hattian) made 6+ visits during prenatal care. About 30.2% and 18.9% made 1 to 3 and 4 to 6 visits respectively for utilizing prenatal care. The remaining 10.1% (13.7% from Muzaffarabad and 8.8% from Hattian) did not utilize prenatal care during their pregnancies. The table further reveals that 49.2% visited government hospital, 48.2% visited private clinics and remaining 2.0% visited BHU/other place

Table 4.18

Prenatal care visits, place of visit and attention provided

Prenatal Care	Muzaffarabad		Hattian Bala		Total	
	Frequency	%age	Frequency	%age	Frequency	%age
None	58	8.8	33	13.7	91	10.1
1 to 3	188	28.4	85	35.3	273	30.2
4 to 6	124	18.7	47	19.5	171	18.9
6 +	292	44.1	76	31.5	368	40.8
Total	604	100	208	100	812	100.0
Place of prenatal care visit						
Government Hospital	309	51.2	92	44.2	401	49.2
Private Hospital/Clinic	287	47.5	111	53.4	398	48.8
BHU/Others	8	1.2	5	2.4	13	2.0
Total	604	100	208	100	812	100.0
Attended during prenatal are						
Doctor	578	95.7	174	83.7	752	92.6
Mid Wife	18	3.0	26	12.5	44	5.4
Nurse/Others	8	1.3	8	3.8	16	2.0
Total	604	100	208	100	812	100.0

for availing prenatal care. Majority of the respondents in Muzaffarabad (51.2%) visited the government hospital, whereas, majority of the respondents in the Hattian district (53.4%) visited private hospitals/clinics for utilization of prenatal care. During prenatal care majority of the respondents 92.6% (95.7% from Muzaffarabad and 83.3% from Hattian) were attended by doctors, 5.4% by mid-wives and 2.0% by nursing staff/others.

4.1.1.19. Utilization of healthcare services. In Pakistan, besides distant locations, lack of affordability and availability of transport services and women's restriction of movement also influences the utilization of healthcare services. The women under age 25 were the most restricted in their freedom to go alone to a healthcare facility (13.0% only), 46.0% of elderly women could do so in Pakistan (Batool, 2010). Married adolescents need proper healthcare and family planning services, information on sexual activity, care during pregnancy and child birth. The bias against early age restricts them to go alone for utilization of health services even after marriage.

Table 4.19

Utilization of healthcare services by the married women

Utilization of Healthcare Service	Muzaffarabad		Hattian		Total	
	f	%age	f	%age	f	%age
Go alone						
Often	51	8.4	16	7.7	67	8.3
Few times	72	11.9	33	15.9	105	12.9
Not at all	481	79.9	159	76.4	640	78.8
Total	604	100	208	100	812	100
Go with husband						
Often	230	38.1	62	29.8	292	36.0
Few times	258	42.7	89	42.8	347	42.7
Not at all	116	19.2	57	27.4	173	21.3
Total	604	100	208	100	812	100
Go with some family member						
Often	142	23.5	47	22.6	189	23.3
Few times	285	47.2	98	47.1	383	47.2
Not at all	177	29.3	63	30.3	240	29.6
Total	604	100	208	100	812	100
Wait until someone is available						
Often	125	20.7	29	13.9	154	19.0
Few times	131	21.7	26	12.5	157	19.3
Not at all	348	57.6	153	73.6	501	61.7
Total	604	100	208	100	812	100

In the table 4.19, distribution of the respondents for visiting healthcare centers for utilization of health services are shown. To assess the utilization of healthcare, the respondents were asked questions about their movement to healthcare facilities. The table shows that majority of the respondents (78.8%) never go alone, 12.9% visit few times and remaining 8.3% visit often for attaining prenatal care and other health services. Thirty six percent respondents visit often, 42.7% visit few times and 21.3% did not visit healthcare facility with their husbands. However, 23.3% respondents visit with some family member often, 47.2% visit few times and 29.6% did not visit with family members. Nineteen percent of the respondents often wait for someone to be available, 19.3% few times and 61.7% did not wait for the availability of someone.

4.1.1.20. Place of delivery, mode of delivery and postnatal care during last pregnancy. Adequate medical attention under the supervision of health professional and hygienic environment are essential for reducing the risk of delivery related complications that may cause death and morbidity for the mother and/or her baby. In Pakistan, 48% births take place in a healthcare facility (15% at public facility and 34% at private facility), whereas 52% births take place at home (NIPS Pakistan and ICF International, 2013). The percentage of child births at healthcare facility in Pakistan is different for different regions ranging from 18% in Baluchistan to 86% in Islamabad (NIPS Pakistan & ICF International, 2013). Assistance provided by skilled health professionals is the critical factor for reducing maternal and newborn risk of mortality. The deliveries conducted at child mortality due to unavailability of the emergency obstetric care. About 52% births take place under the assistance of skilled healthcare professionals, 41% births take place under the assistance of traditional birth attendants, 6% under the supervision of family and friends and 1% births take place without any assistance (NIPS Pakistan & ICF International, 2013). The proportion of delivery at health facility has increased from 13% in 1990-91 to 34% in 2006-07 to 48% in 2012-13, whereas home delivery has decreased from 85% in 1990-91 to 65% in 2006-07 to 52% in 2012-13 (NIPS Pakistan & ICF International, 2013). Table 4.20 shows that majority of the respondents (74.4%) delivered babies in health facility (58.9% in Government hospitals, 14.4% in private hospitals/clinics and 1.2% at BHUs).

Table 4.20

Place of delivery, mode of delivery and postnatal care

Place of Last Delivery	Muzaffarabad		Hattian		Total	
	Frequency	%age	Frequency	%age	Frequency	%age
Government Hospital	404	61.0	128	53.1	532	58.9
Private Hospital/Clinic	96	14.5	34	14.1	130	14.4
BHU	11	1.7	0	0.0	11	1.2
Home	151	22.8	79	32.8	230	25.5
Total	662	73.3	241	26.7	903	100
Mode of delivery of last baby born						
Normal	456	68.9	182	75.5	638	70.7
Cesarean	206	31.1	59	24.5	265	29.3
Total	662	73.3	241	26.7	903	100
Postnatal care visits						
None	418	63.1	164	68.0	582	64.5
1 to 2 times	182	27.5	61	25.3	243	26.9
3 to 4 times	34	5.1	11	4.6	45	5.0
More than 4 times	28	4.2	5	2.1	33	3.6
Total	662	73.3	241	26.7	903	100

The proportion of respondents who delivered babies at home is 25.5%. Pakistan has decreased maternal mortality rate (MMR) from 521 in 1990 to 178 in 2015, however, Pakistan has failed to obtain the proposed MMR target of 130 death in 2015. Cesarean section (C-section) is surgical procedure used to save lives of mother and fetus in order to avoid complication during obstetric labor (Bailey et al., 2009).

According to WHO, the C-section rate should not be higher than 10% or lower than 5%, because both extremes are associated with adversarial maternal and neonatal outcomes (WHO, 2015b). Overall, C-section rate in Pakistan has increased from 3.1% in 1990-91 to 8.7% in 2006-07 to 14.9% in 2012-13. A disparity in the utilization of C-section rates has observed with education, wealth quintile, urbanity, region and ethnicity (Mumtaz et al., 2017). The table 4.20 shows that 70.7% (68.9% from Muzaffarabad and 75.5% in Hattian) respondents delivered babies through normal mode of delivery and 29.3% (31.3% from Muzaffarabad and 24.5% in Hattian) delivered babies by C-section. The results depict the overuse of C-section in AJK which is considerably higher than the C-section rate of 5 to 10% set by WHO. In Pakistan, multigravida, fetal distress obstructed labor, previous C-sections, failure of progression of labor and antepartum hemorrhage (APH) are major reasons of C-section in Pakistan (Naeem et al., 2015). Furthermore, some practitioners recommend C-section for more medical practice and financial gain, whereas, some patients willingly opt unnecessary C-section due to fear of vaginal pain during natural delivery.

The first 48 hours of postnatal period are very important because majority of maternal deaths occur during this time. Postnatal care visits provide an opportunity to educate mother on how to care for herself and newborn and counselling on breastfeeding, danger signs and body temperature. According to Pakistan demographic and health survey (PDHS) 2012-13, 60%

received postnatal care within first two days, 1% received postnatal care three or more days after delivery and 38% had received no postnatal care (NIPS Pakistan & ICF International, 2013). Table 4.20 shows that 64.5% respondents had no postnatal checkup, 26.9% had 1 to 2 times postnatal care, 5% had 3 to 4 times and 3.6% had more than 4 times postnatal checkups.

4.1.1.21. Birth order, birth weight and premature delivery of last baby born. Higher birth order is a key factor in determining maternal health and is associated with poor nutritional consequences (Dewey &Cohen, 2007). Low level of maternal hemoglobin is related with increased risk of LBW babies, pre-mature deliveries and related adverse pregnancy outcomes. Pre-mature and LBW infants may suffer cognitive impairment, developmental issues, severe anemia and risk of early mortality compared to those who are born with good health (Batool, 2010). Table 4.21 presents data of women based on birth order, birth weight and premature delivery of last baby born.

Highest proportion of women 29.6% (28.1% from Muzaffarabad and 30.3% from Hattian) had birth order of last child fifth and above. 12.7, 18.3, 20.2 and 19.3% women had birth order of their last child first, second, third and fourth respectively. Table 4.21 further reveals that 14.4% children had birth weight less than 2.5 kg, 34.7% had 2.5 to 3.0 kg and 21.3% had birth weight greater than 3 kg. Remaining 38.6% don’t know about the birth weight of their last child. The table 4.21 indicates 76.5% proportion of women did not delivered premature babies, 14.5% (13.3% from Muzaffarabad and 17.8% from Hattian) delivered premature babies and 9.0% don’t know about premature birth of their baby.

4.1.1.22. Breastfeeding last child. Breastfeeding is the best and most economical food including all nutritional needs for an infant (Thapa, 1988). Colostrum, the first milk boosts immune-stimulating factors such as carbohydrates, protein, low fat and antibodies which protect

Table 4.21

Distribution of women based on the last child birth related factors

Birth Order	Muzaffarabad		Hattian		Total	
	Frequency	%age	Frequency	%age	Frequency	%age
First	83	12.5	32	13.3	115	12.7
Second	124	18.7	41	17.0	165	18.3
Third	140	21.1	42	17.4	182	20.2
Fourth	129	19.5	45	18.7	174	19.3
Fifth & above	186	28.1	81	30.3	267	29.6
Total	662	100	241	100	903	100.0
Birth weight						
<2.5 kg	84	12.7	46	19.1	130	14.4
2.5 to 3.0 kg	238	36.0	75	31.1	313	34.7
>3.0 kg	116	19.2	57	27.4	173	21.3
Don't know	258	39.0	91	37.8	349	38.6
Total	662	100	241	100	903	100.0
Premature birth of last baby born						
Yes	88	13.3	43	17.8	131	14.5
No	507	76.6	184	76.3	691	76.5
Don't know	67	10.1	14	5.8	81	9.0
Total	662	100	241	100	903	100.0

the baby from respiratory infections and gastrointestinal illness causing anemia. The breastfeeding may induce prolonged lactation amenorrhea due to which she is unable to conceive, thus preserving hemoglobin stores and hence the risk of anemia (Lakew et al., 2015). Lactating mothers are exposed to anemia due to iron depletion and blood loss during childbearing.

Table 4.22 presents the data of the women who breast fed their last child, its duration and reason of not breastfeeding the baby. The data show that 90.8% women breastfeed and 9.2% did not breastfeed their last child. Majority of women 43.3% breastfeed last child up to two years, 18.7% for one year, 13.7% for 6 months, 4.6% up to one month and 19.8% were still lactating. Among the women who did not breastfeed last child, majority of them 43.4% (46.7% from Muzaffarabad and 34.8% from Hattian) were sick and/or had gone through C-section. 28.9% did not breastfeed due to baby sickness, 14.5% complained about difficulty in feeding and 13.3% did not feed due to the insufficient amount of milk.

Table 4.22

Breastfeeding, its duration and reason of not breastfeeding

Breastfeed	Muzaffarabad		Hattian		Total	
	f	%age	f	%age	F	%age
Yes	602	90.9	218	90.5	820	90.8
No	60	9.1	23	9.5	83	9.2
Total	662	100	241	100	903	100.0
Duration of breastfeed (if yes)						
< 1 month	32	5.3	6	2.8	38	4.6
Up to 6 months	87	14.5	25	11.5	112	13.7
Up to 1 year	108	17.9	45	20.6	153	18.7
Up to 2 years	257	42.7	98	45.0	355	43.3
Still Lactating	118	19.6	44	20.2	162	19.8
Total	602	100	218	100	820	100
Reason (if no)						
Baby Sickness	17	28.3	7	30.4	24	28.9
Respondent Sickness	28	46.7	8	34.8	36	43.4
Difficulty in Feeding	8	13.3	4	17.4	12	14.5
Insufficient amount of milk	7	11.7	4	17.4	11	13.3
Total	60	100	23	100	83	100

4.1.1.23. Current reproductive status. The current reproductive status is significant factor in determining the anemia. Among pregnant women, age at first pregnancy, birth order, pregnancy interval between two births, gestational age, history of pregnancy complications, frequency of postnatal care visits and postpartum check-ups were associated with anemia status (Perumal, 2014). Lactating mothers are vulnerable to anemia due to maternal iron depletion and blood loss during childbearing. The inappropriate food distribution in household predispose pregnant and lactating women to nutritional deficiency. In the table 4.23, respondent's distribution according to, current reproductive status is detailed. The table reveals that 73.5% respondents were non-pregnant 8.5% pregnant, 17.1% lactating and 0.9% respondents were pregnant and lactating.

4.1.1.24. Preferred gender of baby and preference in food. Gender bias is a situation in which someone is given more preference based on their sex, usually when a male family member is treated in a better way than a female. Son preference is a form of gender bias existing worldwide and is a well-recognized fact. Gender discriminations is a key factor of anemia and malnutrition among females, which starts right from the fetus and are deprived in all aspects whether it is education, clothing or food (Poureslami et al., 2004). Preference of male children, coupled with poverty result in lower caloric intakes by female children resulting in malnutrition, under nutrition

Table 4.23

Respondents current reproductive status

Reproductive Status	Muzaffarabad		Hattian		Total	
	f	%age	f	%age	F	%age
Pregnant	50	7.6	27	11.2	77	8.5
Nonpregnant	494	74.6	170	70.5	664	73.5
Lactating	112	16.9	42	17.4	154	17.1
Pregnant & Lactating	6	0.9	2	0.8	8	0.9
Total	662	100	241	100	903	100

and anemia (Kielmann et al. 1983). Pakistan is ranked 143 (second lowest) on the list of 144 countries in the global gender report (GGR), (2017). The GGR quantifies the gender disparities across four important areas including economy, education, health and political empowerment. According to GGR (2017), Pakistan is ranked 143 in terms of economic participation, 136 in educational attainment, 140 in health & survival and 95 in terms of political empowerment.

The table 4.24 shows women's distribution based on her preferred gender, husband/family preferred gender, and preference in food intake. Majority of the respondents (58.0%) reported that gender does not matter for them, 28.2% women had son preference and 13.7% had daughter preference. The table reveals that 55.6% women reported her husband/family have no preferences

Table 4.24

Gender prejudice and preference in food intake

Respondent	Muzaffarabad		Hattian		Total	
	f	%age	f	%age	f	%age
Son	190	28.7	65	27.0	255	28.2
Daughter	93	14.0	31	12.9	124	13.7
Does not Matter	379	57.3	145	60.2	524	58.0
Total	662	100	241	100	903	100
Husband/family						
Son	213	32.2	73	30.3	286	31.7
Daughter	84	12.7	31	12.9	115	12.7
Does not Matter	365	55.1	137	56.8	502	55.6
Total	662	100	241	100	903	100
Preference in food						
Male	43	6.5	24	10.0	67	7.4
Female	233	35.2	68	28.2	301	33.3
Both	286	58.3	149	61.8	535	59.3
Total	662	100	241	100	903	100

regarding gender of baby, 31.7% had son preference and 12.7% had daughter preference. The results indicate that, respondents showed great proclivity for both sons and daughters nevertheless, son preference was more pronounced. In terms of food intake, 59.3% reported both genders need better and equal share of food, 33.3% were of the view female child needs preference in food and 7.4% reported that male child needs preference in food. Surprisingly, most of the respondents argued that female child needs adequate diet to counter micronutrient deficiencies because of blood loss during menstruation and for better reproductive health.

4.1.1.25. Reasons of son preference. The South Asian countries are inherently patriarchal in nature and son preference is deep rooted in them. (Basu and De Jong, 2010; Channon, 2015). Son preference is a complex phenomenon and it exists in various forms across different cultures in Pakistan (Atif et al., 2016). Sons are valued over daughters because women feel secure and earn more respect among family and society. They provide financial assistance, attract dowry and are considered helpful in old age.

The table 4.25, presents the responses of women about son preferences. The respondents reported that 60.8% women feels secure to great extent, 18.7% to some extent and 20.5% did not agree with this notion. About 65.2% were of the view that male child is the source of respect for women to great extent and 17.2% agree to some extent and 17.6% did not agree with this perception, whereas 65.1% thought boys are the source of prestige in the society to great extent 20.4% some extent and remaining 14.5% did not agree with it. Most (64.7%) women reported that boys are helpful in attaining stronger position in the society to great extent, 20.7% to some extent and 14.6% reported not at all. The table further reveals that 70.5% women were of the view that boys are source of income to great extent, 18.1% to some extent and 11.4% did not agree with this

Table 4.25

Respondent's distribution according to reasons of son preference

Woman feels secure	Muzaffarabad		Hattian		Total	
	f	%age	f	%age	f	%age
Not at all	133	20.1	52	21.6	185	20.5
To Some extent	124	18.7	45	18.7	169	18.7
To great extent	405	61.2	144	59.8	549	60.8
Total	662	100	241	100	903	100
Woman is respected in the family and society						
Not at all	117	17.7	42	17.4	159	17.6
To Some extent	110	16.6	45	18.7	155	17.2
To great extent	435	65.7	154	63.9	589	65.2
Boys are source of prestige in the society						
Not at all	101	15.3	30	12.4	131	14.5
To Some extent	133	20.1	51	21.2	184	20.4
To great extent	428	64.7	160	66.4	588	65.1
Boys are helpful in attaining stronger position in the society						
Not at all	99	15.0	33	13.7	132	14.6
To Some extent	138	20.8	49	20.3	187	20.7
To great extent	425	64.2	159	66.0	584	64.7
Boys are source of income						
Not at all	79	11.9	24	10.0	103	11.4
To Some extent	117	17.7	46	19.1	163	18.1
To great extent	466	70.4	171	71.0	637	70.5
Boys are helpful in the old age						
Not at all	97	14.7	22	9.1	119	13.2
To Some extent	112	16.9	43	17.8	155	17.2
To great extent	453	68.4	176	73.0	629	69.7
Girls are economically burden for parents						
Not at all	242	36.6	99	41.1	341	37.8
To Some extent	142	21.5	59	24.5	201	22.2
To great extent	278	42.0	83	34.4	361	40.0

notion. Majority of the respondents (69.7%) held the view that boys are helpful in the old age to great extent, 17.2% to some extent and remaining 13.2% did not agree. In response to the question of boys being helpful in the old age, 40.0, 22.2 and 37.8% women reported to great extent, to some extent and not at all respectively.

***4.1.1.26. Nutritional knowledge and related factors*.** A balance diet is one which comprises healthy and diverse food with optimum proportions of all required nutrients. Different types of food provide different types of essential nutrients such carbohydrates (wheat, rice, maze), proteins (meat, fish, chicken and beans), fats (oil and ghee), vitamins (fruits, vegetables, milk and dairy products) (Batool, 2010). Education about healthy lifestyle and healthy dietary practices improves knowledge and behavior of an individual related to eating habits (Koch & Kavcic, 2010). The knowledge of balance diet, anemia and rich food is important for all people especially teenagers and WRA. In Pakistani society women have to perform an important role in different household chores including cooking, looking after children and elderly family members. Working women have to perform not only their job-related responsibilities, but also different household work. All these factors result in eating irregularities which reduce her ability to work and performance leading towards ailment and poor health status.

Table 4.26 presents the women’s distribution based on their knowledge about balance diet, frequency and regularity of taking meals. About 45.0% (46.8% from Muzaffarabad and 39.8% from Hattian) women had knowledge about balance diet whilst 55.0% (53.2% from Muzaffarabad and 60.2% from Hattian) did not have proper knowledge of balance diet. Majority of the respondents 55.1% (53.8% from Muzaffarabad and 58.9% from Hattian) took meals three times a day, 31.3% (31.7% from Muzaffarabad and 30.3% from Hattian) four times, 10.2% (11.8% from Muzaffarabad and 5.8% from Hattian) five times, whereas only 3.3% women took meals two times in a day. Table reveals that 77.9% respondents (78.4% from Muzaffarabad and 76.3% from Hattian) took meals regularly and 22.1% (21.6% from Muzaffarabad and 23.7% from Hattian) respondents did not take meals regularly. Only 11.1% respondents used food supplements and 15.4% consumed iron tablets.

Table 4.26

Women knowledge of balance diet, frequency of taking meals and its regularity

Knowledge of Balance Diet	Muzaffarabad		Hattian		Total	
	f	%age	f	%age	f	%age
Yes	310	46.8	96	39.8	406	45.0
No	352	53.2	145	60.2	497	55.0
Total	662	100	241	100	903	100
Frequency of taking meals						
2 times	18	2.7	12	5.0	30	3.3
3 times	356	53.8	142	58.9	498	55.1
4 times	210	31.7	73	30.3	283	31.3
5 times	78	11.8	14	5.8	92	10.2
Total	662	100	241	100	903	100
Take meals regularly						
Yes	519	78.4	184	76.3	703	77.9
No	143	21.6	57	23.7	200	22.1
Total	662	100	241	100	903	100
Take food supplements						
Yes	63	99.5	37	15.4	100	11.1
No	599	90.5	204	84.6	803	88.9
Total	662	100	241	100	903	100
Take iron tablets						
Yes	104	15.7	35	14.5	139	15.4
No	558	84.3	206	85.5	764	84.6
Total	662	100	241	100	903	100

4.1.1.27. Utilization of diverse food. Diverse food with adequate nutrients is essential for a healthy and active life. Poor dietary practices are associated with decreased working capability vulnerability to illness, intrauterine deaths and adverse pregnancy outcomes (Lim et al., 2012; WHO, 2015c). Dietary diversity is considered an important indicator for micronutrient adequacy in pregnant women. (Ali et al., 2014). Men compared to women and children benefit more in terms of diet diversity, because they eat more frequently lunch or dinner away from home. In general, women do not involve men to take part in household dietary decisions, involving men in household dietary decisions will improve the nutrition, (Ochieng et al., 2017). In table 4.27, proportion of women according to the utilization of different food items on weekly basis is shown. The table summarizes the responses of women regarding utilization of carbohydrates, proteins, fats and vitamins. Wheat (99.3%), rice (99.1%) and maze (19.6%) were consumed for carbohydrates. Majority of women (88.7%) consumed wheat 7 or more times, 5.9% consumed 5-6 times, 3.9% 3-4 times, 0.9% 1-2 times and only 0.7% did not consume wheat on weekly basis. Majority of women (83.2%) used rice 7 or more times, 7.2% 5-6 times, 6.1% 3-4 times, 2.7% 1-2 times and only 0.9% did not consume rice on weekly basis. Majority of the respondents (11.8%) used maze 1-2 times, 3.7% 3-4 times, 1.2% 5-6 times, 1.9% 7 or more times. The results reveal that carbohydrates were mainly taken in AJK by utilizing wheat and rice.

Proteins are mainly taken from meat (84.7%), chicken (92.9%), fish (15.7%) and beans (94.9%). Majority of the respondents (52.6%) consumed meat 1-2 times, 26.1% 3-4 times, 3.5% 5-6 times, 2.4% 7 or more times and 15.3% did not consume meat on weekly basis. Majority of women 11.8% consumed fish 1-2 times in a week, 2.1% 3-4 times, 0.6% 5-6 times, 1.2% 7 or more times and 84.3% did not consume fish on weekly basis. The proportion of women utilizing beans on weekly basis included 26.6% using 1-2 times, 47.3% 3-4 times, 15.0% 5-6 times, 6.1%

7 or more times whilst 5.1% did not consume beans. The findings reveal that beans and chicken were main sources of protein in the study populations.

The table reveals that weekly utilization of ghee among respondents is 10.6% for 1-2 times, 6.9% 3-4 times, 4.0% 5-6 times, 54.7% 7 or more times whilst 23.8% did not consume ghee. Oil consumption on weekly basis comprised 2.5% for 1-2 times, 2.4% 3-4 times, 4.5% 5-6 times, 65.2% 7 or more times, whilst 25.2% did not consume oil. The butter was consumed 17.1, 6.3, 0.9,

Table 4.27

Utilization of diverse food on weekly basis

Food Item	1-2 times % (f)	3-4 times % (f)	5-6 times % (f)	7 times % (f)	Not at all % (f)
Carbohydrates					
Wheat	0.9 (8)	3.9(35)	5.9(53)	88.7(801)	0.7(6)
Rice	2.7(24)	6.1(55)	7.2(65)	83.2(751)	0.9(8)
Maze	11.8(107)	3.7(33)	1.2(11)	1.9(17)	81.4(735)
Proteins					
Meat	52.6(475)	26.1(236)	3.5(32)	2.4(22)	15.3(138)
Chicken	58.4(527)	26.8(242)	3.3(30)	4.4(40)	7.1(64)
Fish	11.8(107)	2.1(19)	0.6(5)	1.2(11)	84.3(761)
Beans	26.6(240)	47.3(427)	15.0(135)	6.1(55)	5.1(46)
Fats					
Ghee	10.6(96)	6.9(62)	4.0(36)	54.7(494)	23.8(215)
Oil	2.5(23)	2.4(22)	4.5(41)	65.2(589)	25.2(228)
Butter	17.1(60)	6.3(57)	0.9(8)	9.0(81)	66.1(597)
Vitamins					
Milk	11.5(104)	11.8(107)	4.7(42)	20.7(187)	51.3(463)
Vegetables	9.9(89)	28.7(259)	17.2(155)	41.3(373)	3.0(27)
Fruits	32.7(295)	23.7(214)	4.1(37)	20.4(184)	19.2(173)
Juices	30.7(277)	8.5(77)	1.8(16)	6.1(55)	52.9(478)

9.0, and 66.1% respondents 1-2 times, 3-4 times, 5-6 times, 7 or more times and not at all respectively.

About 11.5% of women consumed milk 1-2 times, 11.8% 3-4 times, 4.7% 5-6 times, 20.7% 7 or more times and 51.3% did not consume milk on weekly basis. Small proportion (9.9%) women consumed vegetables 1-2 times in a week, 28.7% 3-4 times, 17.2% 5-6 times, 41.3% 7 or more times and 3.0% did not consume on weekly basis. The proportion of women consuming fruits on weekly basis included 32.7% 1-2 times, 23.7% 3-4 times, 4.1% 5-6 times, 20.4% 7 or more times whilst 19.2% did not consume fruits. About 30.7, 8.5, 1.8, 6.1, and 52.9% respondents consumed juices 1-2 times, 3-4 times, 5-6 times, 7 or more times and not at all respectively.

4.1.1.28. Perception about hot and cold effect of food. The hot and cold food dichotomy is documented as part of ethno-medical system in China, India, Greece and other parts of the world. (Marak, 2014). According to this system, illness is the result of presence of excessive hot and cold elements in the body and is treated by utilization of the food having hot or cold effects for restoring the balance. The perception about hot and cold effects of food has prevailed in Pakistan and is being practiced by almost all the sectors of the society (Inam, 2003).

In the table 4.28, women distribution based on perception about the hot and cold effects of food is detailed. About 17.3% women (18.0% from Muzaffarabad and 15.4% from Hattian) reported there is no such perception about hot and cold food utilization. 27.5% women (27.8% from district Muzaffarabad and 27 % from Hattian) believe to some extent about perception of hot and cold food utilization, whilst majority of women 55.2% (54.5% from Muzaffarabad and 56.8% from Hattian) reported perception about hot and cold food utilization to great extent. The results depict that there is strong perception of respondents about the hot and cold effect of food.

Table 4.28

Perception about hot and cold effect of food

Perception about hot and cold food	Muzaffarabad		Hattian		Total	
	f	%age	f	%age	f	%age
Not at all	119	18.0	37	15.4	156	17.3
To Some Extent	181	27.8	67	27.0	248	27.5
To Great Extent	361	54.5	137	56.8	498	55.2
Total	662	100	241	100	903	100

Hot foods are generally restricted because these are considered to cause pimples, allergies, diarrhea, digestion issues, stomach burning, early maturity in girls, hypertension and miscarriage or pregnancy related complications, whereas, cold foods are avoided because of cough/cold, sore throat and asthma (Inam, 2003). This perception can be detrimental during pregnancy because it can hurdle in the utilization of diverse and nutrition rich balanced food intake.

Table 4.29 reveals distribution of women based on the reasons about the restricted use of hot and cold foods. The proportion of women who thought hot foods can cause pimples were 72.8%, allergy, 68.4%, blood pressure 66.6%, stomach burning 77.1%, heart palpitation 69.5%, diarrhea 68.7%, increase in weight 60.9% and difficult to digest 67.2%. The proportion of women who thought cold foods can cause cough/cold were 73.9%, chest congestion73.2%, sore throat 73.9%, delay in growth 54.7%, repeated infections 66.3%, headache 67.3%, joint pain 69.1% and asthma 65.2%. The findings indicate that myths about hot and cold effects of foods were widely prevalent among the respondents, which strengthens cultural beliefs related to restricted use of certain food.

4.1.1.29. Foods culturally restricted during pregnancy. Pregnancy is a critical period for the women during which she is nurturing not only herself but also her baby. During this period nutrient requirements are increased and 300 extra calories per day are recommended for adequately meeting

Table 4.29

Reasons of restricted use of hot and cold foods

Side Effects	Muzaffarabad % (f)		Hattian % (f)		Total % (f)	
	Yes	No	Yes	No	Yes	No
Hot effect						
Pimples	71.5(473)	28.5(189)	76.3 (184)	23.7(57)	72.8 (657)	27.2(246)
Allergy	66.2(438)	33.8(224)	74.7(180)	25.3(61)	68.4(618)	31.6(285)
Blood Pressure	65.1(431)	34.9(231)	70.5(170)	29.5(71)	66.6(601)	33.4(302)
Stomach Burning	76.7(508)	23.3(154)	78.0(188)	22.0(53)	77.1(696)	22.9(207)
Heart Palpitation	68.0(450)	32.0(212)	73.9(178)	26.1(63)	69.5(628)	30.5(275
Diarrhea	67.4(446)	32.6(216)	72.2(174)	27.8(67)	68.7(620)	31.3(283)
Increases Weight	59.8(396)	40.2(266)	63.9(154)	36.1(87)	60.9(550)	39.1(353)
Difficult to digest	66.9(443)	33.1(219)	68.0(164)	32.0(77)	67.2(607)	32.8(296)
Cold effect						
Cough/Cold	72.4(479)	27.6(183)	78.0(188)	22.0(53)	73.9(667)	26.1(236)
Chest Congestion	71.8(475)	28.2(187)	77.2(186)	22.8(55)	73.2(661)	26.8(242)
Sore throat	72.5(480)	27.5(182)	77.6(187)	22.4(54)	73.9(667)	26.1(236)
Delays Growth	55.1(365)	44.9(297)	63.5(153)	36.5(88)	57.4(518)	42.6(385)
Repeated Infection	64.8(429)	35.2(233)	70.5(170)	29.5(71)	66.3(599)	33.7(304)
Headache	64.4(426)	35.6(236)	75.5(182)	24.5(59)	67.3(608)	32.7(295)
Joint Pain	66.6(441)	33.4(221)	75.9(183)	24.1(58)	69.1(624)	30.9(279)
Asthma	65.4(433)	34.6(229)	64.7(156)	35.3(85)	65.2(589)	34.8(314)

demands of the pregnancy (Faria, 2011). Healthy and balanced diet is utmost important during pregnancy for meeting the increased needs of the body to support adequate fetal growth and development and to prevent mother from nutritional stress (Parmar et al., 2013). In Pakistani society, early age marriage, inappropriate birth spacing, lack of awareness about balanced diet and exclusive breastfeeding by malnourished mother increase the prevalence of anemia among women (Abbasy et., al., 2013). Misconceptions about the use of certain foods during pregnancy have been part of subcontinent cultures since centuries. The incorrect knowledge and avoidance of certain food items during pregnancy usually results in the premature births, LBW, prenatal and postnatal mortality (Parmar et al., 2013).

Table 4.30 presents proportion of the respondent based on their conception about the use of culturally restricted foods during pregnancy is shown. The percentage of women who thought eggs, half cooked meat organ meat, fish, dairy products and peanuts are culturally restricted foods were 23.9, 17.9, 13.6, 18.1, 11.0 and 18.1% respectively. The misconception about the culturally restricted foods was high among the Hattian district women as compared to Muzaffarabad district. The comparatively higher education and better knowledge about balanced diet can be the reason of lesser misconception among the respondents of Muzaffarabad district. The misconception about culturally restricted foods can be reduced by increasing nutritional education, awareness generation about the use of healthy diet with adequate nutrients during pregnancy for better pregnancy outcomes.

4.1.1.30. Reasons of avoidance of certain foods during pregnancy. Socio-cultural influences and misconceptions about food play a pivotal role in the utilization of mother’s diet. Sood and Kapil (1984) conducted a study to reveal nutritional behavior of pregnant women in rural India. They reported that 64% pregnant women restrict all foods during the first 6 months of pregnancy because of the belief that delivery of small size baby would be easy. Mahmood et al. (1997) reported that 84% of women in Pakistan have nutritional knowledge but only 65.5% put it

Table 4.30

Distribution of women based on the use of culturally restricted foods during pregnancy

Food Items	Muzaffarabad		Hattian		Total	
	f	%age	f	%age	f	%age
Eggs						
Yes	157	23.7	59	24.5	216	23.9
No	505	76.3	182	75.5	687	76.1
Total	662	100	241	100	903	100
Half Cooked Meat						
Yes	115	17.4	47	19.5	162	17.9
No	547	82.6	194	80.5	741	82.1
Organ Meat						
Yes	77	11.6	46	19.1	123	13.6
No	585	88.4	195	80.9	780	86.4
Fish						
Yes	103	15.6	60	24.9	163	18.1
No	559	84.4	181	75.1	740	81.9
Dairy Products						
Yes	60	9.1	39	16.2	99	11.0
No	602	90.9	202	83.8	804	89.0
Peanuts						
Yes	96	14.5	67	27.8	163	18.1
No	566	85.5	174	72.2	740	81.9
Total	662	100	241	100	903	100

in practice. The foods which were reported to be avoided during pregnancy include eggs, brinjal, beef, fish and citrus fruits because these are considered hot and can cause miscarriage. Milk, butter, oranges and curd are considered cold and are not taken during pregnancy due to the fear of harm to fetus. Other reasons for avoidance of certain food during pregnancy/lactation include indigestion, advices of traditional birth attendants, mothers or in-laws (Ali, et al., 2004).

Table 4.31 presents the respondent's distribution according to reasons of avoiding certain foods during pregnancy. Although majority of the respondent as shown in table 4.30 did not believe in these misconceptions, but they were unable to practice due to cultural restriction and advices of elderly female family members. The table 4.31 reveals that 58.4% (59.1% from Muzaffarabad and 56.4% from Hattian) did not consume certain food during pregnancy due to fear of miscarriage, 63.8% (66.2% from Muzaffarabad and 57.3% from Hattian) did not consume certain food due to risk of premature delivery, 68.3% (69.2% from Muzaffarabad and 66% from Hattian) did not consume certain food due to increase in baby size, and 63.2% (65.6% from Muzaffarabad and 56.8% from Hattian) avoid certain foods due to fear of difficult labor. About 62.1%, 76.3%, 79.0% and 68.5% respondents avoid certain foods during pregnancy because these foods were considered to cause hypertension, rigors and seizures due to their hot and cold effect respectively.

4.1.1.31. Exercise. Exercise or physical workout can increase the amount of hemoglobin and red cell mass, which increases the oxygen carrying capability to the body for performing different functions. The underlying mechanism of effect of exercise on hemoglobin is mainly from bone marrow stimulation (Hu and Lin, 2012). The effects of exercise for reducing anemia have been investigated and evaluated, but results are controversial due to the significant methodological limitations. Bread and Tobin (2000) reported that IDA is common in athletic populations, especially in younger female athletes compared to healthy sedentary individuals. In a recent study

Table 4.31

Reasons of avoiding certain foods during pregnancy

Food Items	Muzaffarabad		Hattian		Total	
	f	%age	f	%age	f	%age
Miscarriage						
Yes	391	59.1	136	56.4	527	58.4
No	271	40.9	105	43.6	376	41.6
Total	662	100	241	100	903	100
Premature delivery						
Yes	438	66.2	138	57.3	576	63.8
No	224	33.8	103	42.7	327	36.2
Increase in baby size						
Yes	458	69.2	159	66.0	617	68.3
No	204	30.8	82	34.0	286	31.7
Difficult labor						
Yes	434	65.6	137	56.8	571	63.2
No	228	34.4	104	43.2	332	36.8
Hypertension						
Yes	408	61.6	153	63.5	561	62.1
No	254	38.4	88	36.5	342	37.9
Rigors						
Yes	507	76.6	182	75.5	689	76.3
No	155	23.4	59	24.5	214	23.7
Seizures						
Yes	523	79.0	190	78.8	713	79.0
No	139	21.0	51	21.2	190	21.0
Hot and cold food						
Yes	444	67.1	175	72.6	619	68.5
No	218	32.9	66	27.4	284	31.5
Total	662	100	241	100	903	100

conducted by Wouthuyzen-Bakker and van Assen (2015) demonstrated that intensive physical exercise is a promising risk factor of developing IDA, particularly in young females. Hu and Lin (2012) argued that exercise might be a potential, safe and cost-effective method to reduce anemia. El Nahas and Gabr (2017) determined that aerobic exercises in conjunction with medication has better effect on Hb level and scores of total symptoms of anemia instead of medication only.

Table 4.32 reveals the respondent's distribution based on exercise habits and type of exercise training. Among the respondents of Muzaffarabad district, 40% women exercise daily, 5.2% 1-2 times in a week, 2.9% 3-4 times in a week and 51.8% did not exercise. In Hattian district, 17 % women exercise daily, 6.2% 1-2 times in a week and 2.9% 3-4 times in a week and 73.9%

Table 4.32

Distribution of the respondents based on the exercise and its type

Workout	Muzaffarabad		Hattian		Total	
	Frequency	%age	Frequency	%age	Frequency	%age
How often exercise?						
Daily	265	40.0	41	17.0	306	33.9
1-2 times/week	35	5.3	15	6.2	50	5.5
3-4 times/week	19	2.9	7	2.9	26	2.9
Not all	343	51.8	178	73.9	521	57.7
Total	662	100	241	100	903	100
If yes, what type of exercise						
Walking	311	87.9	59	89.4	370	88.1
Running	31	8.8	6	9.1	37	8.8
Gym	3	0.8	0	0.0	3	0.7
Yoga	10	2.5	1	1.5	10	2.4
Total	354	84.3	66	15.7	420	100

did not exercise. Overall, majority of the respondents (57.7%) did not exercise, 33.9% exercise daily, 5.5% 1-2 times and remaining 2.9% 3-4 times in a week. Among those who exercise, majority of the respondent (88.1%) are involved in walking and 8.8% in running. Very small proportion of the respondents were involved in gym and yoga. No significant difference was found among the respondents of both districts in terms of type of exercise.

4.1.1.32. Addiction habits. Addiction is an uncontrollable urge or disease which poses major challenge for developing as well as developed countries. Among women, drug addiction is not only injurious for their personal health but also adversely affects their children and family (Hassan et al., 2014). In pregnant women, drugs cause lethal physical and psychological disorders in their fetus. Addiction increases the healthcare cost, depletes financial sources and affects family relationships (Yakkaldevi, 2012). In Pakistan psychological, social and economic issues are major contributing factors of drug addiction among women (Hassan et al., 2014). The most commonly used drugs by Pakistani women are cigarette smoking/huka, and use of smokeless tobacco (Naswar, Ghutka and chaliya). Table 4.33 presents the results of univariate analysis to show the distribution of the respondent based on addiction habits. The table reveals that usage of addiction material among respondents of AJK is negligibly small. Naswar is the major addiction material used by 6.9% women, followed by sleeping pills (1.7%), cigarette smoking (0.8%), huka/chillum smoking (0.4%) and ghutka/chaliya (0.4%). The usage of addiction material was comparatively high among the respondents of Hattian than Muzaffarabad. The burning of Tabaco releases the substances such as nicotine, carbon monoxide and tar which is absorbed in the body through lungs. These toxic elements stimulate the brain cells, affect the blood vessels, heart, and hormones. Onori (2005) studied that smoking and other addiction material reduces the amount of oxygen in the bloodstream and therefore causes stress, sleepiness, fatigue and tiredness.

Table 4.33

Distribution of the respondents according to addiction habits

Addiction	Muzaffarabad		Hattian		Total	
	f	%age	f	%age	f	%age
Cigarette						
Yes	1	0.2	6	2.5	7	0.8
No	661	99.8	235	97.5	896	99.2
Total	662	100	241	100	903	100
Chilum/Huka						
Yes	2	0.3	2	0.8	4	0.4
No	660	99.7	239	99.2	899	99.6
Naswar						
Yes	37	5.6	25	10.4	62	6.9
No	625	94.4	216	89.6	841	93.1
Ghutka/Chaliya						
Yes	2	0.2	2	0.8	6	0.4
No	660	99.7	239	99.2	899	99.6
Sleeping Pills						
Yes	6	0.9	9	3.7	15	1.7
No	656	99.1	232	96.3	888	98.3
Total	662	100	241	100	903	100

4.1.1.33. Personal hygiene. Personal hygiene is necessary for personal health, social and psychological reasons. Maintaining a good standard of hygiene helps to preclude the growth and spread of infections, diseases and unpleasant aromas (Johnson, 2018). Personal hygiene is important for women because biological factors such as sweating, menstruation and vaginal discharge and household responsibilities including cooking, cleaning and taking care of children put women at risk of spreading germs and disease (Skelton, 2018). Ali et al., (2007) identified that unhygienic practices such as delivery at unclean place, birth attendant delivering baby without washing hands with soap, using unclean material for lochia absorption, non-washing of perineal area after urination and insertion of home-made medicine in vagina are the major risk factors causing infertility among Pakistani women.

Table 4.34 shows the data to reveal distribution of the respondents based on personal hygiene practices. High majority of the respondents 74.3% (75.8% from Muzaffarabad and 70.1% from Hattian) gave importance to personal hygiene to great extent, 25.1% (23.4% from Muzaffarabad and 29.9% from Hattian) to some extent and only small percentage (0.6%) did not give importance to personal hygiene. The second part of table 4.34 reveals that majority of women 67.3% (69 % from Muzaffarabad and 62.7% from Hattian) always wash hands after dusting and cleaning, 31.8% (29.8% from Muzaffarabad and 37.3% from Hattian) often and less than one percent did not wash hands. The third part of table shows the responses of women about washing of hands after using toilet, 88.7, 10.6 and 0.7% of the respondents reported that they always wash hands after using toilet, often and not at all respectively. The percentage of responses about this question were almost same for both districts.

Table 4.34 also reveals that 66.7% (68.3% from Muzaffarabad and 62.2% from Hattian), 31.5% (29.6 from Muzaffarabad and 36.5 from Hattian) and 1.9% (2.1% from Muzaffarabad and 0.3% from Hattian) reported to wash hands before cooking always, often and not at all respectively. Majority of women, 70.4% (71.5% from Muzaffarabad and 67.6% from Hattian) always wash vegetables and meat before cooking and remaining 29.6% (20.5% from Muzaffarabad and 32.4% from Hattian) do this often. The last part of table reveals response of women about covering eatables, which shows that 65.0% women always covered eatables, 33.1% often and remaining

Table 4.34

Personal hygiene practices of the women

Hygiene	Muzaffarabad		Hattian		Total	
	f	%age	f	%age	f	%age
How much personal hygiene is important for you?						
To great extent	502	75.8	169	70.1	671	74.3
To some extent	155	23.4	72	29.9	227	25.1
Not at all	5	0.8	0	0.0	5	0.6
Total	662	73.3	241	26.7	903	100.0
Do you wash your hands after dusting or cleaning?						
Always	457	69.0	151	62.7	608	67.3
Often	197	29.8	90	37.3	287	31.8
Not at all	8	1.2	0	0.0	8	0.9
Do you wash your hands after using toilet?						
Always	591	89.3	210	87.1	801	88.7
Often	65	9.8	31	12.9	96	10.6
Not at all	6	0.7	0	0.0	6	0.7
Do you wash your wash your hands before cooking?						
Always	452	68.3	150	62.2	602	66.7
Often	196	29.6	88	36.5	284	31.5
Not at all	14	2.1	3	0.3	17	1.9
Do you wash your wash vegetable and meat before cooking?						
Always	473	71.5	163	67.6	636	70.4
Often	189	20.5	78	32.4	267	29.6
Not at all	0	0.0	0	0.0	0	0.0
Do you cover your eatables?						
Always	431	65.1	156	64.7	587	65.0
Often	217	32.8	82	34.0	299	33.1
Not at all	14	2.1	3	1.3	17	1.9

1.9% did not cover eatables. No significant difference in terms of responses for covering eatables were found among respondents. The findings elucidate that majority of women give importance to personal hygiene and put it in practice while performing different household chores and to combat with hygienic issues arising due to their biological factors.

4.1.1.34. Relationship quality with husband and in-laws. In Pakistan, marriage is a social and familial obligation requiring a woman to get prepared to adjust with her husband and his family. The relation of women with her husband and in-laws depends on the communication patterns and attitudes, both of which are based on the socio-economic and cultural setups (Batool, 2010). The conflict in household/family relationships often worsened by the actions of in-laws consequently giving rise to the tension between relation of women and her husband/in-laws.

Table 4.35

Relationship quality of the respondents with husband and in-laws

Relation	Muzaffarabad		Hattian		Total	
	f	%age	f	%age	f	%age
Spouse						
Good	290	43.8	116	48.1	406	45.0
Some Tension	327	49.4	106	44.0	433	48.0
Full Tension	45	6.8	19	7.9	64	7.1
Total	662	100	241	100	903	100
In-laws						
Good	430	65.0	154	63.9	584	64.7
Some Tension	205	31.0	71	29.5	276	30.6
Full Tension	27	4.1	16	6.6	43	4.8
Total	662	100	241	100	903	100

In table 4.35, respondents distribution based on the relationship quality of women with their husbands and in-laws is displayed. As shown in the table, three kinds of relationship quality parameters were measured. Forty five percent women reported that they had good relationship with their husbands, 48% reported some tension between them and remaining 7.1% reported full tension with their husbands. The proportion of respondents belonging to Hattian district have had comparatively better relationship quality with their husband. Majority of women (64.7%) reported that they have good relations with their in-laws, followed by 30.6% with some tension and 4.8% reported full tension. Almost similar trend in terms of relationship quality of the respondents with their in-laws was found in both districts. The tension among relations is a clear indication of violence faced by women from their husbands and in-laws.

4.1.1.35. Violence and its effects on health. Domestic Violence is an act of gender-based violence committed against women in public or private life that results in or is likely to result in physical, psychological or sexual abuse including threats, coercion or subjective deprivation of these acts (United Nations, 2000; NIPS & ICF international, 2013; Karmaliani et al., 2017). Women experience different forms of domestic violence throughout the world, but its exposure is high in South Asian countries. Domestic violence is an endemic and most underreported form of violence committed against women in Pakistan (NIPS & ICF International, 2013). According to Pakistan demographic and health survey (PDHS) 2012-13, 32% WRA (15-49 years) have faced physical violence since the age of 15 years and 19% faced it during last year prior to survey (NIPS & ICF International, 2013). WRA who are illiterate, divorced or widowed, residing in rural area and have low wealth quintile are more likely to experience physical violence in Pakistan. The prevalence of physical violence is the highest (57%) in Khyber Pakhtunkhwa, followed by 43% in Baluchistan, 25% in Punjab and 19% in Sind (NIPS and ICF International, 2013). About 10%

women reported about facing violence during pregnancy and 52% experienced domestic violence and never pursued for help or told about it to anybody (NIPS and ICF International, 2013).

Table 4.36 reveals distribution of women based on the types of violence experienced from spouse and in-laws. The women were asked questions about the psychological, verbal and physical violence experienced by them. The first part of table reveals the spousal violence experienced by women. About 47.7% of the respondents reported that their husbands did not embarrass them in front of others, followed by 43.2% to some extent and remaining 10.1% reported that they

Table 4.36

Violence experienced by women from spouse and in-laws

Violence	Not at all % (f)	To some extent % (f)	To great extent % (f)
Spouse			
Embarrass in front of others	46.7(422)	43.2(390)	10.1(91)
Tease verbally	50.4(455)	42.1(380)	7.5(68)
Prevent to spent time with family and friends	81.8(739)	15.9(144)	2.2(22)
Threaten with weapon	96.5(871)	2.7(24)	0.9(8)
Grab hair	89.7(810)	9.2(83)	1.1(10)
Slap/kick	77.4(699)	20.3(183)	2.3(21)
Beat with a stick	90.3(815)	8.3(75)	1.4(13)
In-Laws			
Embarrass in front of others	70.5(637)	23.4(211)	6.1(55)
Tease verbally	69.5(628)	25.7(232)	4.8(43)
Prevent to spent time with family and friends	84.9(767)	11.6(105)	3.4(31)
Threaten with weapon	97.9(884)	2.0(18)	0.1(1)
Grab hair	97.9(884)	1.9(17)	0.2(2)
Slap/kick	97.0(876)	2.8(25)	0.2(2)
Beat with a stick	98.1(886)	1.7(15)	0.2(2)

experience this embarrassment to great extent. Half of the respondents (50.4%) never faced teasing words, 42.1% and 7.5% were teased to some extent and to great extent respectively by their husbands. Majority of the respondents (81.8%) were not prevented to spend time with the family and friends, whereas 15.9% and 2.2% were prevented to do so by their husbands. Small percentage 3.6% (2.7% to some extent and 0.9% to great extent), 10.3% (9.2% to some extent and more than 1.1% to great extent), 22.6% (20.3% to some extent and 2.3% to great extent) and 9.7% (8.3% to some extent and 1.4% to great extent) committed violence against the respondents by their spouses including threatening with weapon, hair grabbing, slapping/kicking and beating with stick respectively.

The second part of table 4.36 reveals the distribution of women according to the type of violence experienced from in-laws. The table shows that the respondents experienced comparatively less violence from in-laws than their husbands. About 70.5% never faced embarrassment, 23.4% faced it to some extent and remaining 6.1% faced embarrassment to great extent in front of others. One fourth (25.7%) were teased verbally, 11.6% were prevented to spend time with family and friends, 2% were threatened with weapon, 1.9% hair grabbed, 2.8% were slapped/kicked and 1.7% were beaten with stick by in-laws to some extent, whilst, very small percentage of the respondents experienced these types of violence to great extent from in-laws.

Mounted research on violence conducted globally and in Pakistan suggested that spousal and family violence had a severe impact on the reproductive, physical and mental health of the women (Karmaliani et al., 2017; Campbell et al., 2002; Plichta, 2004; Batool, 2010). Victims of violence are at higher risk of reproductive health problems such as, pelvic pain, vaginal bleeding, fibroids, vaginal infection, decreased sexual desire, pain during intercourse, genital irritation and urinary tract infections (Campbell et al., 2002; WSC & OSF Armenia 2017).

Table 4.37

Impact of violence on reproductive health of the women

Relation	Muzaffarabad		Hattian		Total	
	f	%age	f	%age	f	%age
Vaginal bleeding and/or infection						
Not at all	596	89.7	211	87.6	805	89.1
To some extent	52	7.9	22	9.1	197	8.2
To great extent	16	2.4	8	3.3	19	2.7
Total	662	100	241	100	903	100
Decreased sexual desire						
Not at all	422	63.7	154	63.9	576	63.8
To some extent	156	23.6	58	24.1	214	23.7
To great extent	84	12.7	29	12.0	113	12.5
Pain during intercourse						
Not at all	427	64.5	164	68.0	591	65.4
To some extent	166	25.1	53	22.0	219	24.3
To great extent	69	10.4	24	10.0	93	10.3
Irregular or heavy menstruation						
Not at all	547	82.6	210	23.3	757	83.8
To some extent	98	14.8	24	10.0	122	13.5
To great extent	17	2.6	7	2.9	24	2.7
Infertility						
Not at all	631	95.3	231	95.9	862	95.5
To some extent	27	4.1	5	2.1	32	3.5
To great extent	4	0.6	5	2.1	9	1.0
Miscarriage						
Not at all	624	94.3	225	93.4	849	94.0
To some extent	24	3.6	9	3.7	33	3.4
To great extent	14	2.1	7	2.9	21	2.3

Table 4.37 reveals distribution of the respondents about multiple consequences of violence on the reproductive health of women. Small percentage 10.9% (8.2% to some extent and 2.7% to great extent) women suffered from vaginal bleeding/infection and majority (89.1%) did not face this problem. However, 23.7% women complained of decreased sexual desire to some extent, 12.5% to great extent and remaining 63.8% did not face this problem. Less than one-fourth (24.3%) women reported experiencing pain to some extent and 10.3% to great extent during intercourse because of nonconsensual sex. 16.2% (13.5% to some extent and 2.7% to great extent) respondents complained about irregular/painful menstruations after being subjected to sexual abuse, 4.5% (3.5% to some extent and 1.0% to great extent) women stated to experience infertility and 6.0% (3.7% to some extent and 2.3% to great extent) reported miscarriages/absorptions, which is attributed to the abuse they have endured. There was no significant difference between the respondents of two districts suffering from any of the reproductive health problem due to violence.

Numerous interrelated socio-cultural factors have kept women deprived and vulnerable to the violence and all of them have manifestations of imbalanced power between men and women (Batool, 2010). Mounted research reveals that spousal violence poses a substantial risk to the women's physical (Plichta, 2004) and psychological health (Lee et al., 2002). The exposure to domestic violence is a psychosocial issue, which can be associated with anemia, decreased weight of women and their children (Lee et al., 2002). The degree of controlling behavior exercised by husbands is the precursor of violence, which affects the physical and mental health of women.

To determine the impact of violence on the physical and mental health, women were asked questions about their decreased working capacity, headache, poor appetite, inability to take decision, decreased self-confidence, intolerance/mood swing and inappropriate personal care. In

Table 4.38

Respondent's distribution for assessing impact of violence on the physical and mental health

Decreased Working Capacity	Muzaffarabad		Hattian		Total	
	f	%age	f	%age	f	%age
Not at all	287	43.4	112	46.5	399	44.2
To some extent	207	31.3	87	36.1	294	32.6
To great extent	168	18.6	42	17.4	210	23.3
Total	662	100	241	100	903	100
Headache						
Not at all	305	46.1	116	48.1	421	46.6
To some extent	186	28.1	68	28.2	254	28.1
To great extent	171	25.8	57	23.7	228	25.2
Poor appetite						
Not at all	346	52.3	134	47.3	480	53.2
To some extent	185	27.9	71	29.5	256	28.3
To great extent	131	19.8	36	14.9	167	18.5
Inability to take decision						
Not at all	323	48.8	119	49.4	442	48.9
To some extent	215	32.5	88	36.5	303	33.6
To great extent	124	18.7	34	14.1	158	17.5
Decreased self confidence						
Not at all	305	46.1	121	50.2	426	47.2
To some extent	220	33.2	87	36.1	307	34.0
To great extent	137	20.7	33	17.7	175	18.8
Intolerance/Mood swing						
Not at all	336	50.8	123	51.0	459	50.8
To some extent	189	28.5	67	27.8	256	28.3
To great extent	137	20.7	51	21.2	188	20.8
Inappropriate personal care						
Not at all	287	43.4	114	47.3	401	44.4
To some extent	118	17.8	50	20.7	168	18.6
To great extent	257	38.8	77	32.0	334	37.0

table 4.38 percentage distribution of the responses of these questions is expressed. About 44.2% women did not complain about decreased working capacity, 32.6% experienced to some extent and remaining 23.3% to great extent, whereas, 46.6% did not complain about headache, 28.1% complained to some extent and remaining 25.2% to great extent. It can be observed from the table responses that both districts were almost similar for different options asked. Little more than fifty percent (53.2%) respondents (52.3% from Muzaffarabad and 47.3% from Hattian) never suffered from poor appetite, 28.3% (27.9% from Muzaffarabad and 29.5% from Hattian) to some extent and 18.5% (19.8% from Muzaffarabad and 14.9% from Hattian) to great extent. Violence decreases self-confidence and affects the ability of victims to take decision.

Table reveals that inability to take decision was reported as not at all, to some extent and to great extent by 48.9, 33.6 and 17.5% respondents respectively. The decreased self-confidence was reported to be not at all by 47.2%, to some extent by 34.0% and to great extent by 18.8% respondents. Victims of violence suffer from intolerance, mood swings and did not take personal care. The table underlines that half of the respondents (50.8%) did not suffer from intolerance/mood swing, 28.3% to some extent and 20.8% to great extent. The inappropriate personal care was reported not at all by 44.4% respondents, to some extent by 18.6% and to great extent by 37.0%. The results indicate that almost similar trend was found about the bearing of violence on the physical and mental health in both districts.

4.1.1.36. Communicable diseases. Communicable diseases are major health issue in Pakistan which is the foremost cause of mortality and illness because of the socioeconomic, behavioral and environmental risk factors. These diseases hit and try to weaken the immune system of the body. Pakistan bears substantial portion of regional communicable diseases causing anemia

Table 4.39

Prevalence of communicable diseases in women during last one year

Cholera	Muzaffarabad		Hattian		Total	
	f	%age	f	%age	Ff	%age
Yes	96	14.5	37	15.4	133	14.7
No	566	85.5	204	84.6	770	85.3
Total	662	100	241	100	903	100
Pneumonia						
Yes	54	8.2	30	12.4	84	9.3
No	608	91.8	211	87.6	819	90.7
Measles						
Yes	21	2.3	5	2.1	26	2.9
No	641	96.8	236	97.9	877	97.1
Tetanus						
Yes	2	0.3	3	1.2	5	0.6
No	660	99.7	238	98.8	898	99.4
Diarrhea						
Yes	238	36.0	80	33.2	318	35.2
No	424	64.0	161	66.8	585	64.8
Tuberculosis						
Yes	19	2.9	3	1.2	22	2.4
No	643	97.1	238	98.8	881	97.9
Cough						
Yes	79	11.9	33	13.7	112	12.4
No	583	88.1	208	86.3	791	87.6
Polio						
Yes	0	0.0	0	0.0	0	0.0
No	662	73.3	241	26.7	903	100.0
Total	662	100	241	100	903	100

including pneumonia, cholera, malaria, influenza, hepatitis and HIV/AIDS (Batool, 2010). The overcrowded cities, poor socio-economic conditions, scarce vaccine coverage, unsafe drinking water, poor sanitation and low health awareness put Pakistan on the risk of endemics (Batool, 2010). Communicable diseases decrease the women immunity level specifically during reproductive age causing miscarriage, LBW, pre-term birth and other related health afflictions (Khan, 1995).

Table 4.39 reveals respondent's distribution according to the prevalence of communicable diseases. Diarrhea was the most prevalent communicable disease, which was reported by 35.2% respondents, followed by cholera 14.7% and cough 12.4%, measles by 2.9%, tetanus 0.6% and tuberculosis by 2.4%. None of the respondents reported to suffer from polio. High prevalence of diarrhea and cholera might be due to utilization of contaminated water, unhygienic food and inadequate eating habits. The findings clearly indicate similar trend of communicable diseases in the Muzaffarabad and Hattian districts.

4.1.1.37. Knowledge about anemia and its symptoms. The knowledge about a disease, its symptoms, causes, and prevention is important for its diagnosis and treatment (Allen, 2000). The person having appropriate knowledge of disease responds adequately and takes timely therapeutic interventions. Inadequate knowledge of anemia and unawareness about its consequences on women health, inapt distribution of iron supplementation, misapprehensions about negative implications of iron supplements, irregular and delayed prenatal care and cultural beliefs are major barriers in the treatment and prevention of anemia (Dreyfuss, 1998). Inadequate maternal knowledge of anemia, spurring iron supplements intake and malnourishment are major contributing factors of anemia which can escalate further complications (Rusia, 1995). Souganidis et al. (2012) reported that maternal knowledge about anemia and other healthcare practices utilized

Table 4.40

Knowledge of women about anemia and its symptoms

Statement	Muzaffarabad		Hattian		Total	
	f	%age	f	%age	f	%age
Do you think anemia is a health problem?						
Yes	567	85.6	218	90.5	785	86.9
No	95	14.4	23	9.5	118	13.1
Do you know pale skin, lips and nails are symptoms of anemia?						
Yes	565	85.3	194	80.5	759	84.1
No	97	14.7	47	19.5	144	15.9
Do you know tiredness is symptom of anemia?						
Yes	561	84.7	208	86.7	769	85.2
No	101	15.3	33	13.7	134	14.8
Do you know weakness is symptom of anemia?						
Yes	562	84.9	207	85.9	769	85.2
No	100	15.1	34	14.1	134	14.8
Do you know decreased working capacity is symptom of anemia?						
Yes	538	81.3	185	76.8	723	80.1
No	124	18.7	56	23.2	180	19.9
Do you know eating non-food items is symptom of anemia?						
Yes	354	53.5	117	48.5	471	52.2
No	308	46.5	124	51.5	432	47.8
Do you know weight loss is symptom of anemia?						
Yes	467	70.5	154	63.9	621	68.8
No	195	29.5	87	36.1	282	31.2
Do you know heart palpitation is symptom of anemia?						
Yes	426	64.4	128	53.1	554	61.4
No	236	35.6	113	46.9	349	38.6
Do you know shortness of breath is symptom of anemia?						
Yes	423	63.9	142	58.9	565	62.6
No	239	36.1	99	41.1	338	37.4

for reducing anemia are linked with lower odds of anemia among their children. Common symptoms of many types of anemia include; easy fatigability, tiredness, immunity, shortness of breath, heart palpitation, decreased working capacity, depression and headache.

Table 4.40 presents the distributions of women on the basis of their knowledge about anemia and its symptoms. The table reveals that 86.9% women have the knowledge that anemia is a health problem. Majority (84.1%) women reported that paleness of skin, lips and nailbeds are the symptoms of anemia. Tiredness, weakness, decreased working capacity, eating non-food items, weight loss, heart palpitation, and shortness of breath are reported by 85.2, 85.2, 80.1, 52.2, 68.8, 61.4 and 62.6% women as symptoms of anemia respectively. The findings did not show significant differences between respondents of Muzaffarabad and Hattian district about their knowledge of symptoms of anemia. The results demonstrate that knowledge of respondents about symptoms of weight loss, eating non-food items, heart palpitation and shortness of breath is modest.

4.1.1.38. Knowledge about causes, preventive measures and barriers in the treatment of anemia. Generally, anemia is caused due to some underlying disease (Infections, cancer etc.), nutritional deficiencies (iron, vitamins A, B12 and C) and genetic Hb disorders (Warrell et al., 2003; Harding et al., 2017). IDA is the most common type of anemia which accounts for more than 60% of all cases of anemia (Harding et al., 2017). IDA has multiple causes including increased iron requirements during pregnancy, insufficient intake of micronutrients, small birth intervals, infections, increase blood loss and others (USAID, 2011). Knowledge of the respondents can play a vibrant role in preventing anemia.

In the table 4.41, percentage distribution of women based on their knowledge about causes of anemia are depicted. High majority (91.8%) respondents knew repeated pregnancies and 90.6% were of the view that malnutrition is the cause of anemia. Poor socioeconomic conditions, heavy

Table 4.41

Knowledge of women about anemia causes

Causes of anemia	Muzaffarabad		Hattian		Total	
	f	%age	f	%age	f	%age
Repeated pregnancies						
Yes	603	91.1	226	93.8	829	91.8
No	59	8.9	15	6.2	74	8.2
Total	662	100	241	100	903	100
Malnutrition						
Yes	596	90.0	222	92.1	818	90.6
No	66	10.0	19	7.9	85	9.4
Poor socioeconomic condition						
Yes	590	89.1	223	92.5	813	90.0
No	72	10.9	18	7.5	90	10.0
Heavy bleeding						
Yes	604	91.2	223	92.5	827	91.6
No	58	8.8	18	7.5	76	8.4
Heredity conditions						
Yes	387	58.5	106	44.0	493	54.6
No	275	41.5	135	56.0	410	45.4
Non-consumption of animal protein						
Yes	498	75.2	142	58.9	640	70.9
No	164	24.8	99	41.1	263	29.1
Communicable diseases						
Yes	384	58.0	101	41.9	485	53.7
No	278	42.0	140	58.1	418	46.3
Violence						
Yes	516	77.9	175	72.6	691	76.5
No	146	22.1	66	27.4	212	23.5
Total	662	100	241	100	903	100

bleeding, heredity conditions, non-consumption of animal protein, communicable diseases and violence were reported by 90.0, 91.6, 54.6, 70.9, 53.7 and 76.5% women as causes of anemia respectively. The table further reveals that women of Muzaffarabad and Hattian had approximately same knowledge about repeated pregnancies, malnutrition, poor socio-economic condition, heavy bleeding as causes of anemia. However, women from Muzaffarabad district had considerably better knowledge about causes of anemia such as heredity conditions, non-consumption of animal protein and communicable diseases compared to Hattian district.

Preventive measures of anemia are complementary and have importance depending on local situations and needs. Many types of anemia are not preventable; however, IDA and vitamin deficiency anemia can be prevented utilizing the diet which includes folate, iron, vitamin C and vitamin B-12 (WHO, 2014; WHO, 2016). Utilization of iron-rich diet on daily basis keeps body healthy and prevents it from anemia (Rasmussen, 2001). Mayo (2007) reported that anemia can be prevented by consuming healthy and diverse iron rich diet, folate and vitamin B-12.

In table 4.42 respondent’s distribution for assessing their knowledge about preventive measures of anemia is delineated. The results indicate that 77.5% had knowledge about preventing anemia by consuming plenty of green leafy vegetables, 86.9% were of view to prevent by taking food supplements and almost similar percentage reported to prevent anemia by taking iron tablets. About 80.5, 59.1, 75.7, 76.5 and 79.4% knew that anemia can be prevented by eating red meat, deworming, utilizing hygienic food, personal hygiene and avoiding violence respectively. The knowledge of respondents about preventing anemia by deworming is modest. The table also reveals that knowledge about taking preventive measures of anemia is considerably more among the women of Muzaffarabad districts than women of Hattian district.

Table 4.42

Knowledge of women about preventive measures of anemia.

Preventive Measures	Muzaffarabad		Hattian		Total	
	f	%age	f	%age	f	%age
Eating plenty green leafy vegetables						
Yes	526	79.5	174	72.2	700	77.5
No	136	20.5	67	27.8	203	22.5
Total	662	100	241	100	903	100
Taking food supplements						
Yes	583	88.1	202	83.8	785	86.9
No	79	11.9	39	16.2	118	13.1
Taking iron tablets						
Yes	586	88.5	204	84.6	790	87.5
No	76	11.5	37	12.5	113	12
Utilization of red meat						
Yes	559	84.4	168	69.7	727	80.5
No	103	15.6	73	30.3	176	19.5
Deworming						
Yes	422	63.7	112	46.5	534	59.1
No	240	36.3	129	53.5	369	40.9
Utilization of hygienic food						
Yes	525	79.3	159	66.0	684	75.7
No	137	20.7	82	34.0	219	24.3
Personal hygiene and clean environment						
Yes	532	80.4	159	66.0	691	76.5
No	130	19.6	82	34.0	212	23.5
Avoid violence						
Yes	535	80.8	182	75.5	717	79.4
No	127	19.2	59	24.5	186	20.6
Total	662	100	241	100	903	100

In Pakistan, poor nutritional knowledge, misconceptions about certain foods during pregnancy, poor socioeconomic condition, lack of knowledge about anemia symptom, its causes and prevention and long distances from healthcare facility are major barriers in the treatment of anemia. WHO has recommended a daily oral iron and folic acid (IFA) supplements for pregnant women and weekly IFA supplements for WRA (WHO, 2014a). Woman's decision about the utilization of IFA and other natural iron rich diets influenced by her husband, mother or mother-in-law (Sedlander et al., 2018). Recent studies in Kenya and Nepal investigated that knowledge barrier exists about adequate information of IFA among women (Kimiywe, et al., 2017; Rai et al., 2016). The side effects such as nausea, stomach pain and gastric problems have been considered as critical barriers of consuming IFA supplementation among women (Sedlander et al., 2018).

Table 4.43 reveals knowledge of the women about the barriers in the treatment of anemia. Majority of women (79%) consider lack of available food supplements and 88.7% consider poor socioeconomic conditions as barrier in the treatment of anemia. Lack of knowledge about anemia, inadequate guidance, compliance with food supplements and long waiting hours at healthcare facility were reported by 79.6, 75.4, 58.9 and 59.6% women respectively as barriers. The knowledge of women especially belonging to Hattian district was unobtrusive about the treatment barrier's compliance with food supplements and long waiting hours at the healthcare facility.

4.1.1.39. Anemia severity determined by hemoglobin level. Anemia is an inappropriate number of RBCs in the blood which is determined by Hb concentration (WHO, 2001). Severity of anemia can be determined based on its symptoms and Hb level, which is categorized into mild, moderate, or severe anemia (Beutler & Waalen, 2006). The Hb cutoffs for anemic pregnant and non-pregnant women are ≤11g/dl and ≤12g/dl respectively. (WHO, 1968). The cutoffs of mild, moderate and severe anemia for pregnant women were 10-10.9 g/dl, 7.0 to 9.9 g/dL and ≤7.0 g/dL

Table 4.43

Knowledge of women about barriers in the treatment of anemia

Barriers in Treatment	Muzaffarabad		Hattian		Total	
	f	%age	f	%age	f	%age
Lack of available food supplements						
Yes	532	80.4	181	75.1	713	79.0
No	130	19.6	60	24.9	190	21.0
Total	662	100	241	100	903	100
Poor socio-economic conditions						
Yes	584	88.2	217	90.0	801	88.7
No	78	11.8	24	10.0	102	11.3
Total	662	100	241	100	903	100
Lack of knowledge about anemia						
Yes	540	81.6	179	74.3	719	79.6
No	122	18.4	62	25.7	184	20.4
Total	662	100	241	100	903	100
Inadequate guidance						
Yes	519	78.4	162	67.2	681	75.4
No	143	21.6	79	32.8	222	24.6
Total	662	100	241	100	903	100
Compliance with food supplements						
Yes	416	62.8	116	48.1	532	58.9
No	246	37.2	125	51.9	371	41.0
Total	662	100	241	100	903	100
Long waiting hours at healthcare facility						
Yes	422	63.7	116	48.1	538	59.6
No	240	36.3	125	51.9	365	40.4
Total	662	100	241	100	903	100

Table 4.44

Anemia severity determined by hemoglobin level

Anemia Severity	Muzaffarabad			Hattian Bala			Total		
	%(f)	Mean	SD	%(f)	Mean	SD	%(f)	Mean	SD
Normal	40.3(267)	12.90	0.79	42.3(102)	12.77	0.73	40.9(369)	12.86	0.77
Mild	22.4(148)	11.38	0.35	18.3(44)	11.33	0.57	21.3(192)	11.37	0.41
Moderate	33.7(223)	9.91	0.81	32.8(79)	9.72	0.81	33.4(302)	9.86	0.81
Severe	3.6(24)	7.52	1.42	6.6(16)	6.73	0.84	4.4(40)	7.20	1.27
Total	100(662)	11.36	1.66	100(241)	11.10	1.91	100(903)	11.29	1.73

respectively, whereas these cutoffs for non-pregnant women were 11-11.9 g/dL, 8.0-10.9 g/dl and ≤8.0 g/dL respectively (WHO, 1989). Mild anemia is asymptomatic and is commonly untreated, however some of the common symptoms can be fatigue and weakness (Batool, 2010).

Table 4.44 reveals the distribution of women according to anemia severity determined by Hb level. In Muzaffarabad district 40.3% and in Hattian 42.3% women were non-anemic. The prevalence of mild, moderate and severe anemia in Muzaffarabad was 22.4, 33.7 and 3.6% respectively, whereas in Hattian the prevalence was 18.3, 32.8, 6.6% respectively. Overall, the prevalence of mild anemia was 21.3%, moderate anemia was 33.4% and severe anemia was 4.4% among married women. The mean ± SD of Hb level for the non-anemic and those suffering from mild, moderate and severe anemia are 12.86 ± 0.77, 11.37 ± 0.4, 9.86 ± 0.81 and 7.20 ± 1.27 g/dl respectively. The results reveal that approximately 60% of the respondents were suffering from anemia in AJK, which is higher than the anemia prevalence among WRA.

4.1.2 Adolescent girls4.1.2.1

Age of adolescent girls. Adolescence is the transitional period of aging between 19 years development between childhood to adulthood. According to WHO, an adolescent is an individual (WHO, 1986). Age is a rough marker of adolescence and is one of the characteristics delineating this period, which is appropriate for assessing biological changes (puberty). In broader terms, adolescence encompasses neurodevelopmental, psychological, social as well as biological aspects of maturation (WHO, 2018). The hormonal changes and growth spurt in height, weight and other body parts increase the nutritional demands of the body in adolescents. In adolescent girls, additional stress of blood loss during menstruation results in the incidences of nutritional deficiencies especially IDA (WHO, 2006b). The interventions to overcome female nutritional deficiencies are focused during reproduction period from maternal and child health perspective and adolescent girls remained most neglected in terms of dietary intake. Recently the focus has changed from maternal and child health to life cycle approach of reproductive health. The focus of health system has shifted from maternal and child health to reproductive health in terms of overcoming nutritional deficiencies by making interventions before marriage and entering motherhood (Hassan et al., 2017). Adolescence can be the best time to intervene for nutritional deficiencies, assist adequate physical development and to prevent anemia during motherhood (WHO, 2005b; Srinivas & Mankeshwar, 2015).

Table 4.45 shows data on age of the adolescent girls (10- 19 years) at the time of interview. This table comprised three data sets; first three columns exclusively show data collected from district Muzaffarabad, next three column comprised data gathered from respondents belonging to district Hattian Bala and the last part of the table shows results of total data set (combined data of both districts). District-wise analysis followed by combined analysis enables the readers to better judge the situation within each district as well as overall situation. During analysis of data current

Table 4.45

Adolescent girls age at the time of interview

Age (years)	District Muzaffarabad			District Hattian Bala			Total		
	%(f)	Mean	SD	%(f)	Mean	SD	%(f)	Mean	SD
Adolescent age at the time of interview									
10-13	24.8(114)	12.02	1.04	27.1(14)	12.67	0.52	25.4(159)	12.20	0.97
14-16	39.6(182)	15.10	0.78	42.2(70)	14.86	0.80	40.3(252)	15.04	0.79
17-19	35.7(164)	17.76	0.78	30.7(51)	17.92	0.85	34.3(215)	17.80	0.80
Total	100(460)	15.29	2.36	100(166)	15.20	2.16	100(626)	15.27	2.31

age of the adolescent girls was divided into three groups: early adolescence (10-13 years), middle adolescence (14-16 years) and late adolescence (17-19 years).

Most of the respondents (39.6%) from district Muzaffarabad were between 14-16 years, 35.7% between 17-19 years and 24.8% were between 10-13 years old. The results of data collected from district Hattian revealed that most of the respondents (40.3%) were between 14-16 years, 34.3% were between 17-19 years and 25.4% were between 10-13 years at the time of interview. No significant difference was found between respondents of two districts based on the mean age. The combined analysis of the data collected from both the districts showed that 25.4% girls fall into the age group 10-13 years, 40.3% in 14-16 years and remaining 34.3% belong to age group 17-19 years. The overall mean age of adolescent girls was 15.27 years with SD 2.31 years.

4.1.2.2. Body Mass Index (BMI) of the respondents. BMI is an important indicator of body fitness and nutritional status of adolescents. Research evidences reveal that underweight, overweight and obese adolescents especially girls are vulnerable to IDA (Nead et al., 2004; Bose

& Bisai, 2008).

In the table 4.46, distribution of the adolescent girls based on the BMI is presented. Nutritional status of the respondents is assessed using WHO BMI charts for girls (WHO, 2001). The respondents are divided into underweight (BMI<5th percentile), normal (BMI between 5th and 85th percentile), overweight (BMI above than 85th percentile and below 95th percentile) and obese having BMI>=95th percentile (Lindsay et al., 2001; Dietz & Robinson, 2005). In Muzaffarabad district, 22.6% girls were underweight, 70.7% had normal BMI, 5.0% were overweight and 1.7% were obese. In Hattian district 22.3% girls were underweight, 70.5% had normal BMI, 6.6% were overweight and 0.6% were obese. Almost similar statistics are revealed by the respondents of Hattian and Muzaffarabad on the basis of BMI. Overall, 22.5% girls were underweight, 70.6% had normal BMI, 5.4% were overweight and remaining 1.4% were obese. Majority of the respondents have normal BMI; however considerable adolescents are also malnourished. The malnourished adolescent girls can be at the risk of anemia, pregnancy and childbirth complications.

Table 4. 46

Distribution of adolescent girls on basis of their BMI

BMI (kg/m^2)	District Muzaffarabad			District Hattian Bala			Total		
	%(f)	Mean	SD	%(f)	Mean	SD	%(f)	Mean	SD
Underweight	22.6(104)	1.74	1.04	22..3(37)	2.10	1.29	22.5(141)	1.84	1.12
Normal	70.7(325)	35.94	24.34	70.5(117)	37.29	24.55	70.6(442)	36.30	24.38
Overweight	5.0(23)	89.52	2.48	6.6(11)	88.82	2.71	5.4(34)	89.29	2.54
Obese	1.7 (8)	96.75	1.75	0.6(1)	95.00	0.00	1.4(9)	96.56	1.74
Total	100(460)	31.95	29.60	100(166)	33.21	29.70	100 (626)	32.28	29.61

4.1.2.3. Educational attainment of adolescent girls and their parents. Educational level of the adolescent and her parents are important for utilizing healthcare services, good dietary habits and consumption of balanced diet, knowledge about anemia, its causes and prevention. Parental education plays vitally crucial role in the child development. Involvement of parents in educational affairs plays a facilitating role among poverty, ethnicity, race, academic achievement and reduces achievement gap (Emon, 2002). Mother's education is crucial in reducing the iron deficiency and risk of anemia in their children (Choi et al., 2011). Rahman and Chowdhury (2006) reported that a strong relationship exists between parental education and their children health. Higher maternal education has been associated to increased knowledge about health and nutrition and awareness about diet quality of children (Variyam et al., 1999). Education affects healthy decision making in mothers and hence influences the nutrition-related requirements of the children (Mwanri, et al., 2001). Children of formally educated (Wamani, et al., 2006) or literate (Chopra, 2006) mothers are at decreased risk of stunting.

Table 4.47 elucidates the respondents distribution and their parents according to the years of schooling. The first part of table reveals percentage distributions of adolescent girls. The 0.9% girls from Muzaffarabad were illiterate, 8.9% had 1-5 years of schooling, 29.8% had 6-8 years, 29.6% had 9-10 years and 30.9% more than 10 years. In Hattian district, no girl was illiterate, 1.14% had 1-5 years of schooling, 42.2% had 6-8 years, 30.1% had 9-10 years and reaming 21.7% had more than 10 years of schooling. The combined analysis of the data collected from both districts revealed that one third girls (33.1%) had 6-8 years of schooling, followed by 29.7 % had 9-10 years, 28.4% more than 10 years, 8.1% 1-5 years and only 0.6% were illiterate. The mean years of schooling and SD for Muzaffarabad were (mean=8.99 and SD=2.55) and for the Hattian were (mean = 8.92 and SD=2.50). Overall, average years of schooling for adolescent girls that

Table 4.47

Educational attainment of adolescent girls and their parents

Education (Years of Schooling)	District Muzaffarabad			District Hattian Bala			Total		
	%(f)	Mean	SD	%(f)	Mean	SD	%(f)	Mean	SD
Education of respondent									
Illiterate	0.9(4)	0.00	0.00	0.0(0)	0.00	0.00	0.6(4)	0.00	0.00
1-5	8.9(41)	4.39	1.14	6.0(10)	5.00	0.00	8.1(51)	4.51	1.05
6-8	29.8(137)	7.25	0.82	42.2(70)	7.53	0.68	33.1(207)	7.34	0.78
9-10	29.6(136)	9.48	0.50	30.1(50)	9.52	0.50	29.7(186)	9.49	0.50
10+	30.9(142)	11.79	0.67	21.7(36)	11.86	0.42	28.4(178)	11.80	0.63
Total	100(460)	8.99	2.55	100(166)	8.92	2.01	100(626)	8.97	2.42
Education level of father									
Illiterate	11.5(53)	0.00	0.00	15.1(25)	0.00	0.00	12.5(78)	0.00	0.00
1-5	12.6(58)	4.36	1.09	12.0(20)	4.70	0.80	12.5(78)	4.45	1.03
6-8	15.9(73)	7.67	0.67	14.5(24)	7.50	0.78	15.5(97)	7.63	0.70
9-12	45.7(210)	10.51	0.92	44.6(74)	10.34	0.86	45.4(284)	10.47	0.91
12+	14.3(66)	15.86	5.62	13.9(23)	15.09	1.08	14.2(89)	15.66	4.87
Total	100(460)	8.84	5.02	100(166)	8.35	4.59	100(626)	8.71	4.91
Education level of mother									
Illiterate	27.6(127)	0.00	0.00	40.4(67)	0.00	0.00	31.0(194)	0.00	0.00
1-5	16.1(74)	4.05	1.48	10.2(17)	4.82	0.93	14.5(91)	4.20	1.38
6-8	16.7(77)	7.57	0.75	10.8(18)	7.67	0.69	15.2(95)	7.59	0.74
9-12	29.3(135)	10.62	0.83	28.3(47)	10.45	0.95	29.1(182)	10.33	0.86
12+	10.2(47)	15.62	3.79	10.2(17)	14.71	1.04	10.2(64)	15.38	3.30
Total	100(460)	6.53	5.26	100(166)	5.79	5.37	100(626)	6.34	5.30

almost 100% adolescents are enrolled in the schools in Azad Kashmir.

The second part of the table 4.47 reveals results of univariate analysis about the years of schooling of girls fathers. In Muzaffarabad district, majority of the girls fathers (45.7%) had 9-12 years of schooling, 15.9% have 6-8 years, 14.3% had more than 12 years, 12.6% had 1-5 years and belonging to both districts were mean= 8.97 years and SD= 2.42 years. The results clearly depict remaining 11.5% were illiterate. The mean years of schooling for fathers were 8.84 years with SD 5.02 years. In Hattian district, majority of fathers (44.6%) had 9-12 years of schooling, followed by 15.1% as illiterate, 14.5% had 6-8 years, 13.9% had more than 12 years of schooling and remaining 12% had 1-5 years. The mean years of schooling are 8.35 years with standard deviation 4.59 years. Overall 12.5% fathers were illiterate, same percentage were educated up to primary level, 15.5% for 6-8 years, 45.4% for 9-12 years and 14.2% for more than 12 years.

The third part of table reveals distribution of the adolescent girls based on the maternal educations. The findings indicate that in Muzaffarabad districts 27.6% mothers were illiterate, 16.1% had 1-5 years of schooling, 16.7% had 6-8 years, 29.3% had 9-12 years and 10.2% had more than 12 years of schooling. It is obvious from figure that mothers belonging to Hattian district were comparatively less educated, 40.4% were illiterate, 10.2% had 1-5 years of schooling, 10.8% had 6-8 years of schooling, 28.3% had 9-12 years and remaining 10.2% more than 12 years of schooling. Overall 31.0% are illiterate, followed by 29.1% had 9-12 years of schooling, 15.2% had 6-8 years, 14.5% had 1 to 5 years and remaining 10.2% had more than 12 years of education. Overall mean maternal years of schooling were 6.34 and SD 5.30 years. The table reveals that fathers were more educated than mothers, however, data did not reflect massive disparities in their years of schooling in AJK.

4.1.2.4. Economic wellbeing. Income is an indicator of socio-economic status in the society and low income limits the availability of adequate and good quality food (Assefa et al., 2014). Numerous studies reported that maternal education and low family income are linked to anemia prevalence in the children (Mohamed et al., 2008; Kaya et al., 2006; Bassam, 2009). Sharif et al. (2017) reported that mother's education and low family income are associated with risk factors of anemia among infants. The infants of illiterate mothers belonging to low income families with less than PKR10,000 monthly income were more susceptible to IDA compared to infants of educated mother of high-income families.

The table 4.48 reveals that the results for univariate analysis of parental and family monthly income of the respondents. The first part of table shows the monthly income of respondent's father in Pakistani rupees. Overall 12.1% (10.9% from Muzaffarabad and 15.7% from Hattian) had no monthly income and are economically dependent on their wives, other family member and/or societal support. In Muzaffarabad district majority of fathers (39.5%) had monthly income 20,001 to 50,000 PKR, almost same percentage up to 20,000 rupees, 12.6 % 50,001 to 100,000 and 3.5% had more than 100,000 PKR. Majority of adolescent fathers from Hattian district (39.8%) had monthly income 20,001 to 50,000, 27.1% up to 20,000, 15.1% 50,001 to 100,000 PKR and remaining 2.4% earned more than 100,000 per month. Overall, 31.9, 39.5, 13.3 and 3.2% respondent fathers had monthly income up to 20,000, 20,001 to 50,000, 50,001 to 100,000 and more than 100,000 PKR respectively.

The second part of table 4.48 reveal the distributions of the respondent mother's monthly income in PKR. About 80.7% of the mothers (80.4% from Muzaffarabad and 81.3% from Hattian) had no monthly income and economically dependent on their husbands and/or financial support of others 7.5% mothers earned up to 10000 PKR (8.7% from Muzaffarabad ab 4.2% from Hattian), 3.8% (3.3% from Muzaffarabad and 5.4% from Hattian) earned between 10001 to 20000 rupees, 6.2% earned between 20001 to 50000 rupees and remaining 1.8% had income more than 50000 rupees. (43.5% from Muzaffarabad and 31.9% from Hattian) have family monthly income between 20,001 to 50,000 rupees, followed by 27.6% (28.3% from Muzaffarabad and 25.9% from Hattian)

Table 4.48

Parental and family monthly income of the respondents

Monthly Income	Muzaffarabad		Hattian Bala		Total	
(PKR)	f	%age	F	%age	f	%age
Father's monthly income						
No Income	50	10.9	26	15.7	76	12.1
Up to 20000	155	33.7	45	27.1	200	31.9
20001 to 50000	181	39.3	66	39.8	247	39.5
500001 to 100000	58	12.6	25	15.1	83	13.3
100000+	16	3.5	4	2.4	20	3.2
Total	460	100	166	100	626	100
Mother's monthly income						
No Income	370	80.4	135	81.3	505	80.7
Up to 10000	40	8.7	7	4.2	47	7.5
10001 to 20000	15	3.3	9	5.4	24	3.8
20001 to 50000	24	5.2	15	9.0	39	6.2
50000+	11	2.4	0	0.0	11	1.8
Total	460	100	166	100	626	100
Family monthly income						
No Income	0	0.0	0	0.0	0	0.0
Up to 20000	130	28.3	43	25.9	173	27.6
20001 to 50000	200	43.5	53	31.9	253	40.4
500001 to 100000	93	20.2	57	34.3	150	24.0
100000+	37	8.0	13	7.8	50	8.0
Total	460	100	166	100	626	100

have earning up to 20,000 rupees. Remaining 24.0 % and 8.0% have family monthly income between 50,001 to 100,000 rupees and more than 100,000 rupees respectively.

***4.1.2.5. Parental occupation*.** Parental occupation is an important indicator of social status and economic well-being of the adolescent girls. The social status determines the health services utilization, consumption of nutritional diet and better dietary plan. Adolescent girls with mother's occupation as service or business were less susceptible to anemia compared to those whose mothers are housewives or laborers (Kulkarni et al., 2013). Ramachandran et al. (2013) reported that mother's going out for jobs is a significant risk factor anemia in adolescent girls. Another study reported that hemoglobin concentration is significantly associated with father's occupation in adolescents (Rani & Baburao, 2017).

In table 4.49, frequency distribution of study population based on respondent's parental occupations is shown. The first part of table reveals results of the univariate analysis of mother's occupation. Majority of the respondent's mothers 78.3% (78.7% from Muzaffarabad and 77.1% from Hattian) were house wives. In Muzaffarabad district 8.5, 3.0, 6.3, 0.4, and 1.1% were government servants, in private service, self-employed, laborer and domestic workers respectively. As far as occupation of the respondent mothers of Hattian district are concerned, 12.0% were government employees, 2.4% were in private service, 3.6% self-employed 4.8% domestic workers and none of them were laborer. Overall, 9.4%, 2.9%, 5.6%, 0.3%, and 2.1% respondents were government servants doing private jobs, self-employed, laborer and domestic workers respectively.

The second part of table 4.48 shows the result of univariate analysis of the respondents father's occupation. Majority of the respondent fathers in the Muzaffarabad district were government employees (41.5%), followed by 21.3% doing private jobs, 16.5% businessmen, 10.0% any other,

Table 4.49

Distribution of the respondents based on their parental occupation

Occupation	District Muzaffarabad		District Hattian Bala		Total	
	f	%age	f	%age	f	%age
Respondent mother's occupation						
House Wife	362	78.7	128	77.1	490	78.3
Government Servant	39	8.5	20	12.0	59	9.4
Private Service	14	3.0	4	2.4	18	2.9
Self Employed	29	6.3	6	3.6	35	5.6
Laborer	2	0.4	0	0.0	2	0.3
Domestic Worker	5	1.1	8	4.8	13	2.1
Total	460	100	166	100	626	100.0
Respondent father's occupation						
Government Servant	191	41.5	40	24.1	231	36.9
Private Service	98	21.3	45	27.1	143	22.8
Businessman	76	16.5	35	21.1	111	17.7
Skilled Laborer	35	7.6	13	7.8	48	7.7
Laborer	3	0.7	3	1.8	6	1.0
Unemployed	11	2.4	9	5.4	20	3.2
Any other	46	10.0	21	12.7	67	10.7
Total	460	100	166	100	626	100

7.6% skilled laborers, 2.4% self-employed and 0.7% were laborers. The any other option includes the respondent's father were abroad or they were died. In Hattian district 24.1%, 27.1%, 21.1%, 7.8%, 1.8%, 5.4%, and 12.7% respondent's fathers were government employees, doing private jobs, businessmen, skilled laborer, laborer, unemployed and doing any other jobs respectively. Overall majority of the respondent's fathers (36.9%) were government servants, 22.8% were private job holders and 17.7% were businessmen. 7.7% were skilled laborers and remaining 14.9% were associated with other low paid jobs or are unemployed. The findings clearly aver that very small number of women were in the workforce whist majority were economically dependent on their husbands. The findings reveal that majority of the respondent fathers were either government employees, doing jobs private in organizations (especially in private schools and colleges) and businessmen.

4.1.2.6. Household head. Household head is a person male or female involved in the economic and household decision making (Hedman et al., 1996). Due to the patriarchal family system in Pakistan decision making and responsibilities to run the family are in the hands of male members (Hakim & Aziz, 1998). The adolescents, living in the joint families with control on household other than their parents remain deprived in utilizing adequate diet and better health facilities.

In table 4.50, the percentage distributions of adolescents on the basis of household heads are presented. It is evident from the table, 68.5% of household heads (71.5% from Muzaffarabad and 60.2% from Hattian) were respondent's father followed by 13.6% (12.6% from Muzaffarabad and 16.3% from Hattian) respondent's mothers. About 9.4% (8.3% from Muzaffarabad and 12.7% from Hattian) household heads were grandmothers, 5.9% (5.7% from Muzaffarabad and 6.6% from Hattian) were grandfathers, and 2.6% others (2.0% from Muzaffarabad and 4.2% from Hattian) were household heads. Overall, family system in Azad Kashmir like Pakistan is patriarchal, where economic and household decision making is the responsibility of male members.

4.1.2.7. Community household factors. The poor community household factors including residing in non-concrete houses, inappropriate latrine facility, unhygienic surrounding environment

Table 4.50

Distribution of adolescent girls based on the household heads

Household Head	District Muzaffarabad		District Hattian Bala		Total	
	f	%age	f	%age	f	%age
Father	329	71.5	100	60.2	429	68.5
Mother	58	12.6	27	16.3	85	13.6
Grandfather	26	5.7	11	6.6	37	5.9
Grandmother	38	8.3	21	12.7	59	9.4
Others	9	2.0	7	4.2	16	2.6
Total	460	100	166	100	626	100.0

(poor sewerage system and garbage disposal) can cause parasitic infection, thus elevating prevalence of anemia among adolescents. Most (64.2%) of the families in Pakistan are living in houses made of concrete or bricks depicting an increase of 50% compared to finding of NNS 2001 (NNS, 2011). The unhygienic surrounding environment, unclean water and the unhygienic practices are the multiple threats of anemia among adolescents in Pakistan.

In the table 4.51, the percentage distribution of adolescents based on community household factors such as house structure, latrine facility, sewerage system and garbage disposal are elucidated. The first part of table reveals the results of univariate analysis depicting distribution of adolescents according to type of household. Majority of the girls (59.7%) were residing in the concrete houses, 36.3% were living in the shelters and very small percentages live in the mud and wooden houses. Almost same number of respondents live in the concrete houses, however a greater number of adolescents (38.0%) from Muzaffarabad district were living in shelters than (31.3%) in Hattian district. Overall majority of houses in both districts are concrete and after the earthquake of October 2005, number of shelters have increased in both districts.

Table 4.51

Household living conditions of the adolescent girls

Housing Environment	District Muzaffarabad		District Hattian Bala		Total	
	f	%age	f	%age	f	%age
Type of Household Structure						
Concrete	276	60.0	98	59.0	374	59.7
Mud	9	2.0	10	6.0	19	3.0
Wooden	0	0.0	6	3.6	6	1.0
Shelters	175	38.0	52	31.3	227	36.3
Total	460	100	160	100	626	100
Latrine Facility						
Yes	432	93.9	149	89.9	581	92.8
No	28	6.1	17	10.2	45	7.2
Total	460	100	160	100	626	100
Sewerage System						
Open System	61	13.3	35	21.1	96	15.3
Underground	399	86.7	131	78.9	530	84.7
Total	460	100	160	100	626	100
Garbage Disposal						
Burn	214	46.5	101	60.8	315	50.3
Burry	33	7.2	5	3.0	38	6.1
Municipality Drum	43	9.3	13	7.8	56	8.9
Collect Outside	125	27.2	31	18.7	156	24.9
Throw in rivers/streams	45	9.8	16	9.6	61	9.7
Total	460	100	160	100	626	100

The second part of the table displays distribution of adolescent girls according to the facility of proper latrine in the household. High majority of the girls 92.8% (93.9% from Muzaffarabad and 89.9% from Hattian) had proper latrine facility whereas, 7.2% (6.1% from Muzaffarabad and 10.2% from Hattian) had no proper latrine facility. The third part of the table shows distribution of respondents according to the type of sewerage system, where 15.3% had open sewerage system (13.3% from Muzaffarabad and 21.1% from Hattian) and 84.7% of the respondents (86.7% from Muzaffarabad and 78.9% from Hattian) had the facility of underground sewerage system.

The fourth part table 4.51 reveals the garbage disposal by burning, burying, collecting in municipality drums, collecting outside the house and throwing in rivers/streams. Half (50.3%) respondents burn the garbage, 6.1% bury, 8.9% collect in municipality drums, 24.9% collect outside and 9.7% throw in rivers/streams.

4.1.2.8. Family Structure and size. In Pakistan, nuclear and joint family system is commonly found, however, a smaller proportion of people reside in the extended family system (Batool, 2010). It is general belief that nutritional requirements of children residing in joint families are less cared compared to one living in the nuclear family. Thus, children living in nuclear families are considered less susceptible to anemia. Adolescents living in joint families have less opportunity for consuming good diet and healthcare facilities. Shaka and Wondimagegne (2018) reported that parental education, family size, daily meal frequency, food sources, place of residence and shoe wearing frequency, are significantly associated with anemia among adolescents.

Table 4.52 presents the distribution of the respondents based on their family structure and family size. The first part of table reveals distribution of the adolescent girls based on the family structure. The table shows that majority of adolescent girls 74.4% (75.7% from Muzaffarabad and 71.1% from Hattian) lived in the nuclear family, whilst 25.6% (24.3% from Muzaffarabad and 28.9% from Hattian) lived in joint family. The results indicate that in AJK majority of the respondents were living in nuclear family system compared to joint family systems. The disintegration of joint families and emergence of nuclear families in AJK is the result of radical change in the social fabric after devastating earthquake of October 2005.

Table 4.52 also reveals percentage distributions of the adolescent girls according to their family size. In Muzaffarabad district 6.1% adolescent girls were living in the family size of up to

Table 4.52

Family structure and family size of the adolescent girls

Family Structure and Size	District Muzaffarabad		District Hattian Bala		Total	
	f	%age	f	%age	f	%age
Family structure						
Nuclear	348	75.7	118	71.1	466	74.4
Joint	112	24.3	48	28.9	160	25.6
Total	460	100	166	100	626	100.0
Family size						
Up to 4 family members	28	6.1	18	10.8	46	7.3
5-8 family members	306	66.5	90	54.2	396	63.3
8+ family Members	126	27.4	58	34.9	184	29.4
Total	460	100	166	100	626	100.0

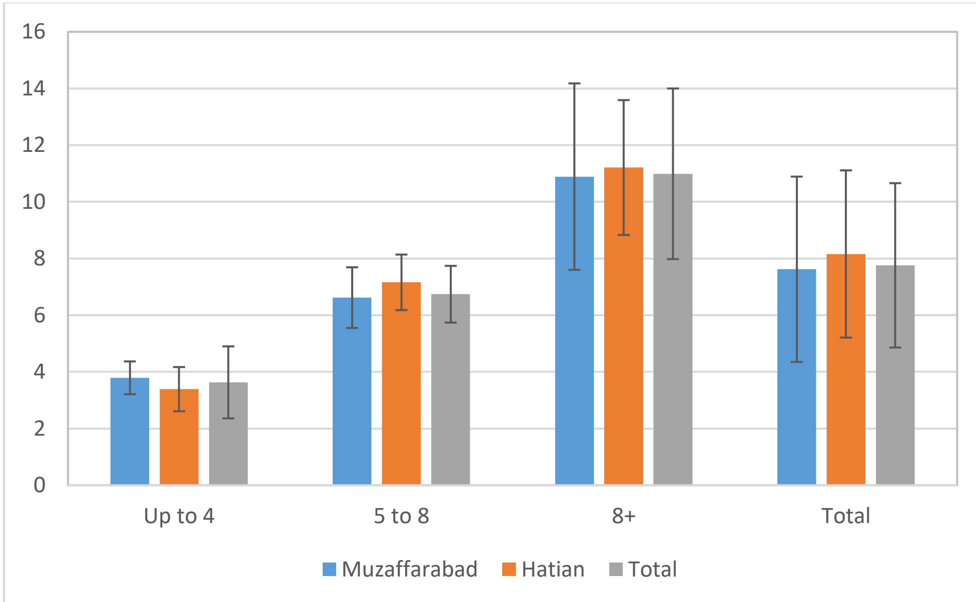

Figure 4.3: Mean ± Standard deviation family size of adolescent girls

4 members, 66.5% were living in a family size of 5-8 and 27.4% are living in a family size of more than 8 members. In Hattian district, 10.8% live in a family size of up to 4 members, 54.4% were living in a family size of 5-8 member and almost 35% were living in a family comprising more than 8 family members. Overall, majority of adolescent's girls 63.3% are living in a family size of 5-8 family members, followed by 29.4% living in a family with more than 8 members and remaining 7.3% were living in a family size of more than 4 members. The results clearly demonstrate that despite majority of girls living in nuclear families 92.7% were living in a family size of 5 or more members. In figure 4.3, the bar chart with error bars of family sizes of the respondents living in the two districts and total study population are shown. It is evident from the figure; average family size was more than 7 family members in both districts.

4.1.2.9. Drinking water and its quality. Water is an essential component for endurance of human. Safe and healthy drinking water is a basic human right and a global challenge as well as a major objective for the sustainable development. About five million children deaths are caused due to the poor water quality in developing countries (Holgate, 2000). The quality of water in Pakistan has now deteriorated due to increase in population, inadequate sewerage disposal and industrial waste (Saleem, et al, 2018). About 20% population has availability of safe drinking water and remaining 80% population is underprivileged from this facility (Saleem, et al, 2018). According to United Nation International Children Emergency Fund (UNICEF), 20-40% hospitals are filled with waterborne health related issues in Pakistan (Daud et al., 2017). Poor quality of water is a major source of stunting and anemia among children and adolescents. Table 4.53 shows

Table 4.53

Adolescent girls drinking water source and their satisfaction about its quality

Drinking Water	District Muzaffarabad		District Hattian Bala		Total	
	f	%age	f	%age	f	%age
Source of Drinking Water						
Tape water	95	20.7	40	24.1	135	21.6
Spring water	317	68.9	116	69.9	433	69.2
Filtered water	32	7.0	9	5.4	41	6.5
Mineral/Bottled water	6	1.3	0	0.0	6	1.0
Others	10	2.2	1	0.6	11	1.8
Total	460	100	166	100	626	100
Satisfied with quality of water						
Yes	416	90.4	143	86.1	559	89.3
No	44	9.6	23	13.9	67	10.7
Total	460	100	166	100	626	100

the distribution of adolescent girls according to the main sources of drinking water and their satisfaction about water quality.

The first part of table reveals the percentage distributions of girls about the source of drinking water. Majority of girls 69.2% (almost same percentages of girls from both districts) followed by 21.6% (20.7% from Muzaffarabad and 24.1% from Hattian) reported to use spring water and tape water respectively for drinking. Remaining 6.5, 1.0 and 1.8% girls reported to use filtered water, bottled water and water from other sources (hand pumps or tube wells) respectively for drinking purpose.

The second part of table reveals the percentage distributions of girls according to their satisfaction with water quality. Majority of the respondents 89.3% (90.4% from Muzaffarabad and 86.1% from Hattian) were satisfied with the water and remaining 10.7% (9.6% from Muzaffarabad and 13.9% from Hattian) were not satisfied with the water quality. According to the point of view of girls and their family, quality of spring water is better and safer as compared to tape water. Majority of adolescent girls were not aware about different parameters which are affecting water quality and contaminating it.

***4.1.2.10. Symptoms of anemia*.** IDA prevalence is very high among adolescent girls in Pakistan due to scarcity of nutrient dense food. Accelerated growth of body, starting of menstruation, hormonal changes and malnutrition are major contributors of anemia among adolescent girls. Hassan et al., (2017) aver that 68.8% adolescent's girls living in poor socio-economic conditions suffer from IDA in Pakistan. Symptoms of anemia vary with anemia type and other medical conditions (Batool, 2010). At an early stage, symptoms of anemia may not be observed, however, easy fatigability, tiredness, cardiac arrhythmia, shortness of breath, reduced working capacity, depression and headache are major symptoms of anemia.

The table 4.54 shows response about the different symptoms of anemia asked from adolescent girls. Small percentage (5.3%) respondents felt tiredness/fatigue to great extent, 65.5% to some extent and 29.9% did not feel any tiredness. Four percent girls noted weakness to great extent, 63.9% to some extent and 32.1% did not note any weakness. The response about pale skin reflected that 7.7% girls had this symptom to great extent, 44.1% had to some extent and 48.2% did not face this problem. Majority of the respondents (63.7%) did not notice decreased pinkness in lips and gums, 26.4% noticed to some extent and 9.9% to great extent. The symptoms of decreased pinkness in nails, feel dizziness, shortness of breath, heart palpitation, depression,

Table 4.54

Distribution of adolescent girls according to anemia symptoms

Statement	To great extent		To some extent		Not at all	
	f	%age	f	%age	f	%age
Tiredness/Fatigue	33	5.3	410	65.5	183	29.2
Weakness	25	4.0	400	63.9	201	32.1
Pale skin	48	7.7	276	44.1	302	48.2
Decreased Pinkness in lips and gums	62	9.9	165	26.4	399	63.7
Decreased pinkness in nail beds	86	13.7	136	21.7	404	64.5
Feel dizziness	91	14.5	160	25.6	375	59.9
Shortness of breath	99	15.8	177	28.3	350	55.9
Heart palpitation	110	17.6	189	30.2	327	52.2
Feel depressed	85	13.6	282	45.0	259	41.4
Decreased working capacity	97	15.5	345	55.1	184	29.4
Feel unusually cold	198	31.6	268	42.8	160	25.6

decreased working capacity and feeling unusually cold were reported to great extent by 13.7, 14.5, 15.8, 17.6, 13.6, 15.5 and 31.6% girls respectively. The responses to some extent about the above-mentioned symptoms are reported by 21.7, 25.6, 28.3, 30.2, 45.0, 55.1 and 42.8% girls, whilst 64.5%, 59.9%, 55.9%, 52.2%, 41.4%, 29.4% and 25.6% did not observe these symptoms.

4.1.2.11. Preventive measures taken after feeling symptoms of anemia. In table 4.55, preventive measures taken by the adolescent girls or their parents after feeling different symptoms of anemia are recorded. High majority (90.3%) take rest, 68.2% respondents take food, 74.6% visit doctor, 12.5% visit Hakeem, 16.3% visit for spiritual treatment and 21.1% take multivitamins. Some of the respondents were taking more than one preventive measure at a time. Although majority of girls were visiting doctors and Hakeems after feeling these symptoms, however, still good number of them prefer spiritual treatment.

4.1.2.12. Menstruation, blood loss and bleeding disorder. During adolescence, rapid growth increases the body iron demands. The girls have higher incidence of anemia compared to

Table 4.55

Preventive measures taken by girls after feeling symptoms of anemia

Preventive Measures	Yes		No		Total	
	Frequency	%age	Frequency	%age	Frequency	%age
Rest	565	90.3	61	9.7	662	100
Take Food	427	68.2	199	31.8	662	100
Visit Doctor	467	74.6	159	25.4	662	100
Visit Hakeem	78	12.5	548	87.5	662	100
Spiritual Treatment	102	16.3	524	83.7	662	100
Take Multivitamins	132	21.1	494	78.9	662	100

boys (Kara et al., 2006; Balci et al., 2012; Jamali et al., 2016). Hemorrhoid bleeding and blood loss with stool also cause deficiency of RBCs in the body. Balci et al. (2012), aver that the anemia prevalence among adolescent girls is 5.6% and in boys was 1.6%. Jamali et al. (2016) reported that anemia prevalence among students of age 11-18 years is 43.1% (30.4% girls and 11.7% boys). The onset of menarche and bleeding disorder during menstruation contribute to the development of anemia in girls (Balci et al., 2012; Soekarjo et al., 2001).

Table 4.56 reveals the distribution of adolescent girls based on menstrual periods, menstruation duration, heavy blood loss (HBL), hemorrhoid bleeding, blood loss with stool and bleeding disorder are detailed. The first part of table divulges distribution of the respondents according to menstrual status. Majority of adolescent girls 83.7% (83.3% from and 84.9% from Hattian district) were having menstrual period. The second part of table reveals the percentage distribution of menstruating adolescent girls according to the duration of menstruation. The girls were divided in to three groups based on menstrual duration i.e., 2 to 3 days, 4 to 5 days and more than 5 days. The menstruation duration of 2 to 3 days was reported by 12.8% girls (14.6% from Muzaffarabad and 7.8% from Hattian). 43.5% girls (41.5% from Muzaffarabad and 48.9% from Hattian) reported menstruation duration of 4 to 5 days, whilst 43.7% girls with almost same percentages from both districts reported menstruation duration of more than 5 days.

Third part of table 4.56 shows distribution of the girls according to HBL during menstruation. Little more than one fourth (26.3%) of the girls (26.9% from Muzaffarabad and 24.8% Hattian) complained about heavy blood loss during menstruation. Fourth part of the table shows the results of univariate analysis of bleeding disorder among the menstruating girls. The results elucidate that 13.7% adolescent girls (13.1% from Muzaffarabad and 15.6% from Hattian) suffered from bleeding disorder, 2.9% hemorrhoid bleeding and 4.0% suffered from blood loss with stool.

Table 4.56

Menstrual periods, its duration and bleeding disorders in adolescent girls

Menstrual Periods	Muzaffarabad		Hattian		Total	
	Frequency	%age	Frequency	%age	Frequency	%age
Yes	383	83.3	141	84.9	524	83.7
No	77	16.7	25	15.1	102	16.3
Total	460	100	166	100	626	100
Menstruation Duration						
2 to 3 days	56	14.6	11	7.8	67	12.8
4 to 5 days	159	41.5	69	48.9	228	43.5
More than 5 days	168	43.9	61	43.3	229	43.7
Total	383	100	141	100	524	100
Heavy Blood Loss during menstruation (only menstruating girls)						
Yes	103	26.9	35	24.8	138	26.3
No	280	14.5	106	75.2	386	73.7
Total	383	100	141	100	524	100
Bleeding disorder (only menstruating girls)						
Yes	50	13.1	22	15.6	72	13.7
No	333	86.9	119	84.4	452	86.3
Total	383	100	141	100	524	100
Hemorrhoid Bleeding						
Yes	16	3.5	2	1.2	18	2.9
No	444	96.5	164	98.8	608	97.1
Total	460	100	166	100	626	100
Blood loss with stool						
Yes	18	3.9	7	4.2	25	4.0
No	442	96.1	159	95.8	601	96.0
Total	460	100	166	100	626	100

4.1.2.13. Distance of the respondent's residence from healthcare facility. The long distance between healthcare facility and patient locale affects the frequency of visits and utilization of healthcare facility due to time spent during travelling and related costs (Winters et al., 2006). In Pakistan, distant locations, lack of affordability and availability of transport services influences the utilization of healthcare services by female (Majrooh et al., 2013).

Table 4.57 shows the distribution of the respondents based on healthcare facility. Majority of the respondents 39.6% (41.5 from Muzaffarabad and 34.3% from Hattian) were residing at a distance 1-5 kilo meters from healthcare facility, 25.7% respondents at less than 1 km from healthcare facility, 12.3% live between 6-10 km and remaining 22.4% were living at more than 10 km far from the healthcare facility. Overall, the respondents belonging to Muzaffarabad district travelled more distance for the utilization of healthcare services.

4.1.2.14. Utilization of healthcare services. According to revised population council projections 2015, the population of adolescents (10-19 years) in Pakistan is 22% comprising of 12 million male and 10.9 million female adolescents (Sathar et al., 2016). People of Pakistan generally

Table 4.57

Distance of healthcare facility from adolescent girls' residence

Distance	Muzaffarabad		Hattian Bala		Total	
	f	%age	f	%age	f	%age
Less than 1 km	90	19.6	71	42.8	161	25.7
1 to 5 km	191	41.5	57	34.3	248	39.6
6 to 10 km	63	13.7	14	8.4	77	12.3
10+ km	116	25.2	24	14.5	140	22.4
Total	460	100	166	100	626	100

and adolescents specifically have restricted access to puberty related health education and services (Khan, 2000). Poverty, long distances from healthcare facility and women's restrictive freedom of movement influences the utilization of healthcare services. The bias against early age especially during adolescence restricts them to go alone for utilization of health services even after marriage. Furthermore, shyness about discussing menstruation and reproductive health problems restricts them from utilizing healthcare services.

In the table 4.58, distribution of the respondents for visiting healthcare centers to utilize the health services are shown. The first part of table shows the results of univariate analysis revealing how often respondents visit healthcare facility for availing medical services. Majority of girls 75.6% (77.8% from Muzaffarabad and 69.3% from Hattian) availed medical facility few times, 17.6% (15.9% from Muzaffarabad and 22.3% from Hattian) availed health services often and only a small percentage of girls (6.9%) reported no visit to healthcare facility. The second part of table shows the distribution of girls visiting healthcare facility alone. Majority 90.1% (88.9% from Muzaffarabad and 93.4% from Hattian) did not visit healthcare facility alone, 7.3% visited alone few times and remaining 2.6% often visited healthcare facility alone. The findings indicated that majority of adolescent are restricted to go alone to avail health facility.

Third part of the table reveals distribution of girls who visited with their mothers and sisters to health facility. In Muzaffarabad district 37.8% girls visited health facility often, 43.9% few times and 18.3% did not visit, whilst in Hattian 33.1% visit often and 40.4% visit few times with mothers/sisters. Overall, 36.6% girls visit often, whilst 43.0% few times to healthcare facility with the mothers/sisters. The fourth part of table reveals the responses of girls about assessing health facility with father/brother. Majority of girls, 45.2% (46.3% from Muzaffarabad and 42.2% from Hattian) visit few times, whereas, 18.8% (19.1% from Muzaffarabad and 15.7% from Hattian) visit

Table 4.58

Utilization of healthcare services by adolescent girls

Utilize Healthcare Service	Muzaffarabad		Hattian		Total	
	f	%age	f	%age	f	%age
Often	73	15.9	37	22.3	110	17.6
Few times	358	77.8	115	69.3	473	75.6
Not at all	29	6.3	14	8.4	43	6.9
Total	460	100	166	100	626	100
Go alone						
Often	14	3.0	2	1.2	16	2.6
Few times	37	8.0	9	5.4	46	7.3
Not at all	409	88.9	155	93.4	564	90.1
Total	460	100	166	100	626	100
Go with mother/sister						
Often	174	37.8	55	33.1	229	36.6
Few times	202	43.9	67	40.4	269	43.0
Not at all	84	18.3	44	26.5	128	20.4
Total	460	100	166	100	626	100
Go with father/brother						
Often	88	19.1	26	15.7	114	18.8
Few times	213	46.3	70	42.2	283	45.2
Not at all	159	34.6	70	42.2	229	36.6
Total	460	100	166	100	626	100
Wait until someone is available						
Often	91	19.8	23	13.9	114	18.2
Few times	103	22.4	24	14.5	127	20.3
Not at all	266	57.8	119	71.7	385	61.5
Total	460	100	166	100	626	100

often with father/brother. About 20.3% (22.4% from Muzaffarabad and 14.5% from Hattian) wait few times until someone is available and 18.2% (19.8% from Muzaffarabad and 13.9% from Hattian) often wait for someone to go with them.

4.1.2.15. Preferred gender of baby and preference in food. In south Asia female face life time deprivation and inequality, especially adolescent girls who transmit undernutrition to the next generation by giving birth to malnourished babies (Sen & Hook, 2012). The better food and care provided to the boys compared to girls in this region results in differential nutritive outcomes (Sen & Hook, 2012). Preference of male children, coupled with poverty result in lower caloric intakes by female children malnutrition, under nutrition and anemia (Kielmann et al., 1983). Table 4.59 displays the distribution of adolescent girls based on preferred gender and preference in food intake by parents and family. The first part of table reveals percentage distributions of adolescent girls according to the parent's preferred gender of baby. Majority of the girls 58.6% (57.6% from Muzaffarabad and 61.4% from Hattian) reported that gender of baby does not matter for their parents. Little more than one fifth (21.6%) girls reported sons, whilst 19.8% reported daughters are preferred gender of their family. The responses of girls elucidate that majority of parents treat both genders equally in this region.

The second part of table 4.59 shows the percentage distribution of girls on the basis of family preferred gender (grandparents, uncles and aunties). Majority of the girls 56.7% (54.6% from Muzaffarabad and 62.7% from Hattian) believed gender does not matter for their family, 28.8% (30.9% from Muzaffarabad and 22.9% from Hattian) reported son preference and remaining 14.5% (almost same percentage of girls from both districts) reported girls as preferred gender. In terms of food preference majority of girls 61.5% (59.6% from Muzaffarabad and 66.9% from Hattian) reported both boys and girls are given equal preference in food intake, 28.9% reported

Table 4.59

Distribution of the adolescent girls based on the parental and family preferred gender

Parents	Muzaffarabad		Hattian		Total	
	f	%age	f	%age	f	%age
Son	102	22.2	33	19.9	135	21.6
Daughter	93	20.2	31	18.7	124	19.8
Does not Matter	265	57.6	102	61.4	367	58.6
Total	460	100	166	100	626	100
Family						
Son	142	30.9	38	22.9	180	28.8
Daughter	67	14.6	24	14.5	91	14.5
Does not Matter	251	54.6	104	62.7	355	56.7
Total	460	100	166	100	626	100
Preference in food						
Male	42	9.1	18	10.8	60	9.6
Female	144	31.3	37	22.3	181	28.9
Both	274	59.6	111	66.9	385	61.5
Total	460	100	166	100	626	100

(31.3% from Muzaffarabad and 22.3% Hattian) reported girls are preferred in food intake and remaining 9.6 reported boys are preferred in food intake. Surprisingly, most of the respondents argued that female child needs adequate diet to counter micronutrient deficiencies because of blood loss during menstruation and for better reproductive health. Educational measures taken by government and non-government organizations, media campaigns and counselling of lady health visitors have created awareness among masses that health of adolescent girls is the predictor of better motherhood and hence the good family health.

4.1.1.16. Reasons of son preference. Like other South Asian countries, Pakistani society is inherently patriarchal, where desire for son is dominant and widely prevalent (Satha, et al., 2015; UNFPA, 2012). The son preference is stronger in rural areas due to agricultural work and binding of land ownership with male inheritance, even in other areas, boys are considered important in carrying on the family name and taking parental care in old age (Sather et al., 2015).

In table 4.60, percentage distributions of adolescent girls about son preference in the society is presented. According to their responses, 43.8% women feels secure to great extent, 28.8% to some extent and 27.5% did not agree with this notion. Overall, there is no significant difference about the responses of this question among girls of two districts. About 49.4, 26.5 and 24.1% girls were of the view that women who gives birth to male child is given respect in the family and society to great extent, to some extent and not at all respectively. Almost 50% of girls highlighted that male child is source of prestige in the society to great extent, 30.4% to some extent and remaining 20.3% did not agree with this notion. Little more than half (52.4%) girls were of the view that boys are preferred because, they are helpful in attaining stronger position in the society to great extent, 27.8% agree with it to some extent and remaining 19.8% did not agree with it. The table further reveals the reason of preferring boys over girls as being the source of income, in response 58.9% girls reported to great extent, 25.4% to some extent and 15.7% did not agree with it. Majority of girls (57.5%) reported the reason boys are helpful in the old age to great extent, 25.7% to some extent and remaining 16.8% were against this perception. In response to the question girls are economically burden on parents, majority of girls (45.7%) reported not all, 25.7% to some extent and remaining 28.6% to great extent.

Table 4.60

Distribution of the girls according to reasons of son preference

Woman feels secure	Muzaffarabad		Hattian		Total	
	f	%age	f	%age	f	%age
Not at all	124	27.0	48	28.9	172	27.5
To Some extent	140	30.4	40	24.1	180	28.8
To great extent	196	42.6	78	47.0	274	43.8
Total	460	100	166	100	626	100
Woman is given respect in the family and society						
Not at all	104	22.6	47	28.3	151	24.1
To Some extent	121	26.3	45	27.1	166	26.5
To great extent	235	51.1	74	44.6	309	49.4
Boys are source of prestige in the society						
Not at all	85	18.5	42	25.3	127	20.3
To Some extent	149	32.4	41	24.7	190	30.4
To great extent	226	49.1	83	50	309	49.4
Boys are helpful in attaining stronger position in the society						
Not at all	81	17.6	43	25.9	124	19.8
To Some extent	140	30.4	34	20.5	174	27.8
To great extent	239	52.0	89	53.6	328	52.4
Boys are source of income						
Not at all	67	14.6	31	18.7	98	15.7
To Some extent	126	27.4	33	19.9	159	25.4
To great extent	267	58.0	102	61.4	369	58.9
Boys are helpful in the old age						
Not at all	70	15.2	35	21.1	105	16.8
To Some extent	131	28.5	30	18.1	161	25.7
To great extent	259	56.3	101	60.8	360	57.5
Girls are economically burden for parents						
Not at all	195	42.4	91	54.8	286	45.7
To Some extent	122	26.5	39	23.5	161	25.7
To great extent	143	31.1	36	21.7	179	28.6

4.1.2.17. Nutritional knowledge and dietary habits. Healthy and diverse food with optimum proportions of all required nutrients is called balanced diet. The knowledge of balance diet, and nutrient rich food is important for people of all age groups especially teenagers and women of reproductive age. Poor socioeconomic status, traditional and eating habits and fear of gaining weight are the contributing factors of IDA development among girls (Balcı et al., 2014). The life style and behavior towards utilization of balanced diet is related to increasing trend of IDA among young girls in Pakistan (Shazad et al., 2017).

Table 4.61 displays the distribution of adolescent girls based on their knowledge about balanced diet and dietary intake habits of girls. The first part of the table shows percentage distribution of girls according to their knowledge about balanced diet. Majority of girls (60.7%) from Muzaffarabad and 57.2% from Hattian had no knowledge about balanced diet. Overall 59.7% reported no knowledge about balanced diet, whilst 40.3% had the knowledge of balance diet. The second part of table presents the percentage distribution of girls according to the frequency of meals taken on daily basis. Majority of girls 58.8% (60.0% from Muzaffarabad and 55.4% from Hattian) take meals three times a day, 30.2% (almost same percentage from both districts) takes four times, 6.2% (5.4% from Muzaffarabad and 8.4% from Hattian) takes five times, whereas only 4.8% girls take meals two times in a day.

Third part of table reveals the percentage distribution of girls according to regularity in taking meals. Most of the respondents 76.5% (74.6% from Muzaffarabad and 81.9% from Hattian) take meals regularly and 23.5% (25.4% from Muzaffarabad and 18.1% from Hattian) reported not to take meals on regular basis. Fourth and fifth parts of table shows the percentage distribution of girls according to utilization of food supplements and iron tablets. Seven percent girls (5.4% from Muzaffarabad and 11.4% from Hattian) used food supplements; whilst 5.6% girls (4.3% from

Table 4.61

Adolescent girls Knowledge of balance diet and dietary intake habits

Knowledge of Balance Diet	Muzaffarabad		Hattian		Total	
	f	%age	f	%age	f	%age
Yes	181	39.3	71	42.8	252	40.3
No	279	60.7	95	57.2	374	59.7
Total	460	100	166	100	626	100.0
Frequency of taking meals						
2 times	20	4.3	10	6.0	30	4.8
3 times	276	60.0	92	55.4	368	58.8
4 times	139	30.2	50	30.1	189	30.2
5 times	25	5.4	14	8.4	39	6.2
Regularity in taking meals						
Yes	343	74.6	136	81.9	479	76.5
No	117	25.4	30	18.1	147	23.5
Utilization of food supplements						
Yes	25	5.4	19	11.4	44	7.0
No	435	94.6	147	88.6	582	93.0
Utilization of iron tablets						
Yes	20	4.3	15	9.0	35	5.6
No	440	95.7	151	91.0	591	84.4
Total	460	100	166	100	626	100

Muzaffarabad and 9.0% from Hattian) used iron tablets.

4.1.2.18. Utilization of diverse food. Dietary diversity reflects the quality of food consumed at household or an individual level (Birru, et al., 2017). Diverse food with adequate nutrients is critical for adolescents as 50% weight, 20% height and 50% skeletal mass is gained during this period (Shahid et al., 2010; WHO, 2006). Globally, only 17% of adolescents consume diversified food (Duffy et al., 2015). The utilization of suboptimal and undiversified food results in the development of varied macro and micronutrient deficiencies (Worku et al., 2017; WHO, 2005b). The nutritional deficiencies cause delayed puberty, contracted pelvis and unfavorable fetal and birth outcomes among adolescent girls (Begum et al., 2017; Hossen et al., 2016). Maternal education, residence, school type, nutritional knowledge and socioeconomic status are associated with adolescent's dietary diversity (Birru, et al., 2017; Worku et al, 2017; Oldewage-Theron et al., 2016; Belachew et al., 2013; Belachew et al., 2008).

Table 4.62 shows the results of univariate analysis for depicting the frequency of utilization of different food items such as carbohydrates, proteins, fats and vitamins on weekly basis. The first part of table summarizes the responses of girls about utilization of carbohydrates. Majority of the girls (88.7%) utilized wheat 7 times or more weekly, 5.0% 5-6 times, 4.0% 3-4 times, 1.1% 1-2 times and same percentage did not consume wheat on weekly basis. Majority of girls (87.5%) consumed rice 7 or more times, 6.5% 5-6 times, 2.9% 3-4 times, 1.4% 1-2 times and remaining 1.6% did not consume rice on weekly basis. Majority of girls (74.6%) did not consume maze, 18.8% consumed 1-2 times, 4.0% 3-4 times, 1.0% 5-6 times, 1.6% 7 or more times. The results revealed that nutritional requirement of carbohydrates is mostly fulfilled by consuming wheat and rice.

The second part of table 4.62 reveals the distribution of girls according to frequency of utilizing different proteins on weekly basis. Majority of girls (53.0%) eat meat 1-2 times, 9.7% did not eat meat, 32.7% eat 3-4 times, 3.7% eat 5-6 times, less than 1.0% 7 or more times consumed meat on weekly basis. The chicken was consumed by 54.6, 31.0, 3.8, 2.2 and 8.3% girls 1-2 times, 3-4 times, 5-6 times, 7 times or more and not at all respectively. Twelve percent girls consumed

Table 4.62

Utilization of diverse food on weekly basis by adolescent girls

Food Item	1 to 2 times % (Freq)	3 to 4 times % (Freq)	5 to 6 times % (Freq)	7 times % (Freq)	Not at all % (Freq)
Carbohydrates					
Wheat	1.1 (7)	4.0(25)	5.1(32)	88.7(555)	1.1(7)
Rice	1.4(9)	2.9(18)	6.5(41)	87.5(548)	1.6(10)
Maze	18.8(118)	4.0(25)	1.0(6)	1.6(10)	74.6(467)
Proteins					
Meat	53.0(332)	32.7(205)	3.7(23)	0.8(5)	9.7(61)
Chicken	54.6(342)	31.0(194)	3.8(24)	2.2(14)	8.3(52)
Fish	12.0(75)	2.2(14)	0.2(1)	0.5(3)	85.1(533)
Beans	25.4(159)	52.2(327)	16.5(103)	3.7(23)	2.2(14)
Fats					
Ghee	24.1(151)	18.5(116)	2.4(15)	38.0(238)	16.9(106)
Oil	2.1(13)	2.6(16)	2.9(18)	66.3(415)	26.2(164)
Butter	24.8(155)	16.1(101)	1.1(7)	4.5(28)	53.5(335)
Vitamins					
Milk	16.8(105)	27.2(170)	11.5(72)	9.4(59)	35.1(220)
Vegetables	9.4(59)	32.9(206)	29.1(182)	27.0(169)	1.6(10)
Fruits	35.8(224)	42.7(267)	5.4(34)	9.4(38)	10.1(63)
Juices	48.1(301)	12.3(77)	2.2(14)	3.8(24)	33.5(210)

fish 1-2 times in a week, 2.2% consume 3-4 times, less than 1.0% consume 5-6 times and 0.5% consume 7 or more times, whist 85.1% did not consume fish weekly. The proportion of girls utilizing beans on weekly basis included 25.4% with consumption of 1-2 times, 52.2% 3-4 times, 16.5% 5-6 times, 3.71% 7 or more times whilst 2.2 did not consume beans. The findings reveal that beans and chicken are more frequently used for the consumption of protein in the study population.

Third part of table shows the frequency of weekly utilization of different fats among respondents. Almost one fourth (24.1%) girls reported to utilize ghee 1-2 times, 18.5% 3-4 times, 2.4% 5-6 times, 38.0% 7 or more times whilst 16.9% did not consume ghee. Oil consumption on weekly basis comprised 2.1% for1-2 times, 2.6% 3-4 times, 2.9% 5- 6 times, 66.3% 7 or more times whilst 26.2% did not consume oil, while 24.8, 16.1, 1.1, 4.5, and 53.5% girls consumed butter 1-2 times, 3-4 times, 5-6 times, 7 or more times and not at all respectively.

The fourth part of table shows the frequency of weekly utilization of different sources of vitamins such as milk, vegetables, fruits and juices among respondents. About 16.8% girls consumed milk 1-2 times, 27.2% 3-4 times, 11.5% 5-6 times, 9.4% 7 or more times and 35.1% did not consume it on weekly basis, 9.4% girls consumed vegetables 1-2 times in a week, 32.9% 3-4 times, 29.1% 5-6 times, 27.0% 7 or more times and 1.6% did not consume vegetables once in a week. The proportion of girls utilizing fruits was 35.8, 42.7, 5.4, 9.4, and 10.1% for 1-2 times, 3-4 times, 5-6 times, 7 or more times and not at all respectively in a week. Less than half (48.1%) girls consumed juices 1-2 times, 12.3% 3-4 times, 2.2% 5-6 times, 3.8% 7 or more times and remaining 33.5% did not consume juices in a week.

4.1.2.19. Utilization of fast food. Fast foods are mostly junk foods, often have poor nutritional contents with substantial amount of energy intake resulting unhealthy weight gain (Keats et al., 2018; Ahmed et al., 2016; Payab et al., 2015). The taste, convenience, cost and time are the major factors of popularity of fast foods among adolescents (Paeratakul et al., 2003; ALFaris et al., 2015). The utilization of fast food is the contributing factor of obesity and non-communicable health problems and adolescent girls are more prone to this compared to boys (WHO, 2006b). In Pakistan, school going adolescents are not only exposed to fast foods at homes but also in Schools (Ahmed et al., 2016). In schools, canteens are providing fast foods, which

Table 4.63

Distribution of girls based on utilization of fast food

Food Items	Muzaffarabad		Hattian		Total	
	f	%age	f	%age	f	%age
Instant noodles						
Not at all	124	27.0	70	42.2	194	31.0
Sometimes	275	59.8	84	50.6	359	57.3
Often	61	13.3	12	7.2	73	11.7
Total	460	100	166	100	626	100
Potato chips						
Not at all	45	9.8	13	7.8	58	9.3
Sometimes	326	70.9	128	77.1	454	72.5
Often	89	19.3	25	15.1	114	18.20
Pakora and samosa						
Not at all	52	11.3	18	10.8	70	11.2
Sometimes	346	75.2	126	75.9	472	75.4
Often	62	13.5	22	13.3	84	13.4
Burgers						
Not at all	165	35.9	78	47.0	243	38.8
Sometimes	254	55.2	83	50.0	337	53.8
Often	41	8.9	5	3.0	46	7.3
Pizza						
Not at all	241	52.4	119	71.7	360	57.5
Sometimes	191	41.5	46	27.7	237	37.9
Often	28	6.1	1	0.6	29	4.6
Total	460	73.5	166	26.5	626	100

contain mostly fried contents cooked in unhygienic environment, affecting badly their health. In table 4.63, percentage distribution of girls according to the utilization of fast foods is elucidated.

The first part of table reveals the percentage distribution of girls according to their utilization of instant noodles. Majority of the girls 57.3% (59.8% from Muzaffarabad and 50.6% from Hattian) reported to take instant noodles sometime, 11.7% (13.3% from Muzaffarabad and 7.2% Hattian) often, whereas, 31.0% (27.0% from Muzaffarabad and 42.2% from Hattian) did not utilize instant noodles.

The second part of table reveals the percentage distribution of girls utilizing potato chips. Most (72.5%) of the girls consume potato chips sometimes, 18.2% often and remaining 9.3% did not consume potato chips. The pakoras and samosas were utilized by 75.4%girls sometimes, 13.4% often and 11.2% did not consume at all. About 53.8% reported to eat burgers sometimes, 7.3 often and 38.8% reported not at all. The consumption of burgers was comparatively high among the girls residing in the Muzaffarabad district. The pizza was consumed by 37.9% girls sometimes, 4.6% often and 57.5% not all. The utilization of pizza was significantly higher among girls of Muzaffarabad than Hattian. The greater number of pizza houses is the reason of more consumption of pizza among the girls belonging to Muzaffarabad district.

4.1.2.20. Perception about hot and cold food. In most parts of the world, menarche is the sign of developing sexuality among girls, which is negatively perceived and experienced by them (Dasgupta & Sarkar, 2008). Among many misconceptions, alternations in the dietary practices such as avoiding the hot and cold intensity foods based on their cultural and societal beliefs are made (Rizvi & Ali, 2016). The perception about hot and cold effects of food has prevailed in Pakistan and is being practiced by almost all the sectors of the society (Inam, 2003). The foods such as dry fruits, eggs, meat, lentils, pickles, spices, and sour items are considered hot, whereas green leafy vegetable, yogurt, cold drinks, ice cream and cold water, are listed in cold category in Pakistan (Rizvi & Ali, 2016; Ali et al., 2006). Many of the foods avoided during menstruation are iron rich, which can increase the prevalence of anemia among adolescent girls.

In the table 4.64, distribution of adolescent girls based on perception about the hot and cold effect of food are detailed. More than one fourth 26.7% girls (28.9% from Muzaffarabad and 18.1% from Hattian) reported there is no such perception about hot and cold food utilization. 40.1% girls (41.7% from Muzaffarabad and 35.5% from Hattian) believe in perception about hot and cold food utilization to some extent, whilst 33.2% girls (28.5% from Muzaffarabad and 46.4% from Hattian) reported to believe about this perception to great extent. The results depicted that there is strong perception about the hot cold effect of food among respondents. The girls belonging to Hattian districts have comparatively strong perception about hot and cold effect of food.

Table 4.64

Distribution of girls based on perception about hot and cold effect of food

Perception about hot and cold food	Muzaffarabad		Hattian		Total	
	f	%age	f	%age	f	%age
Not at all	137	28.9	30	18.1	167	26.7
To Some Extent	192	41.7	59	35.5	251	40.1
To Great Extent	131	28.5	77	46.4	208	33.2
Total	460	100	166	100	626	100.0

Among adolescent girls, hot foods are generally restricted because these are considered to cause pimples, allergies, diarrhea, digestion issues, stomach burning, early maturity in girls, increase of blood flow during menstruation, whereas, cold foods are considered to cause cough/cold, cease

Table 4.65

Distribution of girls based on the restricted use of certain foods

Side Effects	Muzaffarabad % (f)		Hattian % (f)		Total % (f)	
	Yes	No	Yes	No	Yes	No
Hot effect						
Pimples/allergy	65.7(302)	34.3(158)	69.3 (115)	30.7(51)	66.6 (417)	33.4(209)
Increases blood flow during menstruation	53.5(246)	46.5(214)	67.5(112)	32.5(54)	57.2(358)	42.8(268)
Abdominal cramps	48.7(224)	51.3(236)	57.8 (96)	42.2(70)	51.1(320)	48.9(306)
Stomach burning	62.4(287)	37.6(173)	68.7 (114)	31.3(52)	64.1(401)	35.9(225)
Unpleasant smell	46.7(215)	53.3(245)	56.6(94)	43.4(72)	49.4(309)	50.6(317)
Diarrhea	50.0(230)	50.0(230)	51.8(86)	48.0(80)	50.5(316)	49.5(310)
Increases weight	43.5(200)	56.5(260)	45.2(75)	54.8(91)	43.9(275)	56.1(351)
Difficult to digest	52.4(241)	47.4(219)	57.2(95)	42.8(71)	53.8(336)	46.2(290)
Cold effect						
Cough/Cold	59.1(272)	40.9(188)	75.9(126)	24.4(40)	63.6(398)	36.4(228)
Chest congestion	58.0(267)	42.0(193)	72.9(121)	27.1(45)	62.0(388)	38.0(238)
Cease blood flow during menstruation	60.9(280)	39.1(180)	75.9(126)	24.1(40)	64.9(406)	35.1(220)
Delays growth	37.8(174)	62.2(286)	39.8(66)	60.2(100)	38.3(240)	61.7(386)
Repeated infections	47.8(220)	52.2(240)	53.6(89)	46.4(77)	49.4(309)	50.6(317)
Headache/backache	53.0(244)	47.0(216)	66.3(110)	33.7(56)	56.5(354)	43.5(272)
Pain in limbs	46.7(215)	53.3(245)	53.0(88)	47.0(78)	48.4(303)	51.6(323)
Edema	43.0(198)	57.0(262)	42.8(71)	57.2(95)	43.0(269)	57.0(357)

blood flow, edema and chest congestion (Rizvi & Ali, 2016; Ali et al., 2006; Inam, 2003).

The table 4.65 shows distribution of the adolescent girls according to the reasons about the restricted use of hot and cold foods. The proportion of girls who thought hot foods cause pimples or allergy was 66.6%, 57.2% reported increase in blood flow, 51.1% abdominal cramps, 64.1% stomach burning, 49.4% unpleasant smell, 50.5%, 43.9% increase in weight and 53.8% reported difficult to digest. The proportion of women who thought cold foods can cause cough/cold were 63.6%, chest congestion by 62.0%, decrease/cease of blood during menstruation by 64.9%, delays growth by 38.3%, repeated infections by 49.4% headache/backache by 56.5%, pain in limbs by 48.4% and edema by 43.0%. The findings unfold that misconceptions about hot and cold effect of foods are widely prevalent among the respondents, which strengthens cultural beliefs related to restricted use of certain food during menstruation among adolescents.

4.1.2.21. Utilization of nonfood items (Pica). The intentional consumption of nonfood items (pica) is an eating disorder affecting adolescents suffering from intellectual disability and/or severe iron deficiency (Berry, 2016). Pica also affects children of age up to 6 years, pregnant women and girls of normal intellect due to malnutrition and craving of certain nutrients needed by the body (Berry, 2016). The individuals suffering from pica ingest variety of substances such as ice, chalk, uncooked rice, paper, leaves, mud/ clay, paint, nails, plastic and pieces of metal.

In table 4.66, percentage distribution of girls according to utilization of nonfood items (pica) is detailed. The ice was consumed by 55.0% girls, paper by 19.5% girls, leaves by 4.2%, clay/mud by 5.9%, drywall/paint by 3.4% and uncooked rice by 39.6% girls. The table reveals that ice, followed by uncooked rice and paper are the most frequently used nonfood items, whereas, percentage of girls utilizing leaves, clay/mud and drywalls/paints is small. The table further reveals that there was no marked difference between the respondents of two districts in the utilization of nonfood items.

Table 4.66

Utilization of nonfood items (Pica) by adolescent girls

Nonfood Item	Muzaffarabad		Hattian		Total	
	Frequency	%age	Frequency	%age	Frequency	%age
Ice						
No	209	45.4	73	44.0	282	45.0
Yes	251	54.6	93	56.0	344	55
Total	460	100	166	100	626	100
Paper						
No	373	81.1	131	78.9	504	80.5
Yes	87	18.9	35	21.1	122	19.5
Total	460	100	166	100	626	100
Leaves						
No	440	95.7	160	96.4	600	95.8
Yes	20	4.3	6	3.6	26	4.2
Total	460	100	166	100	626	100
Clay/Mud						
No	432	93.9	157	94.6	589	94.1
Yes	28	6.1	9	5.4	37	5.9
Total	460	100	166	100	626	100
Drywall/paint						
No	443	96.3	162	97.6	605	96.6
Yes	17	3.7	4	2.4	21	3.4
Total	460	100	166	100	626	100
Uncooked rice						
No	270	58.7	108	65.1	378	60.4
Yes	190	41.3	58	34.9	248	39.6
Total	460	100	166	100	626	100

4.1.2.22. Exercise. Exercise enhances the oxygen carrying capability for performing different functions by increasing the amount of hemoglobin and red cell mass. The impact of exercise for reducing anemia have been explored and evaluated by numerous studies, but controversial results have been reported due to the significant methodological limitations. Bread and Tobin (2000) reported that IDA is common in athletic populations, especially in younger female athletes compared to healthy sedentary individuals. In a recent study conducted by Wouthuyzen-Bakker and van Assen (2015), results demonstrated that intensive physical exercise is a promising risk factor of developing IDA, particularly in young females. Hu and Lin (2012) argued that exercise training might be a potential, safe and cost-effective method to reduce anemia. El Nahas and Gabr (2017) determined that aerobic exercises in conjunction with medication has better effect on Hb level and scores of total symptoms of anemia instead of medication only. Among adolescents, physical work can be helpful for proper digestion of food and making it part body, which can ultimately reduce the prevalence of anemia among them.

The table 4.67 shows the distribution of respondents based on the exercise habit and type of exercise training. Among the respondents of Muzaffarabad district, 35.7% girls exercise on daily basis, 7.0% exercise 1-2 times in a week, 5.7% 3-4 times in a week and 46.5% did not exercise. In Hattian district, 21.7% exercise on daily basis, 7.2% 1-2 times in a week and 2.4% 3-4 times in a week and 57.8% did not exercise. Overall, little less than 50% girls did not exercise, 31.9% exercise on daily basis, 7.0% 1 to 2 times and 4.8% 3 to 4 times in a week. Among girls who exercise, majority of them (88.1%) were involved in walking and 8.8% in running. Very small proportion of the respondents were involved in gym and yoga. No significant difference is found among the respondents of both districts in terms of type of exercise.

Table 4.67

Distribution of the girls based on the exercise routine

Exercise	Muzaffarabad		Hattian		Total	
	Frequency	%age	Frequency	%age	Frequency	%age
How often exercise?						
Daily	164	35.7	36	21.7	200	31.9
1 to 2 times in a week	32	7.0	12	7.2	44	7.0
3 to 4 times in a week	26	5.7	4	2.4	30	4.8
Not all	214	46.5	86	57.8	310	49.5
Total	460	100	166	100	626	100
If yes, what type of exercise						
Walking	218	47.4	62	37.3	280	44.7
Running	90	19.6	24	14.5	114	18.2
Gym	9	2.0	2	1.2	11	1.8
Yoga	35	7.6	7	4.2	42	6.7
Total	460	100	166	100	626	100

4.1.2.23. Personal Hygiene. Personal and environmental hygiene is important for women and adolescent girls because it plays a critical role in preventing nutritional anemia among them. The biological factors such as sweating, menstruation and vaginal discharge and household responsibilities put them at risk of spreading germs and disease (Skelton, 2018). Poor hygiene practices among adolescent increase their vulnerability to infections and worm infestation. Awareness about personal hygiene and interventions for improving personal hygiene are needed to make women and adolescent girls not to capitulate to ill effects of anemia.

In table 4.68 distribution of the adolescent girls according to personal hygiene practices is shown. Table reveals that majority of girls, 89.9% (89.3% from Muzaffarabad and 91.6% from Hattian) gave importance to personal hygiene to great extent, 9.6% (10.4% from Muzaffarabad

Table 4.68

Distribution of the girls based on personal hygiene practices

Hygiene	Muzaffarabad		Hattian		Total	
	f	%age	f	%age	f	%age
How much personal hygiene is important for you?						
To great extent	411	89.3	152	91.6	563	89.9
To some extent	48	10.4	12	7.2	60	9.6
Not at all	1	0.2	2	1.2	3	0.5
Total	460	100	166	100	626	100.0
Do you wash your hands after dusting or cleaning?						
Always	394	85.7	157	94.6	551	88.0
Often	62	13.5	9	5.4	71	11.3
Not at all	4	0.9	0	0.0	4	0.6
Do you wash your hands after using toilet?						
Always	437	95.0	159	95.8	596	95.2
Often	22	4.8	7	4.2	29	4.6
Not at all	1	0.2	0	0.0	1	0.2
Do you wash your perineal area after urination?						
Always	436	94.8	156	94.0	592	94.6
Often	24	5.2	10	6.0	34	5.4
Not at all	0	0.0	0	0.0	0	0.0
Do you take bath on bath on daily basis?						
Always	338	73.5	104	62.7	442	70.6
Often	98	21.3	50	30.1	148	23.6
Not at all	24	5.2	12	7.2	36	5.8
Do you wash your hands before eating with soap?						
Always	379	82.4	138	83.1	517	82.6
Often	78	17.0	28	16.9	106	16.9
Not at all	3	0.7	0	0.0	3	0.5

and 7.2% from Hattian) to some extent and only small percentage 0.5% did not give importance to personal hygiene.

The second part of table reveals the percentage distribution of girls according to their habit of washing hands after dusting and cleaning. Majority of girls, 88.0% (85.7% from Muzaffarabad and 94.6 from Hattian) always wash hands after dusting and cleaning, 11.3% (13.5% from Muzaffarabad and 5.4% from Hattian) often and less than one percent did not wash hands. The third part of table shows the responses of girls about the washing of hands after using toilet. Majority of girls 95.2% (95.0% from Muzaffarabad and 95.8% from Hattian) reported to wash hands after use of toilet always, 4.6% (4.8% from Muzaffarabad and 4.2% from Hattian) often and remaining 0.2% of girls reported not at all.

The fourth part of table 4.68 shows the percentage distributions of girls according to the washing of perineal area after urination. High majority 94.6% (94.8% from Muzaffarabad and 94.0 from Hattian) always washed perineal area after urination, 5.4% (5.2% from Muzaffarabad and 6.0% from Hattian) often and no one reported not to wash perineal area after urination.

The fifth part of the table shows distribution of girls according to their habit of bathing on daily basis. Most of the respondents 70.6% (73.5% from Muzaffarabad and 62.7% from Hattian) always take bath on daily basis, 23.6% (21.3% from Muzaffarabad and 30.1% from Hattian) often and 5.8% (5.2% from Muzaffarabad and 7.2% from Hattian) did not take bath on daily basis. The sixth part of the table elucidates percentage distribution of girls according to washing hands before eating. Majority of girls (82.6%) always wash hands before eating, 16.9% often and remaining 0.5% did not wash hands before eating. The respondents pointed out that they do not wash hands while using cutlery for eating.

4.1.2.24. Personality of adolescent girls and parental attitude. Children possessing basic social skills can develop and uphold good relations with peers and adults (Semrud-Clikeman, 2007). Basic social skills are nurtured by parents and caregivers, which are positively linked with academic and nonacademic performance of the children. (Durlak et al., 2011; Fantuzzo et al., 2007). These skills determine social behavior, empathy, interpersonal relationships, communication and are associated with success of children in future at home, family and schools (Elias, 2006; Fantuzzo et al., 2007). The good relationships between parents and children reduces generation gap and are associated with better academic performance, social skills and utilization of health services.

The table 4.69 reveal results of univariate analysis for depiction of respondents personality and relationship quality with parents. It is evident from table that 27.2% girls were shy, 59.1% were friendly nature and remaining 13.7% were compromising. The shyness was comparatively higher among district Hattian girls (34.9%) compared to district Muzaffarabad girls (24.3%). Higher proportion of girls belonging to Muzaffarabad (61.7%) reported to have friendly nature than Hattian district girls (51.8%), whist responses compromising behavior are reported by almost same percentages of girls from both districts.

Majority of girls, 57.3% (56.5% from Muzaffarabad and 59.6% from Hattian) reported about kind behavior of father, 29.2% (29.6% from Muzaffarabad and 28.3% from Hattian) reported mature behavior, whist 13.4% (13.9% from Muzaffarabad and 12.0% from Hattian) reported about harsh behavior of father. The table further reveals the responses of girls about the attitude of mother with them. According to the responses, 10.2% girls reported harsh, 25.4% mature and 64.6% reported kind behavior of mothers. Overall, comparatively higher percentage of girls belonging to Hattian reported kind behavior (69.3%) than Muzaffarabad district (62.6%). In response to the

Table 4.69

Distribution of girls based on their personality and relationship quality with parents

Personality	Muzaffarabad		Hattian		Total	
	f	%age	f	%age	f	%age
Shy	112	24.3	58	34.9	170	27.2
Friendly	284	61.7	86	51.8	370	59.1
Compromising	64	13.9	22	13.3	86	13.7
Total	662	100	241	100	903	100
Father						
Harsh	64	13.9	20	12.0	84	13.4
Mature	136	29.6	47	28.3	183	29.2
Kind	260	56.5	99	59.6	359	57.3
Mother						
Harsh	52	11.3	12	7.2	64	10.2
Mature	120	26.1	39	23.5	159	25.4
Kind	288	62.6	115	69.3	403	64.6
Father spend time with you						
Not at all	92	20.0	43	25.9	135	21.6
To some extent	251	54.6	83	50.0	334	53.4
To great extent	117	25.4	40	24.1	157	25.1
Mother spend time with you						
Not at all	15	3.3	6	3.6	21	3.4
To some extent	102	22.2	40	24.1	142	22.7
To great extent	343	74.6	120	72.3	463	74.0
Total	662	100	241	100	903	100

question about time spent by father and mother with the respondent, the respondent reported that mothers give more time than fathers. About 21.6% did not give time, 53.4% to some extent and remaining 25.1% to great extent. 3.4, 22.7 and 74.0% girls reported their mothers spend time with them, not at all, to some extent and to great extent respectively.

4.1.2.25. Violence and its effects on health. About 1.3 million adolescents die due to infectious diseases, injuries, pregnancy and childbirth, 45% of them are adolescent girls, out of which 10% girls die due to violence (WHO, 2014c). The proportion of violent deaths intensifies as girls enter adolescence (UNCF, 2014). Out of all causes of deaths, the percentage of deaths due to violence among girls raised from 0.4% at age 0 to 9 to 4% at age 10 to 14, and 13% at age 15 to 19 (UNCF, 2014). According to UNCF (2014), violence after infectious and parasitic diseases is the major cause of mortality among adolescent girls. Stark et al. (2017) conducted a multi-country study for estimating prevalence and predictors of violence among adolescent girls. The findings revealed that 51.62% girls reported to experience at least one form of violence during last one year, 36.79% reported loud shouting, 31.78% reported being beaten or hit and 26.67% faced unwanted body touching, sexual coercion and/o forced sex. In Pakistan, adolescents experience difference forms of physical and emotional violence victimizations at home and schools by parents, peers and teachers.

In table 4.70, percentage distributions of girls according to types of violence experienced by adolescent girls are detailed. The first part of the table reveals the responses of girls about parental violence victimization at homes. About 12.0% girls reported parents did not embarrass them in front of others, followed by 60.2% to sometimes and remaining 27.8% often. 40.9, 49.2, and 9.9% girls reported being teased verbally by parents not at all, to sometimes and often respectively. Majority of girls (59.4%) were not prevented, 35.3% sometimes and 5.3% were often

Table 4.70

Distribution of girls based on the violence victimization by parents and teachers

Violence	Not at all % (f)	Sometimes % (f)	Often % (f)
Parents			
Embarrass in front of others	12.0(75)	60.2(377)	27.83(174)
Tease verbally	40.9(256)	49.2(308)	9.9(62)
Prevent to spent time with friends	59.4(372)	35.3(221)	5.3(33)
Grab hair	70.8(443)	26.4(165)	2.9(18)
Slap/kick	54.8(343)	41.4(259)	3.8(24)
Beat with a stick	85.8(368)	37.7(236)	3.5(22)
Teachers			
Embarrass in front of others	27.8(174)	61.2(383)	11.0(69)
Tease verbally	50.6(317)	43.0(269)	6.4(43)
Prevent to spent time with family and friends	67.4(422)	29.2(183)	3.4(21)
Threaten you to fail	83.7(524)	14.4(90)	1.9(12)
Grab hair	86.1(539)	12.1(76)	1.8(11)
Slap/kick	56.5(354)	40.9(256)	2.6(16)
Beat with a stick	37.2(233)	55.9(350)	6.9(43)

prevented to spend time with their friends by the parents. Almost one third 29.3% (26.4% sometimes and 2.9% often), 45.2% (41.4% sometimes and 3.8% often) and 41.2% (37.7% sometimes and 3.5% often) were physically victimized by parents by hair grabbing, slapping/kicking and beating with stick respectively.

The second part of table 4.70 reveals the distribution of the adolescent girls based on the type of violence experienced from teachers. About 27.8% never faced embarrassment, 61.2% faced it to sometime and remaining 11.0% were often embarrassed by teachers in from of others. Less than half (43.4%) were teased verbally, 29.2% were prevented to spend time with friends, 14.4% were threatened to fail, 12.1% were hair grabbed, 40.9% were slapped/kicked, and 55.9% were beaten with stick by teachers sometimes. Very small percentage of girls experienced these victimizations often from teachers.

The exposure to domestic violence is a psychosocial issue, which can be associated with anemia, decreased weight of women and their children (Lee et al., 2002). Violence victimization represented serious physical and psychological health issues among adolescents (Olofsson, 2012).

In table 4.71, percentage distribution of girls according to impact of violence on their physical and mental health is presented. To determine the impact of violence on the physical and mental health, girls were asked questions about their decreased working capacity, headache, poor appetite, inability to take decision, decreased self-confidence and intolerance/mood swings. About 19.5% girls did not complain about decreased working capacity, 27.2% experienced to some extent and remaining 53.4% to great extent. It can be observed that responses of the respondents from both districts are almost similar for different options asked. Less than one fifth (18.8%) girls (20.4% from Muzaffarabad and 14.5% from Hattian) never suffered from poor appetite, 45.5% (44.1% from Muzaffarabad and 49.4% from Hattian) to some extent and 35.6% (35.4 from Muzaffarabad and 36.1 from Hattian) to great extent.

Table reveals that prevalence of mental stress is reported as not at all, to some extent and to great extent by 56.1, 29.9 and 15.0% girls respectively. Sleeping disorder is reported to be not at all by 65.7%, 25.4% reported to some extent and remaining 8.9% reported to great extent. The

Table 4.71

Violence impact on physical and mental health of the adolescent girls

Decreased Working Capacity	Muzaffarabad		Hattian		Total	
	f	%age	f	%age	f	%age
Not at all	86	18.7	36	21.7	122	19.5
To some extent	134	29.1	36	21.7	170	27.2
To great extent	240	52.2	94	56.6	334	53.4
Headache						
Not at all	94	20.4	24	14.5	118	18.8
To some extent	203	44.1	82	49.4	285	45.5
To great extent	163	35.4	60	36.1	223	35.6
Poor appetite						
Not at all	86	18.7	38	22.9	124	19.8
To some extent	166	36.1	51	30.7	217	34.7
To great extent	208	45.2	77	46.4	285	45.5
Mental stress						
Not at all	262	57.0	89	53.6	351	56.1
To some extent	137	29.8	44	26.5	181	29.9
To great extent	61	13.3	33	19.9	94	15.0
Sleeping disorder						
Not at all	307	66.7	104	62.7	411	65.7
To some extent	122	26.5	37	22.3	159	25.4
To great extent	31	6.7	25	15.1	56	8.9
Inability to take decision						
Not at all	122	24.3	35	21.1	147	23.5
To some extent	114	24.8	44	26.5	158	25.2
To great extent	234	50.9	87	52.4	321	51.3
Intolerance/mood swing						
Not at all	84	18.3	36	21.7	120	19.2
To some extent	149	32.4	45	27.1	194	31.0
To great extent	227	49.3	85	51.2	312	49.8

victims of violence have poor decision-making capability and suffer from intolerance/mood swings. The inability to take decisions is reported as not at all by 23.5% girls, 25.5% reported to some extent and 51.3% to great extent. The table underlines that 19.2% girls did not suffer from intolerance/mood swing, 31.0 % to some extent and almost 50% to great extent. The results indicate almost similar trend is found about the impact of violence on the physical and mental health in both districts

4.1.2.26. Communicable diseases. Pakistan bears substantial portion of regional communicable diseases causing anemia including pneumonia, cholera, malaria, influenza, hepatitis and HIV/AIDS (Batool, 2010). In Pakistan among major communicable diseases, acute respiratory infections account for 51%, diarrhea/dysentery 23%, malaria 16% and viral hepatitis 7.5% of the overall disease burden. Overpopulated cities, poor socio-economic conditions, scarce vaccine coverage, unsafe drinking water, poor sanitation and low health awareness put Pakistan at the risk of endemics (Batool, 2010). Communicable diseases decrease immunity level among girls causing anemia and other health related problems.

In table 4.72, percentage distribution of girls is given according to the prevalence of communicable diseases. Diarrhea is the most prevalent communicable disease, which was reported by 39.8% girls, followed by cough 30.7%, cholera 12.9% and pneumonia 9.1%. Measles is reported by 5.1% girls, tetanus 0.6% and tuberculosis by 0.5%. None of the girls reported to suffer from polio. The prevalence of cholera and cough is comparatively high in Muzaffarabad, whereas all other communicable diseases are equally prevalent among respondents of both districts. Utilization of contaminated water, environmental pollutants, unhygienic food and inadequate eating

Table 4.72

Prevalence of communicable diseases during last one year in girls

Cholera	Muzaffarabad		Hattian		Total	
	f	%age	f	%age	F	%age
Yes	51	11.1	30	18.1	81	12.9
No	409	88.9	136	81.9	545	87.1
Total	460	100	166	100	626	100
Pneumonia						
Yes	39	8.5	18	10.8	57	9.1
No	421	91.5	148	89.2	569	90.9
Measles						
Yes	27	5.9	5	3.0	32	5.1
No	433	72.9	161	97.0	594	94.9
Tetanus						
Yes	2	0.4	2	1.2	5	0.6
No	460	99.6	238	98.8	898	99.4
Diarrhea						
Yes	195	42.4	54	32.5	249	39.8
No	265	57.6	112	67.5	377	60.2
Tuberculosis						
Yes	2	0.4	1	0.6	3	0.5
No	458	99.6	162	99.4	881	99.5
Cough						
Yes	146	31.7	46	27.7	192	30.7
No	314	68.3	120	72.3	434	69.3
Polio						
Yes	0	0.0	0	0.0	0	0.0
No	460	100	166	100	626	100

habits at home and in schools might be the causes of higher incidence of diarrhea, cough and cholera.

4.1.2.27. Knowledge about anemia and its Symptoms. The knowledge about a disease, its symptoms, causes, and prevention are as important as the treatment of disease itself (Allen, 2000). Knowledge of the anemia severity and its causes in adolescence girls is important because it opens a window of opportunity for school-based interventions for improving adolescent health (Tesfaye et al., 2015).

The table 4.73 displays percentage distribution of the girls based on their knowledge about anemia and its symptoms. The table reveals that 80.5% girls (79.1% from Muzaffarabad and 84.3% from Hattian) have the knowledge that anemia is a health problem, whilst 76.0% girls (74.8% from Muzaffarabad and 79.5% from Hattian) reported that paleness of skin, lips and nailbeds is the symptoms of anemia. Tiredness is reported by 78.3% girls (82.0% from Muzaffarabad and 86.7% from Hattian), weakness by 81.0% girls (78.9% from Muzaffarabad and 86.7% from Hattian) and decreased working capacity is reported by 78.4% girls as symptoms of anemia. Eating non-food items, weight loss, heart palpitation, and shortness of breath are reported by 73.3, 45.7, 59.9 and 51.6% girls. Comparatively more girls from Hattian reported eating non-food is symptom of anemia, whilst weight loss, heart palpitation and shortness of breath are considered by more girls from Muzaffarabad districts as symptoms of anemia. The results demonstrate that knowledge of girls about anemia symptoms such as weights loss, heart palpitation and shortness of breath is modest.

4.1.2.28. Knowledge about causes, preventive measures and barriers in the treatment of anemia. IDA is the most common type of anemia which accounts for more than 60% of all cases

Table 4.73

Knowledge of the adolescent girls about anemia and its symptoms

Statement	Muzaffarabad		Hattian		Total	
	f	%age	f	%age	f	%age
Do you think anemia is a health problem?						
Yes	364	79.1	140	84.3	504	80.5
No	96	20.9	26	15.7	122	19.5
Total	460	100	166	100	626	100
Do you know pale skin, lips and nails are symptoms of anemia?						
Yes	344	74.8	132	79.5	476	76.0
No	116	25.2	34	20.5	150	24.0
Do you know tiredness is symptom of anemia?						
Yes	360	78.3	144	86.7	504	80.5
No	100	21.7	22	13.3	122	19.5
Do you know weakness is symptom of anemia?						
Yes	363	78.9	144	86.7	507	81.0
No	97	21.1	22	13.3	119	19.0
Do you know decreased working capacity is symptom of anemia?						
Yes	346	75.2	145	87.3	491	78.4
No	114	24.8	21	12.7	135	21.6
Do you know eating non-food items is symptom of anemia?						
Yes	326	70.9	133	80.1	459	73.3
No	134	29.1	33	19.9	167	26.7
Do you know weight loss is symptom of anemia?						
Yes	219	47.6	67	40.4	286	45.7
No	241	52.4	99	59.6	340	54.3
Do you know heart palpitation is symptom of anemia?						
Yes	282	61.3	93	56.0	375	59.9
No	178	38.7	73	44.0	251	40.1
Do you know shortness of breath is symptom of anemia?						
Yes	249	54.1	74	44.6	323	51.6
No	211	45.9	92	55.4	303	48.4

of anemia (Harding et al., 2017). The multiple causes of IDA among the adolescent girls include increased iron requirements due to menstruation, insufficient intake of micronutrients, accelerated growth and hormonal changes (Dugdale, 2001; Halterman, et al., 2001). Knowledge of causes of anemia during adolescence can play a critical role in preventing anemia at an early stage.

In the table 4.74, percentage distributions of girls based on their knowledge about causes of anemia is depicted. About 54.3% girls (54.6% from Muzaffarabad and 53.6% from Hattian) know about malnutrition and 75.1% girls (almost similar proportions for both districts) know that malnutrition can cause anemia. Heavy bleeding, heredity conditions, non-consumption of animal protein, communicable diseases and violence were reported by 75.4, 71.7, 47.6, 60.2 and 44.9% girls as causes of anemia respectively. The table further reveals that girls belonging to both districts have approximately same knowledge about causes of heavy bleeding and heredity conditions. However, girls from Muzaffarabad district have considerably better knowledge about causes of non-consumptions of animal protein, communicable diseases and violence compared to Hattian district.

Many types of anemia are not preventable; however, IDA and vitamin deficiency anemias can be prevented utilizing the diet which includes iron, folate, vitamin B-12, and vitamin C (WHO, 2014; WHO, 2016). Better knowledge about etiology and risk factors of anemia, inclusion of iron dietary intake, availing healthcare facilities and knowledge of personal hygiene vitally important for reducing IDA. The health of adolescent girls can be improved by imparting health education to develop knowledge about preventive measures.

In table 4.75 distribution of girls for assessing the knowledge about preventive measures of anemia is revealed. The results indicate that 54.2% girls had knowledge about preventing anemia by consuming plenty of green leafy vegetables, 71.4% know to prevent anemia by taking

Table 4.74

Knowledge of the girls about causes of anemia

Causes of anemia	Muzaffarabad		Hattian		Total	
	f	%age	f	%age	f	%age
Malnutrition						
Yes	251	54.6	89	53.6	340	54.3
No	209	45.4	77	46.4	286	45.7
Total	460	100	166	100	626	100
Poor socioeconomic condition						
Yes	345	75.0	125	75.3	470	75.1
No	115	25.0	41	24.7	156	24.9
Heavy bleeding						
Yes	345	75.0	127	76.5	472	75.4
No	115	25.0	39	23.5	154	24.6
Heredity conditions						
Yes	330	71.7	119	71.7	449	71.7
No	130	28.3	47	28.3	177	28.3
Non-consumption of animal protein						
Yes	230	50.0	68	41.0	298	47.6
No	230	50.0	98	59.0	328	52.4
Communicable diseases						
Yes	281	61.1	96	57.8	377	60.2
No	179	38.9	70	42.2	239	39.8
Violence						
Yes	223	48.5	58	34.9	281	44.9
No	237	51.5	108	65.1	345	55.1
Total	460	100	166	100	626	100

food supplement and 76.7% girls reported to prevent anemia by taking iron tablets. 74.9, 77.0, 59.6, 77.5 and 77.8% girls know that anemia can be prevented by eating red meat, deworming, utilizing hygienic food, personal hygiene and avoiding violence respectively. The knowledge of respondents about preventing anemia by hygienic food is modest. The table also reveals that knowledge about taking preventive measures of anemia was considerably more among the women of Muzaffarabad districts than women of Hattian district.

Anemia among adolescent girls is a multifactorial disorder that requires a multipronged strategy for its prevention and treatment (Mulugeta et al., 2015). In Pakistan, poor nutritional knowledge, misconceptions about certain foods during menstruation, poor socio-economic condition, lack of knowledge about anemia symptom, its causes and prevention and long distances from healthcare facility are major barriers in the treatment of anemia. Sustained counselling at schools, inclusion of adolescent nutrition in curriculum, media discussion of adolescent nutrition, availability of iron supplementation at schools and health facilities, and involving local government officers, family members and influential people to play a supporting role for encouraging use of iron supplementation among adolescent girls (Mulugeta et al., 2015).

Table 4.76 reveals knowledge of the girls about the barriers in the treatment of anemia. 77.2% girls (almost 80% from Muzaffarabad and 70.5 % from Hattian) reported nonviability of food supplements and 72.2% girls (almost same percentage from both districts) considered poor socioeconomic conditions as the barrier in the treatment of anemia. Lack of knowledge about anemia, inadequate guidance, compliance with food supplements and long waiting hours in healthcare facility were reported by 79.6% (78.9% from Muzaffarabad and 81.3% from Hattian), 77.6 (78.9% from Muzaffarabad and 74.1 % from Hattian), and 61.2% girls (64.3% from Muzaffarabad and 52.4% from Hattian) respectively.

Table 4.75

Knowledge of the girls about preventive measures of anemia

Preventive Measures	Muzaffarabad		Hattian		Total	
	f	%age	f	%age	f	%age
Eating plenty green leafy vegetables						
Yes	266	57.8	73	44.0	339	54.2
No	194	42.2	93	56.0	287	45.8
Total	460	100	166	100	626	100.0
Taking food supplements						
Yes	336	73.0	111	66.9	447	71.4
No	124	27.0	55	33.1	179	28.6
Taking iron tablets						
Yes	355	77.2	125	75.3	480	76.7
No	105	22.8	41	24.7	146	23.3
Utilization of red meat						
Yes	349	75.9	120	72.3	469	74.9
No	111	24.1	46	27.7	157	25.1
Deworming						
Yes	354	77.0	128	77.1	482	77.0
No	106	23.0	38	22.9	144	23.0
Utilization of hygienic food						
Yes	288	62.6	85	51.2	373	59.6
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Personal hygiene and clean environment						
Yes	368	80.0	117	70.5	485	77.5
No	92	20.0	49	29.5	141	22.5
Avoid violence						
Yes	367	79.8	120	72.3	487	77.8
No	93	20.2	46	27.7	139	22.2
Total	460	73.5	166	26.5	626	100.0

Table 4.76

Knowledge of the girls about barriers in treatment of anemia

Barriers in Treatment	Muzaffarabad		Hattian		Total	
	f	%age	f	%age	f	%age
Lack of available food supplements						
Yes	366	79.6	117	70.5	483	77.2
No	94	20.4	49	29.5	143	22.8
Total	460	100	166	100	626	100.0
Poor socio-economic conditions						
Yes	332	72.2	120	72.3	452	72.2
No	128	27.8	46	27.7	452	72.2
Lack of knowledge about anemia						
Yes	363	78.9	135	81.3	498	79.6
No	97	21.1	31	18.7	128	20.4
Inadequate guidance						
Yes	363	78.9	123	74.1	489	77.6
No	97	21.1	43	25.9	140	22.4
Compliance with food supplements						
Yes	346	75.2	124	74.7	470	75.1
No	114	24.8	42	25.3	156	24.9
Long waiting hours at healthcare facility						
Yes	296	64.3	87	52.4	383	61.2
No	164	35.7	79	47.6	243	38.8
Total	460	100	166	100	626	100.0

4.1.2.29. Anemia severity determined by hemoglobin level. Anemia severity can be determined based on its symptoms and hemoglobin level and is categorized as mild, moderate, or severe (Beutler & Waalen, 2006). In this study, married adolescent girls were excluded. Based on hemoglobin level, the girls were categorized into normal (>=12g/dl), mild anemia (11-11.9 g/dl), moderate anemia (8.0 to 10.9 g/dl) and severe anemia (<8.0 g/dl). Mild anemia was asymptomatic and is commonly untreated, however, some common symptoms can be fatigue and decreased working capacity, tiredness, heart palpitation and shortness of breath.

In table 4.77, distribution of girls according to anemia severity determined by hemoglobin level is revealed. Anemia prevalence is significantly high among girls belonging to Hattian district (more than 60%) compared to Muzaffarabad district (43.7%). The prevalence of mild, moderate and severe anemia in Muzaffarabad is 20.2, 21.5 and 1.7% respectively, whereas in Hattian the prevalence was 21.5, 33.7, 5.4% respectively. Overall, the prevalence of mild anemia was 20.4%, moderate anemia is 24.8% and severe anemia is 2.7%. The mean ± SD of hemoglobin level for the non-anemic and those suffering from mild, moderate and severe anemia were 13.13 ± 0.90, 11.44

Table 4.77

Determination of anemia severity in girls by hemoglobin level

Anemia Severity	District Muzaffarabad			District Hattian Bala			Total		
	%(f)	Mean	SD	%(f)	Mean	SD	%(f)	Mean	SD
Normal	56.3(260)	13.14	0.93	39.8(66)	13.05	0.77	52.1(326)	13.13	0.90
Mild	20.2(93)	11.46	0.32	21.1(35)	11.41	0.28	20.4(128)	11.44	0.31
Moderate	21.5(99)	10.00	0.74	33.7(56)	10.07	0.64	24.8(155)	10.03	0.71
Severe	1.7(8)	7.16	0.67	5.4(9)	7.20	0.55	2.7(17)	7.18	0.59
Total	100(460)	12.02	1.64	100(166)	11.39	1.75	100(626)	11.86	1.69

± 0.31, 10.03 ± 0.81 and 7.18 ± 5.09 g/dl respectively. The results reveal that approximately 48% of the adolescent girls are suffering from anemia in AJK, which is quite high.

4.2 Bivariate Analysis

Bivariate analysis is performed to analyze the relationship between two variables for testing the hypothesis of association or causality. It helps to determine up to what extent is it possible to predict value of one variable if value of second variable is known. In this study, bivariate analysis is performed for exploring the association of anemia and strength of this association with the societal determinants. For this purpose, cross tabulation is worked out for exploring the relationship of dependent variable 'anemia severity' with independent variables (sociocultural risk factors). Chi-square is used for estimating the association and testing hypotheses of association of two variables and gamma test is used for exploring the strength of this association. The results were considered statistically significant for significance level ≤ 0.05. Binary logistic regression was used to calculate the odd ratios. The interview schedule comprised both single statement questions as well as matrix of questions. The matrix of questions represents a variable with more than one statement and response category. The cross tabulation of dependent variable with each statement of matrix questions is tedious, long and imprudent. To resolve this issue, an index variable was constructed by combining all the items in the matrix to represent their combined effect.

Before the construction of index variable, a reliability test was applied, and Cronbach alpha (α) was estimated for ensuring consistency within all the statements in the matrix question. The process of construction of index variable for symptoms of anemia is detailed below.

Table 4.78

Index variable of different variables for women

Variables	Items	Categories	Min. Score	Max. Score	Mean Score	Std	Cronbach Alpha
Symptoms of Anemia	11	3	11	33	20.26	5.56	0.90
Pica	7	3	7	21	7.77	1.11	0.64
Son preference	7	3	7	21	17.06	4.54	0.94
Perceptions about restricted use of hot/cold food	16	2	16	32	26.97	6.03	0.97
Food items culturally restricted during pregnancy	6	2	6	12	7.03	1.59	0.81
Reason for not Utilizing certain foods during pregnancy	8	2	8	16	10.60	3.04	0.93
Personal Hygiene	6	3	6	18	16.27	2.25	0.89
Violence	14	3	14	42	16.92	3.29	0.82
Impact of violence on reproductive health	6	3	6	18	7.40	1.99	0.73
Impact of violence on routine matter	7	3	7	21	12.06	4.89	0.96
Knowledge about symptoms of anemia	8	2	8	16	13.79	2.61	0.90
Knowledge about Causes of anemia	8	2	8	16	14.20	2.18	0.87
Knowledge about Preventive measures	8	2	8	16	14.23	2.47	0.90
Knowledge about barriers in the treatment of anemia	6	2	6	12	10.41	2.02	0.88

$$Number\ of\ statements\ in\ matrix\ of\ questions\ for\ symptoms\ of\ anemia = 11$$

$$Number\ of\ categories = 3$$

$$Minimum\ score\ = 11$$

$$Maximum\ score\ = 33$$

$$Low\ level\ of\ response = \frac{Maximum\ value - Minimum\ Value}{Number\ of\ categories} = \frac{33-11}{3} = \frac{22}{3} = 7.33$$

Based on three categories, there were three ranges with mild/no, moderate and severe symptoms of anemia.

$$Mild/No\ symtom\ range = 11 - (11 + 7.33) = 11 - 18.33$$

$$Moderate\ symtom\ range = 18.34 - (18.33 + 7.33) = 18.34 - 25.66$$

$$Severe\ symtom\ range = 25.67 - 33.00$$

In table 4.78, index variables constructed from different variables for women are shown. It is evident from the table that variables were in high or very high reliability classification category and only one variable is in moderate category.

In table 4.79, index variables constructed from different variables for adolescent girls are shown. It is evident from the table that majority of the variables are in high or very high classification category and only three variables pica, violence and impact of violence on general health were in moderate category for adolescent girls.

4.2.1. Socio-economic variables

Hypothesis 1: Education is likely to be associated with the anemia prevalence.

1.1. Higher the education of the respondent, lower is the anemia among married women.

1.2.Higher the parental education, lower is the anemia prevalence among adolescent girls.

Education is the social right of every individual; especially female education is the most powerful tool for changing the world. Female education is not only beneficial for her, but also can be passed to her family, community as well as to her country. Educated female can have better access to employment, adequate medical care, awareness about contraception and family planning, better decision-making capabilities, enhanced nutritional knowledge, effective parenting skills and knowledge about reproductive health for safe motherhood (Batool, 2010). They have less prevalence

Table 4.79

Index variable of different variables for adolescent girls

Variables	Items	Categories	Min. Score	Max. Score	Mean Score	Std	Cronbach Alpha
Symptoms of Anemia	11	3	11	33	18.47	4.82	0.85
Son preference	7	3	7	21	15.70	4.48	0.91
Perceptions about restricted use of hot/cold food	16	3	16	48	24.63	6.15	0.96
Utilization of fast food	6	3	6	18	10.68	2.35	0.76
Foods items culturally restricted during menstruation	6	3	6	18	10.40	3.68	0.86
Reasons for not Utilizing certain foods during menstruation	6	3	6	18	11.57	4.72	0.93
Pica	6	3	6	18	7.27	1.20	0.64
Personal Hygiene	6	3	6	18	17.13	1.39	0.74
Violence	13	3	13	39	19.81	3.11	0.64
Awareness about impact of violence on general health	5	3	5	15	7.9	2.16	0.64
Awareness about impact of violence on Routine matter	5	3	5	15	11.45	3.47	0.92
Knowledge about anemia symptoms	8	2	8	16	13.51	2.76	0.91
Knowledge about anemia causes	8	2	8	16	12.79	2.75	0.87
Knowledge about anemia preventive measures	8	2	8	16	13.69	2.85	0.91
Knowledge about barriers in the treatment of anemia	6	2	6	12	10.43	2.16	0.91

prevalence of anemia due to healthy and diverse dietary practices, food supplements, intake of IFA supplementation, healthier life style. Children of highly educated mothers are less vulnerable to develop anemia and iron deficiency compared to less educated mothers (Choi et al., 2011).

In this study, association of education (respondent education for women and parental education for girls) is examined in terms of two research hypothesis: 1) severity of anemia 2) awareness about causes, preventive measures and barriers in the treatment of anemia. In the table 4.80, association of years of schooling of the respondents and parental education of adolescent girls with anemia severity is presented. The first part of the table reveals the results of bivariate analysis of women education and anemia severity. The findings indicate that years of schooling of 201(22.3%) women were 0 (illiterate), 81 (9.0%) women had 1 to 5 years, 126 (13.9%) women had 6 to 8 years, 211(23.4%) have 9 to 12 years and 284(31.4%) had more than 12 years of schooling. Among 201 illiterate women, 28.4% were non-anemic and remaining 71.4% were anemic (17.4% have mild anemia, 46.3% moderate anemia and 8.0% severe anemia). Anemia prevalence was 61.7, 60.3, 60.2 and 48.2% for 0, 1 to 5, 6 to 8, 9 to 12 and 12+ years of schooling respectively, revealing a decrease in anemia with the education of women. The odds of occurrence of anemia among educated women was compared with illiterate women. The odds of occurrence of anemia are 0.64, 0.68, 0.60 and 0.37 times less among educated women with years of schooling, 1 to 5 years, 5 to 8 years, 9 to 12years and more than 12 years respectively compared to illiterate women. This reveals that compared to illiterate women, prevalence of anemia is 36%, 32%. 40% and 63% less for women with years of schooling, 1 to 5 years, 5 to 8 years, 9 to 12years and more than 12 years respectively. Chi-Square value (56.44) and p-value (9.98×10^{-08}) portrays weighty association between women education and anemia prevalence. The study outcomes were in line with the studies (Batool, 2010; Habib, 2013; Melku et al., 2014) revealing significant association

Table 4.80

Association of educational attainment of the women and parental education of adolescent girls with anemia severity

Years of Schooling	Normal %(f)	Mild %(f)	Moderate %(f)	Severe %(f)	Total %(f)	Odd Ratio
Association of women's years of schooling with anemia severity						
0	28.4 (57)	17.4(35)	46.3(93)	8.0(16)	22.3(201)	Reference
1 to 5	38.3(31)	16.0(13)	44.4(36)	1.2(1)	9.0(81)	0.64
6 to 8	39.7(50)	22.2(28)	31.7(40)	6.3(8)	14.0(126)	0.68
9 to 12	39.8(84)	23.2(49)	31.8(67)	5.2(11)	23.4(211)	0.60
12+	51.8(147)	34.9(67)	23.2(66)	1.4(4)	31.5(284)	0.37
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100.0(903)	
Chi-Square=56.44	p-value=9.98×10^{-08}		Gamma=-0.253		p-value=1.26×10^{11}	
Association of years of schooling of adolescent girl's father with anemia severity						
0	48.7 (38)	15.4(12)	30.8(24)	5.1(4)	12.5(78)	Reference
1 to 5	47.4(37)	24.4(19)	25.6(20)	2.6(2)	12.5(78)	1.05
6 to 8	46.4(45)	21.6(21)	28.9(28)	3.1(3)	15.5(97)	1.10
9 to 12	50.4(143)	20.8(59)	26.4(75)	2.5(7)	45.4(284)	0.94
12+	70.8(63)	13.3(17)	9.0(8)	1.1(1)	14.2(89)	0.39
Total	52.1(326)	20.4(128)	24.8(155)	2.7(17)	100.0(626)	
Chi-Square=22.66	p-value=0.031		Gamma=-0.171		p-value=0.001	
Association of years of schooling of adolescent girl's mother with anemia severity						
0	45.9 (89)	18.0(35)	32.5(63)	3.6(7)	31.0(194)	Reference
1 to 5	47.3(43)	29.7(27)	22.0(20)	1.1(1)	14.5(91)	0.95
6 to 8	60.0(57)	18.9(18)	21.1(20)	0.0(0)	15.2(95)	0.57
9 to 12	51.1(93)	19.2(35)	24.7(45)	4.9(9)	29.1(182)	0.81
12+	68.8(44)	20.3(13)	10.9(7)	0(0)	10.2(64)	0.39
Total	52.1(326)	20.4(128)	24.8(155)	2.7(17)	100.0(626)	
Chi-Square=30.51	p-value=0.002		Gamma=-0.148		p-value=0.003	

of education of women with anemia prevalence. The knowledge of balanced and iron rich diet, utilization of healthcare and personal hygiene can be the reason of lesser anemia prevalence among educated women.

The second part of table 4.80, reveals the association of adolescent girl's father education with severity level of anemia among adolescent girls. It is evident from the table that anemia decreases with the education of respondent's father, especially, for the years of schooling more than 8. For adolescent girls whose fathers has years of schooling more than 12 years, the odds of occurrence of anemia were 0.39 (61% less) than girls whose fathers were illiterate. Chi-Square value (22.66) and significance level (0.031) revealed the significant association between education of the respondent fathers and prevalence of anemia among adolescent girls.

The third part of the table shows the association of maternal education with severity level of anemia among adolescent girls. The prevalence of moderate and severe anemia is considerably high among girls whose mothers are illiterate (years of schooling 0). The results highlight that prevalence of anemia decreases appreciably for adolescent girls, whose mothers had years of schooling more than 5. Chi-Square value (30.51) and significance level (0.002) revealed the significant association between maternal education and prevalence of anemia among adolescent girls. Similar results were reported in numerous studies (Choi et al., 2011; Upadhye & Upadhye, 2017). The odds of occurrence of anemia among girls of educated mothers were 0.95, 0.57, 0.81 and 0.39 for the years of schooling 1 to 5, 6 to 8, 9 to 12 and 12+ years respectively. This reveals that prevalence of anemia was 5%, 43%, 19% and 61% less in adolescent girls, whose mothers had years of schooling 1 to 5, 6 to 8, 9 to 12 and 12+ years respectively compared to illiterate mothers. Children of educated mothers were less susceptible to anemia and iron deficiency compared to mother with lesser education (Choi et al., 2011). The adolescent girls of educated family had better opportunity of utilizing iron rich food and micronutrients, avail better healthcare services, live in hygienic environment, which reduces the risk of developing IDA among them.

Hypothesis 2: Education of the respondents is likely to be associated with awareness about anemia.

2.1 Higher the education of the respondent, higher the awareness about anemia causes.

2.2 Higher the education of the respondent, higher the awareness about prevention of anemia.

2.3 Higher the education of the respondent, higher the awareness about barriers in the treatment of anemia.

In the table 4.81, results of bivariate analysis to reveal association of the respondent (married women) education with her awareness about causes, preventive measures and barriers in the treatment of anemia are presented. The results indicated that educated women had significantly higher knowledge about the causes, preventive measures and barriers in the treatment of anemia.

The first part of table 4.81 presents the association of women education with their knowledge about anemia causes, which increased with education of the respondents. High majority (93.3%) of women with 12+ years of schooling had knowledge about causes of anemia, followed by 90.0% women having 9 to 12 years, 81.0% 6 to 8 years and 69.1% 1 to 5 years of schooling. The odds of knowledge about causes of anemia were 1.68 times higher for 1 to 5 years of schooling, 3.18 for 6 to 8, 6.77 for 9 to 12 and 10.43 for 12+ years of schooling compared to illiterate women. Chi-square value (118.60) and (p-value<0.0005) revealed highly significant association between years of schooling and knowledge about anemia causes. The gamma value (0.589) showed the significantly positive association between years of schooling and knowledge about anemia causes among respondents.

Table 4.81

Association between women's educational attainment and their knowledge about causes, preventive measures and barrier in the treatment of anemia

Years of Schooling	No/very little %(f)	Yes %(f)	Total %(f)	Odd Ratio	Chi Square	Gamma
Knowledge about causes of anemia						
0	42.8(86)	57.2(115)	22.3(201)	Reference	118.60***	0.589***
1 to 5	30.9(25)	69.1(56)	9.0(81)	1.68		
6 to 8	19.0(24)	81.0(102)	14.0(126)	3.18		
9 to 12	10.0(21)	90.0(190)	23.4(211)	6.77		
12+	6.7(19)	93.3(265)	31.5(284)	10.43		
Total	19.4(175)	80.6(728)	100(903)			
Knowledge about preventive measures of anemia						
0	47.8 (96)	52.2(105)	22.3(201)	Reference	153.37***	0.633***
1 to 5	39.5(32)	60.5(49)	9.0(81)	1.4		
6 to 8	20.6(26)	79.4(100)	14.0(126)	3.52		
9 to 12	9.5(20)	90.5(191)	23.4(211)	8.73		
12+	6.7(19)	93.3(265)	31.5(284)	12.75		
Total	21.4(193)	78.10(710)	100(903)			
Knowledge about barriers in the treatment of anemia						
0	64.7 (130)	35.3(71)	22.3(201)	Reference	228.25***	0.707***
1 to 5	50.6(41)	49.4(40)	9.0(81)	1.79		
6 to 8	36.5(46)	63.5(80)	14.0(126)	3.18		
9 to 12	16.6(35)	83.4(176)	23.4(211)	9.21		
12+	6.3(18)	93.7(266)	31.5(284)	27.06		
Total	29.9(270)	70.1(633)	100(903)			

Significance level: <0.05 *, <0.005 **, <0.0005 ***

The second part of table 4.81 reveals the association of women's years of schooling with their knowledge about prevention of anemia, which increased with the years of schooling among respondents. High majority (93.3%) women with 12+ years of schooling had knowledge about anemia preventive measures, followed by 90.5% women having 9 to 12 years, 79.4% 6 to 8 years and 60.5 % 1 to 5 years. The odds of knowledge about preventive measures of anemia are 1.4 times higher for 1 to 5 years schooling, 3.52 for 6 to 8, 8.73 for 9 to 12 and 12.75 for 12+ years of schooling compared to illiterate women. The Chi- square value (153.37) and p-value<0.0005 suggests highly significant association between years of schooling and knowledge about anemia preventive measures. The gamma value (0.633) shows the significantly positive association between years of schooling and knowledge about anemia preventive measures among the respondents.

The third part of table 4.81 presents the association of women education with their knowledge about barriers in the treatment of anemia. High majority (93.7%) women with 12+ years of schooling had knowledge about barriers in the treatment of anemia, followed by 84.4% women having 9 to 12 years, 63.5% 6 to 8 years and 49.4% 1 to 5 years of schooling. The odds of knowledge about barriers in the treatment of anemia are 1.79 times higher for 1 to 5 years of schooling, 3.18 for 6 to 8, 9.21 for 9 to 12 and 24.06 for 12+ years of schooling compared to illiterate women. The Chi-square value (228.25) and p-value<0.0005 suggest highly significant association between years of schooling and knowledge about barriers in the treatment of anemia. The gamma value (0.707) shows the significantly positive association between years of schooling and knowledge about barriers in the treatment of anemia among the respondents.

In the table 4.82, results of bivariate analysis to show the association of respondent's education (adolescent girls) with their knowledge about causes, preventive measures and barriers in the treatment of anemia are presented. The results indicated that years of schooling is significantly associated with the knowledge of adolescent girls about the causes, preventive measures and barriers in the treatment of anemia.

The first part of table 4.82 presents the association of adolescent girls education with their knowledge about causes of anemia, which states that 83.1% adolescent girls with 10+ years of schooling had knowledge about causes of anemia, followed by 68.3% with 9 to 10 years of schooling. The girls with less than 8 years of schooling had lesser knowledge about anemia causes. Due to only 4 illiterate respondents, the odds of knowledge about the causes of anemia were computed by comparing 0 to 5 years as a reference group instead of zero years of schooling (illiterate). The odds of knowledge about causes of anemia were 3.23 times higher for 9 to 10 years of schooling and 7.40 times for 10+ years of schooling compared to girls under six years of schooling.

The Chi-square value (106.195) and p-value<0.0005 suggests highly significant association between years of schooling and knowledge about causes of anemia. The gamma value (0.578) shows the significantly positive association between years of schooling and knowledge about anemia causes among adolescent girls.

The second part of table 4.82 reveals the association of adolescent girl's years of schooling with their knowledge about prevention of anemia, which is reported to increase with the years of schooling among respondents. High majority (94.4%) girls with 10+ years of schooling had knowledge about anemia preventive measures, followed by 83.3% girls having 9 to 10 years of schooling. The odds of knowledge about preventive measures of anemia are 1.17 times higher for 6 to 8 years of schooling, 4.17 for 9 to 10 years and 14.0 for 10+ years of schooling compared to

Table 4.82

Association of the adolescent girl's educational attainment and their knowledge about causes, preventive measures and barrier in the treatment of anemia

Years of Schooling	Yes %(f)	No/very little %(f)	Total %(f)	Odd Ratio	Chi Square	Sig. Level
Knowledge about causes of anemia						
0	50.0(2)	50.0 (2)	0.6(4)	Reference	106.195***	0.578***
1 to 5	60.8(31)	39.2(20)	8.1(51)			
6 to 8	64.7(134)	35.3(73)	33.1(207)	0.82		
9 to 10	31.7(59)	68.3(127)	29.7(186)	3.23		
10+	11.7(30)	83.1(148)	28.4(178)	7.40		
Total	40.9(256)	59.1(370)	100(626)			
Knowledge about preventive measures of anemia						
0	50.0(2)	50.0 (2)	0.6(4)		113.450***	0.655***
1 to 5	45.1(23)	54.9(28)	8.1(51)			
6 to 8	49.3(102)	50.7(105)	33.1(207)	1.17		
9 to 10	16.7(31)	83.3(155)	29.7(186)	4.17		
10+	5.6(10)	94.4(168)	28.4(178)	14		
Total	26.8(168)	73.2(458)	100(626)			
Knowledge about barriers in the treatment of anemia						
0	50.0(2)	50.0 (2)	0.6(4)		115.856***	0.636***
1 to 5	64.7(33)	35.3(18)	8.1(51)			
6 to 8	57.5(119)	42.5(88)	33.1(207)	0.77		
9 to 10	27.4(51)	72.6(135)	29.7(186)	4.63		
10+	10.7(19)	89.3(159)	28.4(178)	14.64		
Total	35.8(224)	64.2(402)	100(626)			

Significance level: <0.05 *, <0.005 **, <0.0005 *** girls under six years of schooling. The Chi-square value (113.450) and (p-value<0.0005) suggested significantly high association between years of schooling and knowledge about anemia preventive measures. The gamma value 0.655 shows the significantly positive association between years of schooling and knowledge about anemia preventive measures among the adolescent girls.

The third part of table 4.82 presents the association of adolescent girl's education with their knowledge about barriers in the treatment of anemia. Majority (89.3%) girls with 10+ years of schooling had knowledge about barriers in the treatment of anemia, followed by 72.6% girls having 9 to 10 years of schooling. The odds of knowledge about barriers in the treatment of anemia were 23% less for 6 to 8 years of schooling, 4.63 times for 9 to 10, and 14.64 times higher for 10+ years of schooling compared to girls under six years of schooling. The Chi-square value (115.856) and p-value<0.0005 reveals significantly high association between years of schooling and knowledge about barriers in the treatment of anemia. The gamma value (0.636) shows the significantly positive association between years of schooling and knowledge about barriers in the treatment of anemia among respondents.

Hypothesis 3: Economic wellbeing of respondent and her family is likely to be associated with the anemia prevalence.

3.1 Higher the respondent's monthly income, lower is the anemia prevalence among married women.

3.2 Higher the family monthly income, lower is the anemia prevalence among married women.

3.3 Higher the parental monthly income, lower is the anemia prevalence among adolescent girls.

3.4 Higher the family monthly income, lower is the anemia prevalence among adolescent girls.

Economic well-being is an important determinant of anemia which is strongly related with access to abundant and quality food, utilization of health facilities and better life style that affect the health of mother and her family. Income is responsible for societal gradients in attaining health facilities between rich and poor. In table 4.83, results of bivariate analysis for revealing the association of economic wellbeing of married women with anemia severity are presented. The economic well-being of the married women is determined based on the respondent and her family monthly income.

The first part of table shows the results of bivariate analysis to find the association of anemia prevalence and respondent's monthly income. Chi- square value (21.39) and p-value (0.045) revealed significantly strong association between respondent's monthly income and anemia prevalence. The gamma value -0.158 at significance level 0.008 revealed the significantly negative association of anemia with the respondent's monthly income. The odds of occurrence of anemia were 36%, 54% and 82% less for women who had monthly income PKR 10,001 to 20,000, PKR 20,001 to 50,000 and PKR 50,000+ respectively compared to those who had no monthly income. The data indicates that moderate and severe anemia are highly prevalent among women, who had no monthly income. The findings clearly elucidate that economic independence is associated to lower odds of moderate and severe anemia among women.

The second part of table 4.83 reveals the association of anemia prevalence with family monthly income. Chi- square value (66.54) and significance level (1.41×10^{-9}) showed that there was a strong association between family monthly income of the respondent and anemia prevalence. The gamma value -0.325 and significance level 1.08×10^{-14} revealed the significant negative association

Table 4.83

Association of economic wellbeing of the married women with anemia severity

Monthly Income (PKR)	Normal %(f)	Mild %(f)	Moderate %(f)	Severe %(f)	Total %(f)	Odd Ratio
Monthly income of married women						
No income	39.0(275)	21.6(152)	34.9(246)	4.5(32)	78.1(705)	Reference
Up to 10,000	36.0(31)	18.6(16)	38.4(33)	7.0(6)	9.5(86)	1.17
10,001 to 20,000	50.0(24)	20.8(10)	25.0(12)	4.2(2)	5.3(48)	0.64
20,001 to 50,000	58.2(32)	23.6(13)	18.2(10)	0.0(0)	6.1(55)	0.46
50,000+	77.8(7)	11.1(1)	11.1(1)	0.0(0)	1.0(9)	0.18
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100(903)	
Chi-Square=21.390	p-value=0.045		Gamma=-0.158	p-value=0.008		
Family monthly income of married women						
No income	17.3 (9)	21.2(11)	46.2(24)	15.4(8)	5.8(52)	Reference
Up to 20,000	32.8(126)	22.5(86)	39.4(151)	5.2(20)	42.4(383)	0.43
20,001 to 50,000	45.4(159)	21.1(74)	30.6(107)	2.9(10)	38.8(350)	0.25
50,001 to 100,000	63.0(58)	17.4(16)	17.4(16)	2.2(2)	10.2(92)	0.12
100,000+	65.4(17)	19.2(5)	15.4(4)	0.0(0)	2.9(26)	0.11
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100(903)	
Chi-Square =66.54	Sig. level $=1.41\times10^{-9}$		Gamma=-0.325	Sig. level$=1.08\times10^{-14}$		

of anemia with increase in the family monthly income. The odds of occurrence of anemia were 57%, 75%, 88% and 89% less for women who had family monthly income up to PKR 20,000, PKR 20,001 to 50,000, PKR 50,001 to 100,000 and PKR 100,000+ respectively compared to those who had no monthly income. The findings indicated moderate and severe anemia were highly prevalent among women, who had no family monthly income or have up to PKR 20,000.

In the table 4.84, results of bivariate analysis to find association of economic well-being of adolescent girls with anemia severity is presented. The economic well-being of adolescent girls is determined based on their mothers, fathers and family monthly income. The first part of table reveals the economic wellbeing of adolescent girls based on their mother's monthly income. About (81%) mothers did not earn and were economically dependent on husbands. The data depicted that odds of occurrence of anemia are 65% and 90% less for the adolescent girls whose mothers earn PKR 20,001 to 50,000 and 50,000+ respectively compared to the mothers who had no income. Chi square value (22.75) and significance level (0.03) showed the significant association of mother's monthly income and anemia prevalence among adolescent girls. The gamma value (-0.219) showed the negative relationship between mothers' monthly income and anemia prevalence among adolescent girls.

The second part of table 4.84 shows the association of economic wellbeing of the adolescent girls based on their father's monthly earning. The odds of occurrence of anemia were 2%, 39%, 49% and 86% less for the adolescent girls whose father earn up to PKR20,000 PKR 20,001 to 50,000, PKR 50,001 to 100, 000 and 100,000+ respectively compared to fathers who had no income. Chi square value (27.39) and significance level (0.007) showed the significant association of father's monthly income and anemia prevalence among adolescent girls. The gamma value (-0.223) shows the negative relationship between father's monthly income and prevalence of anemia among adolescent girls.

The third part of table 4.84 shows the relationship of economic wellbeing of the adolescent girls based on their family monthly earning. The odds of occurrence of anemia were 32%, 62%

Table 4.84

Association of economic well-being of the adolescent girls with anemia severity

Monthly Income (PKR)	Normal %(f)	Mild %(f)	Moderate % (f)	Severe %(f)	Total %(f)	Odd Ratio
Monthly income of adolescent girl's mothers						
No income	50.3 (254)	20.0(101)	26.7(135)	3.0(15)	80.7(505)	Reference
Up to 10,000	46.8(22)	23.4(11)	25.5(12)	4.3(2)	7.5(47)	1.15
10,001 to 20,000	45.8(11)	33.3(8)	20.8(5)	0.0(0)	3.8(24)	1.10
20,001 to 50,000	74.4(29)	33.3(8)	5.1(2)	0.0(0)	6.2(39)	0.35
50,000+	90.9(10)	0.0(0)	9.1(1)	0.0(0)	1.8(11)	0.10
Total	52.1(326)	20.4(128)	24.8(155)	2.7(17)	100.0(626)	
Chi-Square=22.75	p-value=0.03	Gamma=-0.219		p-value =0.004		
Monthly income of adolescent girl's fathers						
No income	43.4 (33)	22.4(17)	31.6(24)	2.6(2)	12.1(76)	Reference
Up to 20,000	44.0(88)	20.5(41)	31.0(62)	4.5(9)	31.9(200)	0.98
20,001 to 50,000	55.9(138)	21.5(53)	21.5(53)	1.2(3)	39.5(247)	0.61
50,001 to 100,000	60.2(50)	16.9(14)	19.3(16)	3.6(3)	13.3(83)	0.51
100,000+	85.0(17)	15.0(3)	0.0(0)	0.0(0)	3.2(20)	0.14
Total	52.1(326)	20.4(128)	24.8(155)	2.7(17)	100.0(626)	
Chi-Square=27.38	p-value=0.007		Gamma=-0.223	p-value $=1.19\times10^{-5}$		
Family monthly income						
Up to 20,000	39.9 (69)	19.7(34)	35.3(61)	5.2(9)	27.6(173)	Reference
20,001 to 50,000	49.4(125)	25.7(65)	22.9(58)	2.0(5)	40.4(253)	0.68
50,001 to 100,000	63.3(95)	14.7(22)	20.0(30)	2.0(3)	24.0(150)	0.38
100,000+	74.0(37)	14.0(7)	12.0(6)	0(0)	8.0(50)	0.23
Total	52.1(326)	20.4(128)	24.8(155)	2.7(17)	100.0(626)	
Chi-Square =39.270	p-value $=1.03\times10^{-5}$		Gamma=-0.296		p-value $=1.60\times10^{-8}$	

and 77% less for the adolescent girls whose family monthly income is PKR 20,001 to 50,000, PKR 50,001 to 100, 000 and 100,000+ respectively compared to families which earn up to PKR20,000. Chi square value (39.27) and significance level (1.03×10^{-5}) showed the significant association of family monthly income and anemia prevalence among adolescent girls. The gamma value (-0.296) shows the negative relationship between family monthly income and anemia among adolescent girls.

Result clearly demonstrate that low income was the cause of anemia prevalence among female population. The results were consistent with several studies conducted across the globe and in Pakistan (Hyder, 2004; Dhakal et al. 2006; Sharma et al., 2007; Rao et al., 2007; Batool, 2010; Habib 2013; Sadeghian et al. 2013; Harding et al. 2017).

Hypothesis 4: Occupation is likely to be associated with the anemia prevalence.

4.1 Occupations of married women and her husband are associated with the anemia prevalence among married women.

4.2 Parental occupation is associated with the anemia prevalence among adolescent girls.

Occupation is strongly related to income and is directly associated with the material living standards and enhancing health facilities (Galobardes et al., 2006; Fujishiro et al., 2010). In the table 4.85, results of bivariate analysis to find the association of the respondent and her husband's occupation with prevalence of anemia are shown. It is evident that majority of women (78.1%) were house wives. Among professional women, majority (9.3%) were government employees, followed by 6.2% serving in private sector and 5.4% were self-employed and a negligible proportion doing laborer/other jobs. The prevalence of anemia among women who were serving in the government sector is lower than other professions. The odds of anemia were 2.31, 2.86, 1.66 and 2.9 times among house wives, doing private service, self-employed and laborers/others respectively

Table 4.85

Association of respondent and her husband's occupation with anemia severity among married women.

Occupation	Normal %(f)	Mild %(f)	Moderate %(f)	Severe %(f)	Total %(f)	Odd Ratio
Association of respondent's occupation with anemia severity						
House wife	38.9(274)	21.7(153)	34.5(245)	4.7(33)	78.1(705)	2.31
Government service	59.5(50)	17.9(15)	20.2(17)	2.4(2)	9.3(84)	Reference
Private service	33.9(19)	25.0(14)	37.5(21)	3.6(2)	6.2(56)	2.86
Self employed	46.9(23)	18.4(9)	28.6(14)	6.1(3)	5.4(49)	1.66
Laborer/Others	33.3(3)	11.1(1)	55.6(5)	0.0(0)	0.1(9)	2.9
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100.0(903)	
Chi-Square=18.98	p-value=0.09		Gamma=-0.117	p-value=0.05		
Association of respondent husband's occupation with anemia severity						
Government service	43.5(134)	19.5(60)	33.1(102)	3.9(12)	34.1(308)	Reference
Private service	45.5(102)	21.0(47)	29.0(65)	4.5(10)	24.8(224)	0.92
Businessman	44.2(80)	26.5(48)	27.1(49)	2.2(4)	20.0(181)	0.97
Skilled Laborer	29.6(24)	19.8(16)	48.1(39)	2.5(2)	9.0(81)	1.83
Laborer/Others	26.6(29)	19.3(21)	43.1(47)	11.0(12)	12.1(109)	2.12
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100.0(903)	
Chi-Square=38.63	p-value=0.0001		Gamma=-0.117		p-value=0.003	

compared to government servants. Chi-square values of (18.98) and significance level 0.09 did not show significant difference among women of different occupations. In AJK, women prefer to perform jobs in government sector and teaching jobs in the private sector, however, they have less opportunity to do business. The women doing jobs in the government sector are more educated, have good salary, consume adequate amount of food, utilize better healthcare services and thus have lower odds of anemia.

The second part of table reveals the association of the respondent husband's occupation and anemia prevalence among women. Majority of the respondent's husbands were associated with government jobs (34.1%), followed by jobs in private sector (24.8%), 20.0% were related to business sector, 12.1% were laborers/others and remaining 9.0% are skilled laborers. Anemia is considerably high among women whose husbands are laborers/others. Odds of anemia are 8% and 3% low for women whose husbands are doing private service and were businessmen respectively compared to those whose husbands were government servants. On the other hand, odd of anemia are 1.83 and 2.12 times more for those women whose husbands were skilled laborer and laborer/others respectively compared to government employees. Chi square value (38.63) and significance level (0.0001) showed significantly high association of anemia with respondent's occupation. The gamma value (0.117) showed the positive relation of respondent husband's occupation with the prevalence of anemia.

In table 4.86, association of parental occupation with anemia severity among adolescent girls is presented. The first part of table 4.86 revealed the association of adolescent girl's mother occupation and severity of anemia among them. The results indicate that majority of mothers were house wives (78.3%), followed by those doing jobs in the government sector (9.4%), 5.6% self-employed 2.9% were working in the private sectors. The percentage of mothers working in the low paid jobs was very small. The data depicts that women working in the government sector had considerably lower prevalence of anemia compared to other professions. Odds of anemia were 3.19, 4.02, 5.44 and 2.33 times more among adolescent girls whose mothers are house wives, doing private jobs, self-employed and laborers/others respectively compared to government employees.

Table 4.86

Association of parental occupation with anemia severity among adolescent girls

Profession	Normal %(f)	Mild %(f)	Moderate %(f)	Severe %(f)	Total %(f)	Odd Ratio
Association of respondent's mother occupation with anemia severity						
House wife	50.2 (246)	20.2(99)	26.9(132)	2.7(13)	78.3(490)	3.19
Government service	76.3(45)	16.9(10)	6.8(4)	0.0(0)	9.4(59)	Reference
Private service	44.4(8)	16.7(3)	27.8(5)	11.1(2)	2.9(18)	4.02
Self employed	37.1(13)	34.3(12)	28.6(10)	0.0(0)	5.6(35)	5.44
Laborer/Others	58.3(14)	16.7(4)	16.7(4)	8.3(2)	3.8(24)	2.33
Total	52.1(326)	20.4(128)	24.8(155)	2.7(17)	100.0(626)	
Chi-Square=32.35	p-value=0.001		Gamma=-0.126	Sig. level=0.092		
Association of respondent father's occupation with anemia severity						
Government service	57.1 (132)	19.5(45)	22.5(52)	0.9(2)	36.9(231)	Reference
Private service	40.6(58)	25.9(37)	30.8(44)	2.8(4)	22.8(143)	1.95
Businessman	57.7(64)	15.3(17)	21.6(24)	5.4(6)	17.7(111)	0.95
Skilled Laborer	66.7(32)	14.6(7)	14.6(7)	4.2(2)	7.7(48)	0.47
Laborer/Others	43.0(40)	23.7(22)	30.1(28)	3.2(3)	14.9(93)	1.77
Total	52.1(326)	20.4(128)	24.8(155)	2.7(17)	100.0(626)	
Chi-Square =26.16	Sig. level =0.010		Gamma=-0.068	Sig. level=0.166		

Chi square value (32.35) and significance level (0.001) revealed the significant association of the respondent's mother profession and anemia. The results are consistent with study (Kulkarni et al., 2013), which reported that anemia was less prevalent among adolescent girls with maternal occupation as service or business compared to those girls whose mothers are housewives or laborers.

The second part of table 4.86 reveals the association of adolescent girl's father profession and severity of anemia among them. The results indicated that majority of respondent fathers were doing jobs in the government sector (36.9%), followed by 22.8% working in the private sector, 17.7% were doing business and 7.7% were skilled laborers. The percentage of fathers working other jobs were very small. The results indicate that prevalence of anemia was considerably low among adolescent girls whose fathers were working in the government sector, doing business or are skilled laborers compared to other professions. Chi square value of 26.16 and significance level of 0.010 revealed the significant association between respondent's father profession and anemia prevalence among adolescent girls. Similar results are reported by Teji et al. (2016), which highlighted that nutritional status and hence the prevalence of anemia among adolescent girls is independently associated with occupation of father.

Hypothesis 5: Poor household and environmental factors are likely to be associated with anemia prevalence.

5.1 Respondents living in poor household and environmental conditions are more susceptible to anemia.

Table 4.87 reveals the association of household and environmental factors including household structure, latrine facility, sewerage system and garbage disposal with anemia prevalence among married women. The first part of table reveals the distribution of the women based on anemia severity living in different household structures. Majority of the respondents (60.2%) were living in houses built using reinforce concrete construction (RCC) structure. Compared with women living in RCC houses prevalence of anemia was 2.38 times higher for women living in

Table 4.87

Association of poor household and environmental factors with the anemia prevalence among married women.

Factors	Normal %(f)	Mild %(f)	Moderate %(f)	Severe %(f)	Total %(f)	Odd Ratio
Household structure						
RCC	42.8(233)	21.1(115)	32.0(174)	4.0(22)	60.2(544)	Reference
Mud	23.9(11)	17.4(8)	39.1(18)	19.6(9)	5.1(46)	2.38
Wooden	42.9(6)	28.6(4)	28.6(4)	0.0(0)	1.6(14)	1.00
Shelters	39.8(119)	21.7(65)	35.5(106)	3.0(9)	33.1(299)	1.13
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100.0(903)	
Chi-Square=31.76	p-value =0.0002		Gamma=0..69		p-value=0.05	
Proper latrine at home						
Yes	42.5(339)	21.4(171)	32.2(257)	3.9(31)	88.4(798)	Reference
No	28.6(30)	20.0(21)	42.9(45)	8.6(9)	11.6(105)	1.85
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100.0(903)	
Chi-Square=12.23	p-value=0.007	Gamma=0.271			p-value=0.001	
Sewerage system						
Open	32.2 (46)	19.6(28)	39.2(56)	9.1(13)	15.8(143)	Reference
Underground	42.5(323)	21.6(164)	32.4(246)	3.6(27)	84.2(760)	0.64
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100.0(903)	
Chi-Square=13.36	p-value=0.004	Gamma=-0.221			p-value=0.003	
Garbage disposal						
Burn	43.5(180)	19.8(82)	32.1(133)	4.6(19)	45.8(414)	Reference
Burry	41.9(13)	25.8(8)	25.8(8)	6.5(2)	3.4(31)	1.07
Municipality drums	41.2(21)	25.5(13)	29.4(15)	3.9(2)	5.6(51)	1.10
Collect outside	39.2(103)	21.3(56)	36.1(95)	3.4(6)	29.1(263)	1.19
Others	36.1(52)	22.9(33)	35.4(51)	5.6(8)	15.9(144)	1.36
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100.0(903)	
Chi-Square=38.15	p-value=0.004	Gamma=0.126		p-value=0.095		

mud houses and 1.13 times higher living in shelters. Chi square value (31.76) and significance level (0.0002) revealed significant association of anemia with household structure.

The second part of table 4.87 shows the association of proper latrine facility and anemia prevalence among married women. The odds of anemia were 1.85 times higher among women, who did not have proper latrine at home. Chi square value (12.23) and significance level (0.007) reveals significant association between latrine facility and anemia prevalence among women. The Gamma value (0.271) shows the significantly positive relation of improper latrine facility and anemia prevalence.

The third part of table 4.87 shows the association of type of sewerage system and anemia prevalence among married women. The odds of anemia were 36% less for the women who had underground sewerage systems compared to open sewerage system. Chi square value (13.36) and significance level (0.004) reveals significant association between type of sewerage system and anemia prevalence among women. Gamma value (-0.221) shows the negative relation of open sewerage system and anemia prevalence among respondents.

The fourth part of table 4.87 shows the association of mode of garbage disposal and anemia prevalence among married women. The odds of anemia were 1.07, 1.10, 1.19 and 1.36 times higher for the women who burry, dispose garbage in the municipality drums, collect outside or use any other mode of garbage disposal respectively compared to women who burn garbage. Chi square value (38.15) and significance level (0.004) revealed significant association between mode of garbage disposal and anemia prevalence among women. Gamma value (0.126) shows positive relation of other modes of garbage disposal and anemia prevalence among respondents compared to those who burn garbage.

Table 4.88 reveals the association of household and environmental factors including household, latrine facility, sewerage system and garbage disposal with anemia prevalence among adolescent girls. The first part of table shows the association of household structure and anemia prevalence among adolescent girls. Majority of girls almost (60.0%) were living in houses having RCC structure. Compared with girls living in RCC houses, prevalence of anemia was 3.15 times higher for women living in mud houses and 1.04 times higher living in shelters. Chi square value (10.07) and significance level (0.345) did not reveal significant association of anemia with household structure. The gamma value (0.16) shows the poor household structure was related to higher anemia prevalence among respondents.

The second part of the table 4.88 displays association of the proper latrine facility and anemia prevalence among adolescent girls. The odds of anemia were 1.15 times higher among girls, who did not have proper latrine. Chi square value (4.261) and significance level (0.235) did not reveal significant association between latrine facility and anemia prevalence among women. Gamma value (0.090) showed the positive relation of improper latrine facility and anemia prevalence, however relationship is not significant.

The third part of table 4.88 shows the association of type of sewerage system and anemia prevalence among girls. The odds of anemia were 16% less for the girls who had underground sewerage systems compared to open sewerage system. Chi square value (11.01) and significance level (0.012) revealed significant association between type of sewerage system and anemia prevalence among girls. Gamma value (-0.258) showed the negative relation of open sewerage system and anemia prevalence among respondents.

The fourth part of table 4.88 shows the association of mode of garbage disposal and anemia prevalence among adolescent girls. The odds of anemia were 51%, 48% and 23% less for the girls

Table 4.88

Association of poor household and environmental factors with the anemia prevalence among adolescent girls

Factors	Normal %(f)	Mild %(f)	Moderate %(f)	Severe %(f)	Total %(f)	Odd Ratio
Household structure						
RCC	52.9 (198)	20.1(75)	23.8(89)	3.2(12)	59.7(374)	Reference
Mud	26.3(5)	36.8(7)	36.8(7)	0.0(0)	3.0(19)	3.15
Wooden	83.3(5)	0.0(0)	16.7(1)	0.0(0)	1.0(6)	0.23
Shelters	52.0(118)	20.3(46)	25.6(58)	2.2(5)	36.3(227)	1.04
Total	52.1(326)	20.4(128)	24.8(155)	2.7(17)	100.0(626)	
Chi-Square = 10.07	Sig. level =0.345		Gamma=0.16		Sig. level=0.803	
Proper latrine at home						
Yes	52.3 (304)	20.8(121)	23.9(139)	2.9(17)	92.8(581)	Reference
No	48.9(22)	15.6(7)	35.6(16)	0.0(0)	7.2(45)	1.15
Total	52.1(326)	20.4(128)	24.8(155)	2.7(17)	100.0(626)	
Chi-Square =4.261	Sig. level =0.235		Gamma=0.090		Sig. level=0.503	
Sewerage system						
Open	36.9 (38)	20.8(20)	37.5(36)	2.1(2)	15.3(96)	Reference
Underground	54.3(288)	20.4(108)	22.5(119)	2.8(15)	84.7(530)	0.84
Total	52.1(326)	20.4(128)	24.8(155)	2.7(17)	100.0(626)	
Chi-Square =11.01	Sig. level =0.012		Gamma=-0.258		Sig. level=0.005	
Garbage disposal						
Burn	48.6 (153)	20.6(65)	27.3(86)	3.5(11)	50.5(315)	Reference
Burry	65.8(25)	10.5(4)	23.7(9)	0.0(0)	6.1(38)	0.49
Municipality drums	64.3(36)	12.5(7)	23.2(13)	0.0(0)	8.9(56)	0.52
Collect outside	55.1(86)	23.1(36)	19.2(30)	2.6(4)	24.9(156)	0.77
Others	42.6(26)	26.2(16)	27.9(17)	3.3(2)	9.7(61)	1.27
Total	52.1(326)	20.4(128)	24.8(155)	2.7(17)	100.0(626)	

Chi-Square = 16.53	Sig. level =0.168	Gamma=-0.059	Sig. level=0.279

who burry, dispose garbage in the municipality drums and collect outside. Chi square value (16.53) and significance level (0.168) did not reveal significant association between mode of garbage disposal and anemia prevalence among adolescent girls. Gamma value -0.059 showed relation of garbage disposed by burying or in municipality drums and anemia prevalence among respondents compared to those who burn garbage. Similar results are reported by Baranwal et al. (2014) that anemia is high among children who have no toilet facility, lived in Kucha or semi pucca house. Better household and environmental conditions reduce parasitic infections among adolescents that results in the decrease of anemia prevalence among them.

4.2.2. Demographic variables

Hypothesis 6: Age at marriage is likely to be associated with the anemia prevalence and its severity.

6.1 Lower the age at marriage, higher is the anemia prevalence among married women.

Age at marriage is an important determinant of anemia and other related reproductive health problems among female. Early age marriage, repeated pregnancies, less birth interval, limited participation in decision making and less control over economic resources are responsible for higher anemia among WRA in Pakistan (Batool, 2010). In table 4.89 association of respondents age at marriage and anemia prevalence among them is presented. The data indicates that prevalence of anemia was considerably high among women married at the age <=18 years. The odds of anemia prevalence were 42%, 47% and 51% lesser in women who married at the age 19 to 25 years, 26 to 30 years and 30+years respectively compared to women who married at the age <=18 years. Chi square value (26.20) at p-value 0.002) revealed significant association of (age at

Table 4.89

Association of age at marriage with anemia prevalence among married women

Age at marriage	Normal %(f)	Mild %(f)	Moderate %(f)	Severe %(f)	Total % (f)	Odd Ratio
Up to 18 years	32.8(114)	19.8(69)	42.0(146)	5.5(19)	38.5(348)	Reference
19 to 25 years	45.5(207)	21.5(98)	28.6(130)	4.4(20)	50.4(455)	0.58
26 to 30 years	47.7(42)	25.0(22)	26.1(23)	1.1(1)	19.7.0(88)	0.53
30+ years	50.0(6)	25.0(3)	25.0(3)	0.0(0)	1.3(12)	0.49
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100.0(903)	
Chi-Square=26.20		p-value=0.002	Gamma=-0.226	p-value=1.23×10^{-6}		

marriage and anemia prevalence among married women. Gamma value (-0.0026) showed negative relation of women age and anemia prevalence among married women.

The results are similar to previous studies which aver that early marriage is a determinantal factor of anemia in mothers (Batool, 2010; Habib, 2013). Women who marry and bear first child before the age of 18 years are at higher risk of developing anemia compared to those who marry and bear children after the age of 20 years (Habib, 2013). Children of adolescent mothers (aged 12-14 or 15-17 years) are at higher risk of mortality in their first year of life compared to children who were born to women aged 27-29 (Finly et al., 2011).

Hypothesis 7: Body mass index (BMI) is likely to be associated with anemia prevalence.

7.1 Lower the BMI of the married women, higher is the prevalence of anemia.

7.2 Lower the BMI of the adolescent girls, higher is the prevalence of anemia.

In the table 4.90, association of BMI with anemia among respondent is shown. The first part of table 4.90 shows the association of BMI and anemia among women. The findings elucidate that anemia prevalence is very high among underweight women. Chi square value (38.15) and p-value (0.004) indicates significant association of BMI with anemia among women. The gamma value (-0.126) shows negative relation of BMI with anemia among women. The odds of anemia occurrence were 4%, 23% and 38% less among normal, overweight and obese women compared to underweight women.

The second part of table 4.90 reveals the association of BMI and anemia prevalence among adolescent girls. Chi square value (7.80) and significance level (0.554) reveals significant association

Table 4.90

Association of BMI with anemia severity among respondents

BMI	Normal %(f)	Mild %(f)	Moderate %(f)	Severe %(f)	Total %(f)	Odd Ratio
Association of BMI with anemia severity among married women						
Underweight	36.1 (22)	8.2(5)	47.5(29)	8.2(5)	6.8(61)	Reference
Normal	37.1(139)	21.9(82)	34.7(131)	6.1(23)	41.5(375)	0.96
Overweight	42.4(117)	22.8(63)	32.6(90)	2.2(6)	30.6(276)	0.77
Obese	47.6(91)	22.0(42)	27.2(52)	3.1(6)	21.2(191)	0.62
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100.0(903)	
Chi-Square=38.15	p-value =0.004		Gamma=-0.126		p-value=0.095	
Association of BMI with anemia severity among adolescent girls						
Underweight	53.2 (75)	22.0(31)	21.3(30)	3.5(5)	22.5(141)	Reference
Normal	51.1(226)	19.2(85)	27.1(120)	2.5(11)	70.6(442)	1.09
Overweight	55.9(19)	29.4(10)	11.8(4)	2.9(1)	5.4(34)	0.90
Obese	66.7(6)	22.2(2)	0.0(0)	11.1(1)	1.4(9)	0.57
Total	52.1(326)	20.4(128)	24.8(155)	2.7(17)	100.0(626)	
Chi-Square=7.80	p-value=0.554		Gamma=-0.014		p-value=0.176	

of BMI with anemia among girls. The gamma value (-0.014) showed marginally negative relation of BMI with anemia among girls. The odds of anemia occurrence were 10% and 43% less among overweight and obese girls compared to underweight girls.

Hypothesis 8: Family size is likely to be associated with anemia prevalence.

8.1 Higher the family size, higher is the anemia prevalence among respondents.

The first part of table 4.91 shows the association of family size and anemia prevalence among women. The odds of anemia were 1.43 and 1.59 times higher among women living in the family size of 5 to 8 and 8+ members compared to living in a family up to 4 members. Chi square value (7.17) and significance level (0.305) did not reveal the significant association between family size and prevalence of anemia among women. Gamma value (0.103) shows the positive relation of anemia prevalence among married women with increase in the number of family members, however this relationship is not significant.

The second part of table 4.91 shows the association of family size and anemia prevalence among adolescent girls. The odds of anemia were 26% less and 1.07 times higher among girls living in the family size of 5 to 8 and 8+ members compared to those living in a family up to 4 members. Chi square value (7.41) and significance level (0.285) did not reveal the significant association between family size and anemia among women.

Hypothesis 9: Menstruation is likely to be associated with anemia and its severity.

9.1 Menstruation for longer period is associated with the higher prevalence of anemia among respondents.

9.2 Heavy the blood loss during menstruation, higher is the anemia among respondents.

The abnormally prolonged bleeding during menstruation is called menorrhagia affects the physical, social, psychological and/or material life quality of the women (Karlsson et al., 2014;

Table 4.91

Association of family size with the prevalence of anemia among respondents

Factors	Normal %(f)	Mild %(f)	Moderate %(f)	Severe %(f)	Total %(f)	Odd Ratio
Association of family size with anemia prevalence among married women						
Up to 4	49.0(70)	18.2(26)	28.7(41)	4.2(6)	15.8(143)	Reference
5 to 8	40.1(211)	22.4(118)	33.7(177)	3.8(20)	58.3(526)	1.43
8+	37.6(88)	20.5(48)	35.9(84)	6.0(14)	25.9(234)	1.59
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100.0(903)	
Chi-Square=7.17	p-value=0.305		Gamma=0.103		p-value=0.035	
Association of family size with anemia prevalence among adolescent girls						
Up to 4	47.8(22)	22.1(12)	23.4(11)	2.2(1)	7.3(46)	Reference
5 to 8	55.3(219)	20.2(80)	22.0(87)	2.5(10)	63.3(396)	0.74
8+	46.2(85)	19.6(36)	31.0(57)	3.3(6)	24.9(184)	1.07
Total	52.1(326)	20.4(128)	24.8(155)	2.7(17)	100.0(626)	
Chi-Square=7.41	p-value =0.285		Gamma=-0.118	p-value=0.068		

NICE, 2007; NICE, 2018). Table 4.92 reveals the association of menstrual duration and blood loss with anemia prevalence. The first part of table shows the association of menstrual duration and anemia among married women. The odds of anemia were 1.11 and 1.50 times higher among women who menstruate 4 to 5 days and 5+ days compared to those who menstruate 2 to 3 days. Chi square value (9.57) and significance level (0.378) did not reveal significant association of anemia with menstruation duration among the women. Gamma value (0.074) showed the positive

Table 4.92

Association of menstruation with the prevalence of anemia among respondents

Factors	Normal %(f)	Mild %(f)	Moderate %(f)	Severe %(f)	Total %(f)	Odd Ratio
Duration of menstruation among married women						
No menstruation	38.2(21)	14.5(8)	41.8(23)	5.5(3)	6.1(55)	Reference
2 to 3 days	45.4(89)	21.9(43)	29.6(58)	3.1(6)	21.7(196)	0.73
4 to 5 days	42.9(157)	20.5(75)	32.5(119)	4.4(15)	40.5(366)	1.11
More than 5 days	35.7(102)	23.1(66)	35.7(102)	5.6(16)	31.7(286)	1.50
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100.0(903)	
Chi-Square=9.57	p-value=0.378		Gamma=0.074		p-value=0.084	
Heavy blood loss among married women						
Yes	26.6(65)	22.1(54)	41.8(102)	9.4(23)	27.0(244)	Reference
No	46.1(304)	20.9(138)	30.3(200)	2.6(17)	73.0(659)	0.66
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100.0(903)	
Chi-Square=12.23	p-value =0.007		Gamma=0.271		p-value=0.001	
Duration of menstruation among adolescent girls						
No menstruation	64.7(66)	18.6(19)	16.7(17)	0.0(0)	16.3(102)	Reference
2 to 3 days	65.3(44)	19.4(13)	14.9(10)	0.0(0)	10.7(67)	0.96
4 to 5 days	52.2(119)	20.2(46)	25.4(58)	2.2(5)	36.4(228)	1.68
More than 5 days	42.4(97)	21.8(50)	30.6(70)	5.2(12)	36.6(229)	2.49
Total	52.1(326)	20.4(128)	24.8(155)	2.7(17)	100.0(626)	
Chi-Square=28.75	p-value =0.001		Gamma=0.263		p-value=2.84×10^{-7}	
Heavy blood loss among adolescent girls						
Yes	40.6(56)	28.3(39)	25.4(35)	5.8(8)	22.0(138)	Reference
No	55.3(270)	18.2(89)	24.6(120)	1.8(9)	78.0(488)	0.55
Total	52.1(326)	20.4(128)	24.8(155)	2.7(17)	100.0(626)	
Chi-Square=15.99	p-value =0.001		Gamma=0.271		p-value=0.007	

relation of anemia prevalence among married women with the increase in menstrual duration, however this relationship was not significant.

The second part of table 4.92 reveals the association of heavy menstrual blood loss (MBL) and anemia prevalence among married women. The odds of anemia were 34% less among women who did not suffer with heavy bleeding during menstruation. Chi square value (12.23) and significance level (0.007) revealed significant association of anemia with heavy MBL among married women. Gamma value (0.271) showed the positive relation of heavy MBL with anemia prevalence among married women. The results were in line with the study of Batool (2010), who reported that heavy MBL is significantly associated with anemia in Pakistan.

The third part of table 4.92 shows the association of menstrual duration and prevalence of anemia among adolescent girls. The odds of anemia were 1.68 and 2.49 times higher among girls who menstruate 4 to 5 days and 5+ days compared to those who are not menstruating. Chi square value of (28.75) and p-value (0.001) revealed the significant association of anemia with menstruation duration among adolescent girls. Gamma value (0.263) showed the positive relation of anemia prevalence among adolescent girls with the increase in menstrual duration.

The fourth part of table 4.92 shows the association of heavy menstrual blood loss (MBL) and prevalence of anemia among adolescent girls. The odds of anemia were 45% less among adolescent girls who did not suffer from heavy bleeding during menstruation. Chi square value (15.99) and significance level (0.001) revealed significant association of anemia with heavy MBL among adolescent girls. Gamma value (0.271) showed the positive relation of heavy MBL with anemia prevalence among adolescent girls. The results are in line with the study of Toheed et al. (2017), who explored that abnormally heavy MBL is an important risk factor of anemia among adolescent girls in Pakistan.

Hypothesis 10: Number of pregnancies and pregnancy related factors are likely to be associated with the anemia prevalence among married women.

10.1 More pregnancies are associated with the higher anemia among married women.

10.2 More number of live births are associated with higher anemia among married women.

10.3 Higher the number of abortions/still birth, higher is the anemia among married women.

10.4 Lower the average birth interval in all pregnancies, higher is the anemia in the married women.

Repeated pregnancy is the main reason of blood loss and vitamin A deficiency among WRA (WHO, 1992). Repeated pregnancies and successive miscarriages are major causes of anemia and low Hb level in women of developing countries (Vora & Gruslin,1998). Table 4.93 shows results of bivariate analysis to reveal the association of repeated pregnancies and pregnancy related outcomes with anemia among married women. The first part of table reveals the association of repeated pregnancies and anemia prevalence among married women. The odds of anemia are (1.59) and 2.43 times more among women having 4 to 6 and 6+ pregnancies respectively compared to those having 1 to 3 pregnancies. Chi square value of (33.84) and p-value (7.22×10^{-6}) reveals significant association of anemia with repeated pregnancies among married women. Gamma value (0.240) shows the positive relation of repeated pregnancies with anemia prevalence among women. The findings are consistent with previous studies which identified that repeated pregnancies are highly associated with the prevalence of anemia among married women (Batool, 2010; Habib, 2013; Taner et al., 2015; Umar et al., 2015; Tayade et al., 2018).

The second part of table 4.93 shows the association of number of abortions/miscarriages with prevalence of anemia among married women. The odds of anemia are 1.25 and 1.29 times more among women who had one or more than one abortions/miscarriages compared to those who

Table 4.93

Association of number of pregnancies and pregnancy outcomes with the prevalence of anemia among respondents

Factors	Normal %(f)	Mild %(f)	Moderate %(f)	Severe %(f)	Total %(f)	Odd Ratio
Number of pregnancies						
1 to 3	48.9(180)	20.9(77)	26.9(99)	3.3(12)	40.8(368)	Reference
4 to 6	37.6(148)	23.6 (93)	34.8(137)	4.1(16)	43.6(394)	1.59
6+	29.1(41)	15.6(22)	46.8(66)	8.5(12)	15.6(141)	2.43
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100.0(903)	
Chi-Square=33.84	p-value=7.22×10^{-6}		Gamma=0.240		p-value=1.49×10^{-7}	
Number of abortions/miscarriages						
None	42.9(246)	21.3(122)	31.1(178)	4.7(27)	63.5(573)	Reference
One	37.6(74)	23.4(46)	36.0(71)	3.0(6)	21.8(197)	1.25
More than one	36.8(49)	18.0(24)	39.8(53)	5.3(7)	14.7(133)	1.29
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100.0(903)	
Chi-Square=6.87	p-value=0.333		Gamma=0.091		p-value=0.070	
Number of live births						
1 to 2	48.0(145)	21.9(66)	26.8(81)	3.3(10)	33.4(302)	Reference
3 to 4	41.1(151)	22.6(83)	33.2(122)	3.0(11)	40.6(367)	1.32
4+	31.2(73)	18.4(43)	42.3(99)	8.1(19)	25.9(234)	2.04
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100.0(903)	
Chi-Square= 29.63	p-value=4.63×10^{-5}		Gamma=0.213		p-value=1.33×10^{-6}	
Average birth interval in all pregnancies						
< 1 years	25.5(14)	18.2(10)	49.1(27)	7.3(4)	6.1(55)	Reference
1 to 2 years	35.6(175)	20.3(100)	38.2(188)	5.9(29)	54.5(492)	0.42
> 2 years	49.8(139)	23.7(66)	24.4(68)	2.2(6)	30.9(279)	0.34
N.A.	53.2(41)	20.8(16)	24.7(19)	1.3(1)	8.5(77)	0.22
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100.0(903)	
Chi-Square=40.51	p-value=6.13×10^{-6}		Gamma= -0.284		p-value=2.03×10^{-10}	

had none. Chi square value (6.87) at significance level (0.333) did not reveal significant association of anemia with number of abortions/miscarriages among married women. Gamma value (0.091) shows the positive relation of number of abortions/miscarriages with anemia prevalence among married women.

The third part of table 4.93 shows the association of number of live births with anemia prevalence among married women. The odds of anemia are 1.32 and 2.04 times more among women who had 3 to 4 and 4+ child births than those who had 1 to 2 child births. Chi square value (29.63) at significance level (4.63×10^{-5}) reveals significant association of anemia with number of live births among women. Gamma value (0.213) showed the positive relation of number of live births with anemia prevalence among married women.

The fourth part of table 4.93 shows the association of number of average birth interval with anemia among married women. The odds of anemia were 58% and 66% less among women who had birth interval 1 to 2 years and >2 years respectively. The odds of anemia were 78% less among those who had only one child (birth interval is not applicable). Chi square value (40.51) at significance level (6.13×10^{-6}) revealed significant association of anemia with average birth interval. Gamma value (-0.284) shows the negative relation of average birth interval with anemia prevalence among married women.

Hypothesis 11: Utilization of healthcare services are likely to be associated with anemia.

11.1 Higher the number of prenatal and postnatal care visits, lower is the anemia in the women.

11.2 Higher the number of healthcare visits of adolescent girls, lower is the anemia.

The utilization of health care is critical for early identification of health issues for taking timely preventive measures. It is important for all women, particularly among women of reproductive age before and after child birth. The utilization of prenatal care is directly associated with improved pregnancy and birth outcomes, decrease in child mortality and malnourishment (Kuhnt & Vollmer, 2017). The postnatal period is critical for both mothers and newborns during which major changes occur and determine their well-being (WHO, 2013). In Pakistan due to hesitation, female especially adolescent girls do not share menstruation related issues with family and healthcare providers, which further worsen the implications of menstrual dysfunction (Batool, 2010; Toheed et al., 2017) that may be associated with anemia among them.

In the table 4.94, results of bivariate analysis to reveal the association of healthcare utilization with anemia prevalence among married women and adolescent girls are detailed. Among married women association of anemia with the utilization of healthcare services during prenatal and postal period were investigated, whereas, among adolescent girls, association of anemia with utilization of general healthcare services were investigated. The first part of table shows the association of prenatal care visits of married women with anemia prevalence. The results elucidate that anemia was highest among women who did not visit the healthcare facility for prenatal care. The odds of anemia were 48%, 53% and 59% less among women who had 1 to 3, 4 to 6 and 6+ prenatal care visits respectively than those who did not visit for prenatal care. Chi square value (25.98) at significance level (0.002) revealed the significant association of anemia with number of prenatal care visits made by women. Gamma value (-0.169) showed the negative relationship between number of prenatal care visits and anemia among respondents.

The second part of table 4.94 shows the association of postnatal care visits with anemia among women. The odds of anemia were 7%, 1% and 56% less among women who had 1 to 2, 3 to 4 and 4+ postnatal care visits respectively than those who did not visit for postnatal care. The Chi square value (6.73) at significance level (0.666) did not reveal significant association of anemia

Table 4.94

Association between utilization of healthcare services and anemia among respondents

Healthcare Visits	Normal %(f)	Mild %(f)	Moderate %(f)	Severe %(f)	Total %(f)	Odd Ratio
Prenatal care visits of women						
None	25.3(23)	19.8(18)	46.2(42)	8.8(8)	10.1(91)	Reference
1 to 3	39.2(107)	19.8(54)	35.9(98)	5.1(42)	30.2(273)	0.52
4 to 6	42.1(72)	21.6 (37)	29.8(51)	6.4(11)	18.9(171)	0.47
6+	45.4(167)	22.6(83)	30.2(111)	1.9(7)	40.8(368)	0.41
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100.0(903)	
Chi-Square=25.98	p-value=0.002		Gamma=-0.169		p-value=4.13×10^{-5}	
Postnatal care visits of women						
None	39.9(232)	21.0(122)	31.1(201)	4.6(27)	64.5(582)	Reference
1 to 2 times	41.6(101)	24.3(59)	30.0(73)	4.1(10)	26.9(243)	0.93
3 to 4 times	40.0(18)	15.6(7)	40.0(18)	4.4(2)	5.0(45)	0.99
More than 4 times	54.5(18)	12.1(4)	30.3(10)	3.0(1)	3.7(33)	0.44
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100.0(903)	
Chi-Square=6.73	p-value=0.666		Gamma=-0.055		p-value=0.290	
Visits of adolescent girls for healthcare utilization						
Not at all	32.6(14)	32.6(14)	32.6(14)	2.3(1)	6.9(43)	Reference
Sometimes	51.6(244)	20.1(95)	25.8(122)	2.5(12)	75.6(473)	0.45
Often	61.8(68)	17.3(19)	17.3(19)	3.6(4)	17.6(110)	0.30
Total	52.1(326)	20.4(128)	24.8(155)	2.7(17)	100.0(626)	
Chi-Square=13.00	p-value=0.043		Gamma= -0.209		p-value=0.004	

with number of postnatal care visits made by women. Gamma value (-0.055) shows the negative relationship between number of postnatal care visits and occurrence of anemia among respondents.

The third part of table 4.94 shows the association of healthcare visits made by the adolescent girls with anemia prevalence. High majority (93.1%) girls avail the healthcare service, when they suffer from health issue. The odds of anemia were 55% and 70% less among girls who had visited healthcare facility sometimes and often respectively than those who did not avail any healthcare facility. Chi square value (13.00) at significance level (0.043) revealed the significant association of anemia with number of healthcare facility visits made by the adolescent girls. Gamma value (-0.209) showed the negative relationship between number of healthcare facility visits and anemia among adolescent girls.

Hypothesis 12: Birth order is likely to be associated with the anemia among adolescents.

12.1 Higher the birth order, higher is the anemia prevalence among adolescent girls.

Birth order is detrimental factor of anemia prevalence among adolescent girls (Goyal and Rawat, 2018). In table 4.95, results of bivariate analysis to reveal the association of birth order

Table 4.95

Association between birth order and occurrence of anemia among adolescent girls

Birth Order	Normal %(f)	Mild %(f)	Moderate %(f)	Severe %(f)	Total %(f)	Odd Ratio
1 to 2	55.0(154)	20.4(57)	22.5(63)	2.1(6)	44.7(280)	Reference
3 to 4	51.4(112)	19.3(42)	22.2(55)	4.1(9)	34.8(215)	1.12
4+	46.9(60)	22.7(29)	28.9(37)	1.6(2)	20.5(128)	1.39
Total	52.1(326)	20.4(128)	24.8(155)	2.7(17)	100.0(626)	
Chi-Square=5.63	p-value=0.463		Gamma= 0.090		p-value=0.105	

with the occurrence of anemia among respondents are presented. The odds of anemia were 1.12 and 1.39 times more among girls having birth order 3 to 4 and 4+ respectively compared to girls having birth order 1 to 2. Chi square value (5.63) at significance level (0.463) did not reveal the significant association of anemia with respondent's birth order. Gamma value (0.090) shows the positive relationship of birth order with the anemia among adolescent girls. Although prevalence of anemia increased with the birth order of the respondents, however, the data depicts that birth order was not significantly associated with anemia prevalence among respondents.

Hypothesis 13: Communicable diseases are likely to be associated with the prevalence of anemia.

13.1 Higher the prevalence of communicable diseases, higher is the anemia.

Communicable diseases decrease the women immunity level especially during pregnancy causing miscarriage, low birth weight, pre-term birth and other related health afflictions (Khan, 1995). Table 4.96 displays results of bivariate analysis to reveal the association of communicable diseases with prevalence of anemia among married women. The respondents are asked questions about communicable diseases including cholera, pneumonia, measles, tetanus, diarrhea, tuberculosis cough, and polio. None of the respondents reported to suffer from polio, whereas prevalence of tetanus and tuberculosis was very small. The results are reported for communicable diseases cholera, pneumonia, measles, diarrhea, and cough only.

The first part of table 4.96 reveals the association of cholera with anemia prevalence among married women. Odds of anemia were 8% less among women who did not suffer from cholera. Chi square value (1.01) at significance level (0.798) did not reveal significant association of cholera with anemia prevalence among married women. Gamma value (0.248) shows the positive relationship between cholera and prevalence of anemia among respondents.

Table 4.96

Association of Communicable diseases with occurrence of anemia among married women

Communicable Diseases	Normal %(f)	Mild %(f)	Moderate %(f)	Severe %(f)	Total %(f)	Odd Ratio
Cholera						
Yes	39.1(52)	21.1(28)	33.8(45)	6.0(8)	14.7(133)	
No	41.2(317)	21.3 (164)	33.4(257)	4.2(32)	85.3(770)	0.92
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100.0(903)	
Chi-Square=1.01	p-value=0.798		Gamma=0.048		Sig. level=0.528	
Pneumonia						
Yes	28.6(24)	16.7(14)	51.2(43)	3.6(3)	9.3(84)	
No	42.1(345)	21.7(178)	31.6(259)	4.5(37)	90.7(819)	0.55
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100.0(903)	
Chi-Square=13.22	p-value=0.004		Gamma=0.268		p-value=0.004	
Measles						
Yes	15.4(4)	19.2(5)	65.4(17)	0.0(0)	2.9(26)	
No	41.6(365)	21.3(187)	32.5(285)	4.6(40)	97.1(877)	0.33
Total	52.1(326)	20.4(128)	24.4(155)	2.7(17)	100.0(626)	
Chi-Square=13.66	p-value=0.003		Gamma=0.441		p-value=0.004	
Diarrhea						
Yes	38.4(122)	22.0(70)	35.2(112)	4.4(14)	35.2(318)	
No	42.2(247)	20.9(122)	32.5(190)	4.4(26)	64.8(585)	0.85
Total	52.1(326)	20.4(128)	24.4(155)	2.7(17)	100.0(626)	
Chi-Square=1.34	p-value=0.719		Gamma=0.057		p-value=0.306	
Cough						
Yes	15.2(17)	17.9(20)	57.1(64)	9.8(11)	12.4(112)	
No	44.5(352)	21.7(172)	30.1(238)	3.7(29)	87.6(791)	0.22
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100.0(903)	
Chi-Square=51.20	p-value=4.43×10^{-11}		Gamma=0.539		p-value=4.18×10^{-12}	

The second part of table 4.96 reveals the association of pneumonia with anemia among married women. The odds of anemia were 45% less among women who did not suffer from pneumonia. Chi square value (13.22) at significance level (0.004) revealed significant association of pneumonia with anemia prevalence among married women. Gamma value (0.268) shows the positive relationship between pneumonia and prevalence of anemia among respondents.

The third part of table 4.96 revealed the association of measles with the anemia among married women. The odds of anemia were 67% less among women who did not suffer from measles. Chi square value (13.66) at significance level (0.003) revealed significant association of measles with anemia prevalence among married women. Gamma value (0.441) showed the positive relationship between measles and prevalence of anemia among married women.

The fourth part of table 4.96 showed the association of diarrhea with occurrence of anemia among married women. The odds of anemia were 15% less among women who did not suffer from diarrhea. Chi square value (1.34) at significance level (0.719) did not reveal significant association of diarrhea with anemia prevalence among married women. Gamma value (0.057) showed the positive relationship between diarrhea and prevalence of anemia among women. The fifth part of table 4.96 reveals the association of cough with prevalence of anemia in the married women. The odds of anemia are 78% less among women who did not suffer from cough. Chi square value (51.20) at significance level (4.43×10^{-11}) revealed highly significant association of cough with anemia prevalence among married women. Gamma value (0.539) shows the positive relationship between cough and prevalence of anemia among women.

Table 4.97 presents the results of bivariate analysis to reveal the association of communicable disease and anemia among adolescent girls. First part of table 4.97 reveals results to elucidate the association of cholera and anemia among girls. The odds of anemia were 34% less

Table 4.97

Association of Communicable diseases with prevalence of anemia among adolescent girls

Communicable Diseases	Normal %(f)	Mild %(f)	Moderate %(f)	Severe %(f)	Total %(f)	Odd Ratio
Cholera						
Yes	43.2(35)	22.2(18)	29.6(24)	4.9(4)	12.9(81)	
No	53.4(291)	20.2 (110)	24.0(131)	2.4(13)	87.1(545)	0.66
Total	52.1(326)	20.4(128)	24.4(155)	2.7(17)	100.0(626)	
Chi-Square=4.13	p-value=0.248		Gamma=-0.181		p-value=0.070	
Pneumonia						
Yes	26.3(15)	29.8(17)	33.3(19)	10.5(6)	9.1(57)	
No	54.7(311)	19.5(111)	23.9(136)	1.9(11)	90.9(569)	0.30
Total	52.1(326)	20.4(128)	24.4(155)	2.7(17)	100.0(626)	
Chi-Square=26.64	p-value=7.01×10^{-6}		Gamma=0.434		p-value=8.42×10^{-5}	
Measles						
Yes	46.9(15)	28.1(9)	25.0(8)	0.0(0)	5.1(32)	
No	52.4(311)	20.0(119)	24.70(147)	2.9(17)	94.9(594)	0.80
Total	52.1(326)	20.4(128)	24.4(155)	2.7(17)	100.0(626)	
Chi-Square=2.06	p-value=0.559		Gamma=0.032		Sig. level=0.824	
Diarrhea						
Yes	46.2(115)	24.1(60)	28.1(70)	1.6(4)	39.8(249)	
No	56.0(211)	18.0(68)	22.5(85)	2.6(5)	60.2(377)	0.68
Total	52.1(326)	20.4(128)	24.4(155)	2.7(17)	100.0(626)	
Chi-Square=9.19	p-value=0.027		Gamma=0.130		p-value=0.054	
Cough						
Yes	36.5(70)	28.1(54)	29.7(57)	5.7(11)	30.7(192)	
No	59.0(256)	17.1(74)	22.6(98)	1.4(6)	69.3(434)	0.40
Total	52.1(326)	20.4(128)	24.4(155)	2.7(17)	100.0(626)	
Chi-Square=32.93	p-value=3.33×10^{-7}		Gamma=0.339		p-value=6.33×10^{-7}	

among girls who were not suffering from cholera. Chi square value (4.13) at significance level (0.248) did not reveal significant association of cholera with anemia prevalence among adolescent girls. Gamma value (0.181) showed the positive relationship between cholera and occurrence of anemia among respondents.

The second part of table 4.97 reveals results to elucidate the association of pneumonia and anemia among girls. The odds of anemia were 70% less among girls who were not suffering from cholera. Chi square value (26.64) at significance level (7.01×10^{-6}) did not reveal significant association of pneumonia with anemia prevalence among adolescent girls. Gamma value (0.434) showed the positive relationship between pneumonia and occurrence of anemia among respondents.

The third part of table 4.97 reveals results to elucidate the association of measles and anemia among girls. The odds of anemia were 20% less among girls who were not suffering from measles. Chi square value (2.06) at significance level (0.559) did not reveal significant association of measles with anemia prevalence among adolescent girls. Gamma value (0.032) showed the positive relationship between measles and occurrence of anemia among respondents.

The fourth part of table 4.97 shows the association of diarrhea and anemia prevalence among adolescent girls. Odds of anemia are 32% less among girls who were not suffering from diarrhea. Chi square value (9.19) at significance level (0.027) revealed significant association of diarrhea with anemia prevalence among adolescent girls. Gamma value (0.130) showed the positive relationship between diarrhea and anemia among girls.

The fifth part of table 4.97 reveals the association of cough with prevalence of anemia among girls. The odds of anemia were 60% less among adolescent girls who were not suffering from cough. Chi square value (32.93) at significance level (3.33×10^{-7}) showed highly significant association of cough with anemia prevalence among girls. Gamma value (0.339) reveals positive relationship between cough and existence of anemia among adolescent girls.

The major communicable diseases causing anemia in Pakistan are pneumonia, influenzas tuberculosis, hepatitis C, and HIV/AIDS. These diseases reduce RBCs and cause sickle cell anemia in the mothers and their babies (Batool, 2010). Numerous studies have revealed a positive association between water born/communicable diseases and maternal as well as child anemia (Batool, 2010).

4.2.3. Cultural variables

Hypothesis 14: Knowledge and attitude towards contraceptive behavior is likely to be associated with anemia prevalence.

14.1 Higher the knowledge about contraceptive behavior, lower is the anemia among women.

14.2 Higher the attitude towards contraceptive behavior, lower is the anemia among women.

The contraception plays a vital role in decreasing number of pregnancies and hence the number of births, blood loss during delivery and improves reproductive health of women. The use of contraceptive methods by anemic women reduces the bleeding regarding safe maternity decisions and prevention (Behboudi-Gandevani, et al., 2015; WHO, 2015d). In table 4.98, results of bivariate analysis to reveal the association of knowledge and attitude towards contraceptive behavior with the occurrence of anemia among women are reported. The first part of the table shows the association of knowledge of the respondent about contraceptive methods with anemia prevalence among women. Majority of women had knowledge about contraception and its methods. The odds of anemia were 1.12 times more among women who had no knowledge of contraception and its methods. Chi square value (5.81) at significance level (0.121) did not reveal

Table 4.98

Association of knowledge and attitude towards contraceptive behavior with the prevalence of anemia among married women

Contraception	Normal %(f)	Mild %(f)	Moderate %(f)	Severe %(f)	Total %(f)	Odd Ratio
Knowledge about contraception and its methods						
Yes	41.0(351)	21.8(187)	32.9(282)	4.2(36)	94.8(856)	Reference
No	38.3(18)	10.6(5)	35.9(98)	5.1(42)	5.2(47)	1.12
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100(903)	
Chi-Square=5.81	p-value=0.121		Gamma=-0.161		p-value=0.218	
Contraceptive method used						
Yes	41.5(191)	22.2(102)	32.6(150)	3.7(17)	50.9(460)	Reference
No	40.2(178)	20.3(90)	34.3(152)	5.2(23)	49.1(443)	1.06
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100(903)	
Chi-Square=1.80	p-value=0.615		Gamma=-0.047		p-value=0.384	
If yes, which method used						
Oral pills	37.5(12)	12.5(4)	46.9(15)	3.1(1)	7.0(32)	Reference
Condoms	39.4(98)	22.9(57)	34.1(85)	3.6(9)	54.1(249)	0.92
Injections	43.4(33)	25.0(19)	27.6(21)	3.9(3)	6.5(76)	0.78
IUD Copper T	46.6(48)	21.4(22)	28.2 (29)	3.9(4)	22.4(103)	0.69
Total	41.5(191)	22.2(102)	32.6(150)	3.7(17)	100(460)	
Chi-Square=6.620	p-value=0.714		Gamma=-0.106		p-value=0.099	

the significant association of anemia with knowledge about contraception and its methods. Gamma value (-0.161) showed negative relationship between knowledge about contraception and its methods with the prevalence of anemia among respondents.

The second part of table 4.98 reveals the association of contraceptive prevalence rate (CPR) with the prevalence of anemia. The data depicts that CPR is 50.9% and there is a wide gap between CPR and knowledge about contraceptive (94.8%). Khawaja et al. (2004) also reported a wide gap between knowledge (97%) and contraceptive prevalence rate (28%) in Pakistan. The odds of anemia were 1.06 times more among women who did not use contraceptives compared to its users. Chi square value (1.80) at significance level (0.615) does not reveal the significant association of anemia with CPR among women. Gamma value (-0.047) showed the negative relationship between CPR and the prevalence of anemia among respondents, however this relation was not significant.

The third part of table 4.98 shows the association of contraception used with the anemia among married women. Majority of respondents used condoms and IUD Copper T for contraception. The odds of anemia are 8%, 22% and 31% less among women who use condoms, injections and IUD Copper-T compared to oral pills respectively. Chi square value (6.62) at significance level 0.714 did not reveal the significant association of anemia with contraceptive methods used among women. Gamma value -0.106 shows the negative relationship between contraceptive methods used and the prevalence of anemia among respondents, however this relation is not significant.

Hypothesis 15: Gender bias is likely to be associated with prevalence of anemia.

15.1 Higher the son preference, higher the prevalence of anemia.

15.2 Higher the gender preferences in food intake, higher the prevalence of anemia.

Gender preference is a complex phenomenon and it exists in various forms across different cultures in Pakistan (Atif et al., 2016). The sons are valued over daughters because women feel secure and earn more respect among family and society. The sons provide financial assistance, attract dowry and are considered helpful in old age. In our male dominant society, male member is given more preference in food intake and decision making as compared to female.

Table 4.99 shows the results of bivariate analysis to reveal the association of respondent's preferred gender and preference in food intake with the anemia among women. The first part of the table shows the association of respondent's preferred gender with anemia prevalence among women. Majority of women (58.0%) reported that gender does not matter for them, 28.3% preferred son and 13.7% daughters. The odds of anemia were 29% and 4% less among women, whose preferred gender is daughter and gender did not matter for them respectively compared to those whose preferred gender is son. Chi square value (5.83) at significance level (0.442) did not reveal the significant association of anemia with mother's preferred gender.

The second part of the table 4.99 shows the association of respondent's husband/family preferred gender with anemia prevalence among women. The odds of anemia were 15% and 11% less among women, whose husband/family's preferred gender was daughter and gender did not matter for them respectively compared to those whose preferred gender was son. Chi square value (6.07) at significance level (0.416) did not reveal the significant association of anemia with husband/family's preferred gender.

The third part of the table 4.99 shows the association of preference in food intake with the occurrence of anemia among women. Majority of women (59.3%) reported that both male and female should be given equal preference in food intake, 33.3% reported female and 7.4% male. The odds of anemia are 35% and 29% less among women, who were of the view that female should

Table 4.99

Association of respondent's preferred gender and preference in food intake with the prevalence of anemia among women

Preference	Normal %(f)	Mild %(f)	Moderate %(f)	Severe %(f)	Total %(f)	Odd Ratio
Respondent's preferred gender with the prevalence of anemia						
Son	39.2(100)	20.0(51)	37.3(95)	3.5(9)	28.3(255)	Reference
Daughter	47.6(59)	16.9 (21)	30.6(38)	4.8(6)	13.7(124)	0.71
Does not matter	40.1(210)	22.9(120)	32.3(169)	4.8(25)	58.0(524)	0.96
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100(903)	
Chi-Square=5.83	p-value=0.442		Gamma=-0.011		p-value=0.827	
Respondent's husband/family preferred gender with the prevalence of anemia						
Son	38.8(111)	19.2(55)	38.5(110)	3.5(10)	31.7(286)	Reference
Daughter	42.6(49)	19.1(22)	33.0(38)	5.8(6)	12.7(115)	0.85
Does not matter	41.6(209)	22.9(115)	30.7(154)	4.5(24)	55.6(502)	0.89
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100(903)	
Chi-Square=6.07	p-value=0.416		Gamma=--0.055		p-value=0.247	
Preference in food intake with anemia prevalence						
Male	32.8(22)	13.4(9)	47.8(32)	6.0(4)	7.4(67)	Reference
Female	42.9(129)	21.9(66)	29.9(90)	5.3(16)	33.3(301)	0.65
Both	40.7(218)	21.9(117)	33.6(180)	3.7(20)	59.2(535)	0.71
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100(903)	
Chi-Square=10.15	p-value=0.118		Gamma= -0.038		p-value=0.463	

be preferred in food intake and gender did not matter for them respectively compared to those preferred male family members in food intake. Chi square value (10.15) at significance level (0.118) does not reveal the significant association of preference in food intake with anemia prevalence among women.

Table 4.100 shows the results of bivariate analysis to reveal the association of respondent parent's preferred gender and preference in food intake with occurrence of anemia among adolescent girls. The first part of the table shows the association of respondent parent's preferred gender with anemia prevalence among adolescent girls. Majority of girls (58.6%) reported that gender does not matter for their parents, 21.6% reported son is preferred and 19.8% reported daughters. The odds of anemia were 30% and 18% less among women, whose parent's preferred gender were daughters and gender does not matter for them respectively compared to those whose preferred gender was son. Chi square value (6.82) at significance level (0.338) does not reveal the significant association of anemia with parental preferred gender.

The second part of the table 4.100 shows the association of respondent's family (other than parents) preferred gender with anemia prevalence among adolescent girls. The odds of anemia were 39% and 6% less among girls, whose family's preferred gender is daughter and gender does not matter for them respectively compared to those whose preferred gender is son. Chi square value 7.39 at significance level 0.286 did not reveal the significant association of anemia with family's preferred gender.

The third part of the table 4.100 shows the association of preference in food intake and anemia prevalence among adolescent girls. Majority of girls (61.5%) reported that both male and female should be given equal preference in food intake, 28.9% girls were the preferred female and 9.6% girls had viewpoint that male members should be given preference in food intake. The odds

Table 4.100

Association of son preference and preference in food intake with the anemia among adolescent girls

Factors	Normal %(f)	Mild %(f)	Moderate %(f)	Severe %(f)	Total %(f)	Odd Ratio
Association of parental gender preference with anemia among adolescent girls						
Son	47.7(64)	20.7(28)	28.1(38)	3.7(5)	21.6(135)	
Daughter	56.5(70)	24.2(30)	16.9(21)	2.4(3)	19.8(124)	0.70
Does not matter	52.3(192)	19.1(70)	26.2(96)	2.5(9)	58.6(367)	0.82
Total	52.1(326)	20.4(128)	24.8(155)	2.7(17)	100.0(626)	
Chi-Square=6.82	p-value=0.338		Gamma=--0.022		p-value=0.725	
Association of family's preferred gender with the anemia prevalence						
Son	49.4(89)	22.2(40)	24.4(44)	3.9(7)	28.8(180)	
Daughter	61.5(56)	12.1(11)	25.3(23)	1.1(1)	14.5(91)	0.61
Does not matter	51.0(181)	21.7(77)	24.8(88)	2.5(9)	56.7(355)	0.94
Total	52.1(326)	20.4(128)	24.8(155)	2.7(17)	100.0(626)	
Chi-Square=7.39	p-value=0.286		Gamma=--0.003		p-value=0.926	
Association of preference in food intake with anemia prevalence among adolescent girls						
Male	43.3(26)	16.7(10)	36.7(22)	3.3(2)	9.6(60)	
Female	53.0(96)	19.3(35)	25.4(46)	2.2(4)	28.9(181)	0.68
Both	53.0(204)	21.6(83)	22.6(87)	2.9(11)	61.5(385)	0.68
Total	52.1(326)	20.4(128)	24.8(155)	2.7(17)	100.0(626)	
Chi-Square=6.21	p-value=0.400		Gamma= -0.078		Sig. level p-value=	

of anemia are 32% and 32% less among girls, who are of the view that female should be preferred in food intake and gender does not matter for them respectively compared to those who preferred male family member in food intake. Chi square value (6.21) at significance level (0.40) did not reveal the significant association of preference in food intake with anemia among adolescent girls.

Hypothesis 16: Exercise is likely to be associated with anemia among respondents.

16.1 Regular exercise is associated with the lower anemia prevalence.

The effects of physical exercise/workout for reducing anemia have been explored in numerous studies (Bread & Tobin, 2000; Hu and Lin, 2012; Wouthuyzen-Bakker & van Assen, 2015; El Nahas & Gabr 2017). However, results are controversial due to the significant methodological limitations. In the table 4.101, the association of exercise with prevalence of anemia among respondents is explored based on their walking habits/exercise routine. The first part of table shows the relationship of exercise with occurrence of anemia among married women. Majority of women (57.7%) were not doing any exercise, 5.5% reported sometimes and 36.8% women reported often. The odds of anemia were 33% and 22% less among women who exercise sometime and often respectively than those women who are sedentary. Chi square value (3.87) at significance level (0.659) did not reveal significant association of physical workout with anemia prevalence among married women. The value of gamma (-0.078) showed the negative relationship of anemia and physical workout among respondents.

The second part of table 4.101 reveals the association of exercise with prevalence of anemia among adolescent girls. Majority of girls (49.5%) were sedentary, 7.0% perform exercise sometimes and 43.5% girls did so often. The odds of anemia were 62% and 40% less among girls who exercise/walk sometimes and often respectively than those who were sedentary. Chi square value (20.14) at significance level (0.003) reveals significant association of physical workout with anemia prevalence among adolescent girls. The value of gamma (-0.223) showed the negative relationship of anemia and exercise among respondents.

Table 4.101

Association of exercise with the prevalence of anemia

Factors	Normal %(f)	Mild %(f)	Moderate %(f)	Severe %(f)	Total %(f)	Odd Ratio
Married women						
Not at all	38.4(200)	22.3(116)	34.5(180)	4.8(25)	57.7(521)	Reference
Sometime	48.0(24)	16.0(8)	32.0(16)	4.0(2)	5.5(50)	0.67
Often	43.7(145)	20.5(68)	31.9(106)	3.9(13)	36.8(332)	0.78
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100(903)	
Chi-Square=3.87	p-value=0.659		Gamma=-0.078		p-value=0.127	
Adolescent girls						
Not at all	44.8(139)	21.0(65)	30.6(95)	3.5(11)	49.5(310)	Reference
Sometime	68.2(30)	15.9(7)	11.4(5)	4.5(2)	7.0(44)	0.38
Often	57.5(157)	20.6(56)	13.3(55)	1.5(4)	43.5(272)	0.60
Total	52.1(326)	20.4(128)	24.8(155)	2.7(17)	100.0(626)	
Chi-Square=20.14	p-value=0.003		Gamma=-0.223		p-value=0.0002	

The results are supported by literature (Hu & Lin, 2012; El Nahas & Gabr 2017), reporting that exercise training might be a potential, safe and cost-effective method for reducing anemia. However, intensive physical workout is reported to be a risk factor of developing IDA, particularly in young female (Bread & Tobin, 2000; Hu & Lin, 2012; Wouthuyzen-Bakker & van Assen, 2015). Since odds of anemia are less for respondents who perform physical workout “sometimes” compared to those performing it “often”. The findings clearly elucidate that less exhaustive physical workout might be more effective in reducing anemia compared to excessive/intensive workouts.

Hypothesis 17: Family type is likely to be associated with the prevalence of anemia.

17.1 Respondents living in nuclear family are less susceptible to develop anemia.

Table 4.102 reveals the association of family type with prevalence of anemia in respondents. The first part of table shows the association of family type and prevalence of anemia among married women. Chi square value (1.41) and significance level (0.703) did not reveal significant association of anemia with family type and anemia is equally prevalent in both family types. The outcome of the study rejects the hypothesis that women living in the nuclear family are less susceptible to anemia. Our results contradict with the study of Batool (2010), who reported that prevalence of moderate and severe anemia is high among women living in the joint family system. The disintegration of joint families and emergence of nuclear families may have imposed additional stress on the women in nuclear family that may have increased the prevalence of anemia among them.

The second part of table shows the association of family type and anemia among adolescent girls. The odds of anemia were 1.37 times higher among girls living in the nuclear family compared to those living in the joint family. Chi square value (3.89) and significance level (0.274) did not reveal significant association of anemia with family type. The outcome of the study rejects the hypothesis that girls living in the nuclear family are less susceptible to anemia.

Hypothesis 18: Family relationships and violence are likely to be associated with anemia.

18.1Good relationship with spouse and in-laws is associated with the lower anemia prevalence in married women.

18.2 Higher the violence on respondent, higher is the anemia.

The relation of women with her husband and in-laws depends on the communication patterns and attitudes, both of which are based on the socio-economic and cultural setups (Batool,

Table 4.102

Association of family type with the anemia among respondents

Factors	Normal %(f)	Mild %(f)	Moderate %(f)	Severe %(f)	Total %(f)	Odd Ratio
Association of family type with anemia prevalence among married women						
Nuclear	40.7 (202)	20.4(101)	33.9(168)	5.0(25)	57.9(496)	Reference
Joint	41.0(167)	22.0(91)	32.5(134)	4.1(15)	40.9(407)	0.99
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100.0(903)	
Chi-Square=1.41	p-value=0.703		Gamma=0.026		p-value=0.611	
Association of family type with anemia prevalence among adolescent girls						
Nuclear	54.1 (252)	20.2(94)	23.0(107)	2.8(13)	74.4(466)	Reference
Joint	46.3(74)	21.3(34)	30.0(48)	2.5(4)	25.6(160)	1.37
Total	52.1(326)	20.4(128)	24.8(155)	2.7(17)	100.0(626)	
Chi-Square=3.89	p-value=0.274		Gamma=-0.136		p-value=0.076	

2010). The conflict in household/family relationships often worsen by the actions of in-laws giving rise to tension between relation of women and her husband/in-laws. Table 4.103 reveals the association of family relationships with the anemia among married women. The first part of table reveals the association of respondent's relationship with her husband and occurrence of anemia among them. The odds of anemia were 1.74 and 4.25 times more among women who had tension with her husband to some extent and to great extent respectively compared to those who had no tension. Chi square value (61.19) at significance level (2.57×10^{-11}) showed significant association between respondent's relationship with her husband and prevalence of anemia among them. Gamma

Table 4.103

Association of family relationships with the occurrence of anemia among married women

Relationship	Normal %(f)	Mild %(f)	Moderate %(f)	Severe %(f)	Total %(f)	Odd Ratio
Relationship with husband						
No tension	49.5(201)	21.9(89)	26.1(106)	2.5(10)	45.0(406)	Reference
Some tension	36.0(156)	22.6(98)	36.5(158)	4.8(21)	48.0(433)	1.74
Full tension	18.8(12)	7.8(5)	59.4(38)	14.1(9)	7.0(64)	4.25
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100(903)	
Chi-Square=61.19	p-value=2.57×10^{-11}		Gamma=0.320		p-value=3.08×10^{-11}	
Relationship with in-laws						
No tension	44.2(258)	20.9(122)	31.0(181)	3.9(23)	64.7(584)	Reference
Some tension	37.0(102)	21.7(60)	36.2(100)	5.1(14)	30.6(276)	1.35
Full tension	20.9(9)	23.3 (10)	48.8(21)	7.0(3)	4.8(43)	2.99
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100(903)	
Chi-Square=12.87	p-value=0.045		Gamma=0.167		p-value=0.001	

value (0.320) showed the positive relationship of tension between respondent and her husband with prevalence of anemia among them.

The second part of table 4.103 revealed the association of respondent's relationship with her in-laws. The odds of anemia were 1.35 and 2.99 times more among women who had tension with their in-laws to some extent and to great extent respectively compared to those who had no tension. Chi square value (12.87) at significance level (0.045) showed significant association between respondent's relationship with her in-laws and prevalence of anemia among them. Gamma value (0.167) shows the positive relationship of tension between respondent and her in-laws with prevalence of anemia.

Domestic violence on women is exercised in many forms throughout the world but its exposure is high in South Asia. Domestic violence is a widespread problem in Pakistan, which is the most underreported form of violence committed against women (NIPS and ICF International, 2013). About 10% of women reported about facing violence during pregnancy and 52% of Pakistani women who experience domestic violence and never pursued for help or told about it to anyone (NIPS & ICF International, 2013).

Table 4.104 reveals the association of violence experienced by married women and adolescent girls with the anemia among them. The first part of table reveals the association of violence experienced by married woman from her husband and in-laws. The odds of anemia were 3.65 times more among women who experienced violence to some extent compared to those who did not experience violence from their in-laws and husband. Since only two respondents experienced violence to great extent, thus odd ratio was not computed to great extent response. Chi square value (50.85) at significance level (3.18×10^{-11}) shows significantly high association between violence experienced by the respondent and occurrence of anemia among them. Gamma value 0.517 shows the positive relationship between violence experienced by the women and anemia among them.

The second part of table 4.104 reveals the association of violence experienced by adolescent girls and prevalence of anemia among them. Since only 5 respondents experienced violence to great extent, thus odd ratio was not computed to great extent response. The odds of anemia were 1.24 times more among girls who experienced violence to some extent compared to those who never experienced violence. Chi square value (4.72) at significance level (0.580) did not reveal significant association between violence experienced by adolescent girls and prevalence of anemia among them. Gamma value (0.076) showed the positive relationship of violence experienced by girls and the prevalence of anemia among them.

Table 4.104

Association of violence with the prevalence of anemia among respondents

Violence	Normal %(f)	Mild %(f)	Moderate %(f)	Severe %(f)	Total % (f)	Odd Ratios
Married women						
Not at all	44.2(349)	22.1(174)	30.0(237)	3.7(29)	87.4(789)	
To some extent	17.9(20)	16.1(18)	56.3(63)	9.8(11)	12.4(112)	3.65
To great extent	0.0(0)	0.0(0)	100(2)	0.0(0)	0.2(2)	-
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100.0(903)	
Chi-Square=50.85	p-value=3.18×10^{-9}		Gamma=0.517		p-value=4.47×10^{-11}	
Adolescent girls						
Not at all	53.9(207)	20.3(78)	22.9(88)	2.9(11)	61.3(384)	Reference
To some extent	48.5(115)	20.7(49)	28.3(67)	2.5(6)	37.9(237)	1.24
To great extent	80.0(4)	20.0 (1)	0.0(0)	0.0(0)	0.8(5)	-
Total	52.1(326)	20.4(128)	24.8(155)	2.7(17)	100.0(626)	
Chi-Square=4.72	p-value=0.580	Gamma=0.076		p-value=0.266		

Hypothesis 19: Attitude towards cultural restriction of food during pregnancy and menstruation are likely to be associated with the anemia.

19.1 Higher attitude towards cultural restriction of utilizing certain foods during pregnancy and menstruation, higher the prevalence of anemia among married women.

19.2 Higher attitude towards cultural restriction of utilizing certain foods during menstruation, higher the prevalence of anemia among adolescent girls.

Poor dietary practices are associated with decreased adult work productivity, developmental issues, vulnerability to illness, intrauterine deaths and adverse pregnancy outcomes

(Lim et.al., 2012; WHO, 2015c). Dietary diversity is an important indicator for micronutrient adequacy in pregnant women. (Ali et al., 2014). Menarche is generally considered the sign of developing sexuality among girls, which is negatively perceived and experienced by them (Dasgupta and Sarkar, 2008). Among many misconceptions, alternations in the dietary practices such as avoiding the hot and cold intensity foods are based on their cultural and societal beliefs (Rizvi & Ali, 2016). The perception about hot and cold effects of food has prevailed in Pakistan and is being practiced by almost all the sectors of the society (Inam, 2003). Many of the foods avoided during menstruation/pregnancy are iron rich, which can increase the predisposition of developing anemia among women and adolescent girls.

In the table 4.105, association of attitude towards culturally restricted foods during pregnancy and menstruation with anemia among respondents is revealed. The first part of the table shows the association of attitude towards culturally restricted foods during pregnancy and prevalence of anemia among women (Chi square value 2.66, significance level 0.850). The odds of anemia were 20% and 9% less among women whose attitude towards culturally restricted foods was to some extent and to great extent respectively compared to those women whose response was not at all.

The second part of table reveals the association of attitude towards culturally restricted foods during menstruation and anemia among adolescent girls. The results did not reveal significant association of attitude towards culturally restricted foods during menstruation and prevalence of anemia among girls (Chi square value 5.58, significance level 0.472). The odds of anemia are 1.24 and 1.72 times more among girls whose attitude towards culturally restricted foods was to some extent and to great extent respectively compared to those whose response was not at all.

Table 4.105:

Association of attitude towards culturally restricted foods during pregnancy and menstruation with anemia among respondents

Relationship	Normal %(f)	Mild %(f)	Moderate %(f)	Severe %(f)	Total %(f)	Odd Ratios
Attitude towards culturally restricted of food during pregnancy and menstruation among married women						
Not at all	38.9(204)	21.4(112)	35.1(184)	4.6(24)	58.0(524)	Reference
To some extent	44.4(123)	20.9(58)	30.7(85)	4.0(11)	30.7(277)	0.80
To great extent	41.2(42)	21.6(22)	32.4(33)	4.9(5)	11.3(102)	0.91
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100.0(903)	
Chi-Square=2.66	p-value=0.850		Gamma=0.063		p-value=0.200	
Attitude towards culturally restricted of food during menstruation among adolescent girls						
Not at all	55.8(179)	19.0(61)	23.1(74)	2.2(7)	51.3(321)	Reference
To some extent	50.5(111)	21.4(47)	25.0(55)	3.2(7)	35.1(220)	1.24
To great extent	42.4(36)	23.5 (20)	30.6(26)	3.5(3)	13.6(85)	1.72
Total	52.1(326)	20.4(128)	24.8(155)	2.7(17)	100.0(626)	
Chi-Square=5.58	p-value=0.472		Gamma=0.126		p-value=0.031	

Hypothesis 20: Knowledge about anemia is likely to be associated with the anemia.

20.1 Higher the knowledge that anemia is a health problem, lower is the anemia prevalence.

20.2 Higher the knowledge about the symptoms of anemia as a health problem, lower is the anemia prevalence.

20.3 Higher the knowledge about the causes of anemia, lower the prevalence of anemia.

20.4 Higher the knowledge about the prevention of anemia, lower is the prevalence of anemia.

20.5 Higher the knowledge about the barriers in the treatment of anemia, lower the prevalence of anemia.

Knowledge about a disease, its detrimental factors, various symptoms, preventive measures and compulsory efforts are vital for devising the treatment and therapeutic interventions of any disease (Allen, 2000). A wide gap between knowledge of women about the anemia and its consequences on the women health, mismanagement in iron supplement supply and dissemination, fear of side effect, irregular and late start of prenatal care and other cultural dogmas are the major barriers in taking iron supplements (Dreyfuss, 1998).

In the table 4.106, results of bivariate analysis to reveal the association of knowledge about anemia as a health problem, symptoms of anemia, causes of anemia and barriers in the treatment of anemia with prevalence among women are presented. The first part of table shows the association of between respondent knowledge about the anemia and prevalence of anemia among them. High majority of the women (86.9%) knew that anemia is a health problem. Chi square value (1.35) and p-value (0.717) did not reveal significant association between knowledge about anemia as a health problem and its prevalence among women. The odds of anemia were (1.14) times more among women who did not have adequate knowledge about it. The gamma value (-0.070) shows the negative relationship of anemia prevalence with the knowledge of the respondent about anemia.

The second part of table 4.106 reveals the association of knowledge of the respondent about anemia symptoms and its prevalence among them. High percentage of the respondents (72.8%) had adequate knowledge about the anemia symptoms. Chi square value (11.91) and p-value (0.008) revealed significant association between knowledge of the women about anemia symptoms and its prevalence among them. The odds of anemia were 1.69 times more among women who did

Table 4.106

Association of the married women's knowledge about anemia, its symptoms, causes, preventive measures and barriers in treatment with prevalence of anemia among them

Knowledge about anemia	Normal %(f)	Mild %(f)	Moderate %(f)	Severe %(f)	Total %(f)	Odd Ratios
Anemia is a health problem						
Yes	41.3(324)	21.5(169)	32.7(257)	4.5(35)	86.9(785)	Reference
No	38.1(45)	19.5(23)	38.1(45)	4.2(5)	13.1(118)	1.14
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100.0(903)	
Chi-Square=1.35	p-value=0.717		Gamma=-0.070		p-value=0.384	
Symptoms of anemia						
Yes	43.8(288)	21.5(141)	30.4(200)	4.3(28)	72.8(657)	
No/little	32.9(81)	20.7(51)	41.5(102)	4.9(12)	27.2(246)	1.69
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100.0(903)	
Chi-Square=11.91	p-value=0.008		Gamma=-0.196		p-value=0.001	
Causes of anemia						
Yes	44.9(327)	21.8(159)	29.7(216)	3.6(26)	80.6(728)	
No/little	24.0(42)	18.9(33)	49.1(86)	8.0(14)	19.4(175)	2.58
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100.0(903)	
Chi-Square=37.94	p-value=2.91×10^{-8}		Gamma=-0.395		p-value=1.62×10^{-9}	
Preventive measures of anemia						
Yes	45.2(321)	21.8(155)	29.4(207)	3.8(27)	78.6(710)	
No/little	24.9(48)	19.2(37)	49.2(95)	6.7(13)	21.4(193)	2.49
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100.0(903)	
Chi-Square= 37.09	p-value=3.40×10^{-7}		Gamma=-0.376		p-value=2.06×10^{-9}	
Barriers in the treatment of anemia						
Yes	48.5(307)	22.3(141)	26.5(168)	2.7(17)	70.1(633)	
No/little	23.0(62)	18.9(51)	49.6(134)	8.5(23)	29.9(270)	3.16
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100.0(903)	
Chi-Square = 75.93	p-value=2.29×10^{-16}		Gamma=-0.476		p-value=1.06×10^{-18}	

not have adequate knowledge about anemia symptoms. Gamma value (-0.196) revealed the negative association between knowledge of the women about anemia symptoms and its prevalence among women.

The third part of table 4.106 reveals the association of married women's knowledge about the anemia causes and its prevalence among them. High majority of the women (80.6%) had knowledge about the anemia causes. Chi square value (37.94) and p-value (2.91×10^{-8}) revealed significant association between anemia prevalence and knowledge about its causes among married women. The odds of anemia were 2.58 times more among women who did not have adequate knowledge about the causes of anemia. The gamma value (-0.395) shows the negative relationship of anemia with the knowledge about the causes of anemia among women.

The fourth part of table 4.106 reveals the association of knowledge about the anemia preventive measures and its prevalence among married women. High percentage of women (78.6%) had knowledge about the preventive measures of anemia. Chi square value (37.09) and p-value (3.40×10^{-7}) revealed significant association between anemia prevalence and knowledge about the anemia preventive measures. Odds of anemia were 2.49 times more among women who do not have adequate knowledge about the anemia preventive measures. Gamma value (-0.376) indicates the negative relationship between respondent's knowledge about of anemia preventive measures and its prevalence among them.

The fifth part of table 4.106 reveals the association of knowledge about the barriers in the treatment of anemia and the prevalence of anemia among women. A good majority of the women (70.1%) had knowledge about the barriers in the treatment of anemia. Chi square value (75.93) and p-value (2.29×10^{-16}) revealed significant association between anemia prevalence and knowledge about the barriers in the treatment of anemia. Odds of anemia were 3.16 times more among women who did not have adequate knowledge about the barriers in the treatment of anemia. Gamma value (-0.476) demonstrations the negative relationship of knowledge about barriers in the treatment of anemia and its prevalence among women.

In the table 4.107, results of bivariate analysis to reveal the association of knowledge about anemia as a health problem, symptoms of anemia, causes of anemia and barriers in the treatment of anemia among adolescent girls are presented. First part of table shows the association of respondent's knowledge about the anemia as a health problem and its occurrence among them. High majority of the girls (80.5%) had knowledge about the anemia as a health problem. Chi square value (2.16) and p-value (0.539) did not reveal significant association between knowledge of the girls that anemia is a health problem and its occurrence among them. The odds of anemia were 1.15 times more among adolescent girls who did not have adequate knowledge that anemia is a health problem. Gamma value (-0.024) showed the negative relationship of knowledge of the girls that anemia is a health problem and its occurrence among them.

The second part of table 4.107 reveals the association of knowledge about anemia symptoms and its prevalence among adolescent girls. Majority of the girls (75.4%) had good knowledge about the anemia symptoms. Chi square value (1.47) and p-value (0.689) did not reveal significant association between anemia prevalence and knowledge about anemia symptoms among girls. The odds of anemia are 1.12 times more among adolescent girls who did not have adequate knowledge about symptoms of anemia. Gamma value (-0.019) showed the negative relationship of respondent's knowledge about anemia symptoms and occurrence of anemia among them.

The third part of table 4.107 reveals the association of knowledge about the causes of anemia and its prevalence among adolescent girls. Majority of the girls (59.1%) had adequate knowledge about the causes of anemia. Chi square value (3.13) and significance level (0.372) did

Table 4.107

Association of adolescent girl's knowledge about anemia, its symptoms, causes, preventive measures and barriers in treatment with its prevalence among them

Knowledge about anemia	Normal %(f)	Mild %(f)	Moderate %(f)	Severe %(f)	Total %(f)	Odd Ratios
Anemia is a health problem						
Yes	52.8(266)	19.4(98)	24.8(125)	3.0(15)	80.5(504)	Reference
No	49.2(60)	24.6 (30)	24.6(30)	1.6(2)	19.5(122)	1.15
Total	52.1(326)	20.4(128)	24.4(155)	2.7(17)	100.0(626)	
Chi-Square = 2.16	p-value=0.539		Gamma=-0.024		p-value=0.768	
Symptoms of anemia						
Yes	52.8(249)	19.5(92)	24.8(117)	3.0(14)	75.4(472)	Reference
No/little	50.0(77)	23.4(36)	24.7(38)	1.9(3)	24.6(154)	1.12
Total	52.1(326)	20.4(128)	24.4(155)	2.7(17)	100.0(626)	
Chi-Square =1.47	p-value=0.689		Gamma=-0.019		p-value=0.803	
Causes of anemia						
Yes	50.5(187)	20.0(74)	25.9(96)	3.5(13)	59.1(370)	Reference
No/little	54.3(139)	21.4(54)	23.0(59)	1.6(4)	40.9(256)	0.86
Total	52.1(326)	20.4(128)	24.4(155)	2.7(17)	100.0(626)	
Chi-Square=3.13	p-value=0.372		Gamma=0.088		p-value=0.199	
Preventive measures of anemia						
Yes	50.9(233)	20.5(94)	25.8(118)	2.8(13)	73.2(458)	Reference
No/little	55.4(93)	20.2(34)	22.0(37)	2.4(4)	26.8.4(168)	0.84
Total	52.1(326)	20.4(128)	24.4(155)	2.7(17)	100.0(626)	
Chi-Square = 1.27	p-value=0.737		Gamma=0.085		p-value=0.262	
Barriers in the treatment of anemia						
Yes	51.2(206)	20.1(81)	25.4(102)	3.2(13)	64.2(402)	Reference
No/little	53.6(120)	21.0(47)	23.7(53)	1.8(4)	35.8(224)	0.91
Total	52.1(326)	20.4(128)	24.4(155)	2.7(17)	100.0(626)	
Chi-Square=1.48	p-value=0.687		Gamma=0.056		p-value=0.420	

not reveal significant association between anemia prevalence and knowledge about the causes of anemia. The odds of anemia were 14 % less among girls who did not have adequate knowledge about the causes of anemia.

The fourth part of table 4.107 reveals the association of knowledge about the preventive measures of anemia and its prevalence among adolescent girls. Majority of the girls (73.2%) had good knowledge about the anemia preventive measures. Chi square value (1.27) and p-value (0.737) did not reveal significant association between girl's knowledge about the preventive measures of anemia and its prevalence among them. Odds of anemia were 16% less among girls who did not have adequate knowledge about the anemia preventive measures.

The fifth part of table 4.107 reveals the association of knowledge about the barriers in the treatment of anemia and its prevalence among adolescent girls. Majority of the girls (64.2%) had knowledge about the barriers in the treatment of anemia. Chi square value (1.48) and p-value (0.687) did not reveal significant association between anemia prevalence and knowledge about the barriers in the treatment of anemia. The odds of anemia were 9% more among girls who did not have adequate knowledge about the barriers in the treatment of anemia.

4.2.3. Nutritional variables

Hypothesis 21: Knowledge about balanced diet, regularity in food intake, use of food supplements, iron tables and pica are likely to be associated with anemia prevalence.

21.1 Higher the knowledge about balance diet, lower is the anemia prevalence.

21.2 Regularity in food intake, lower is the anemia prevalence.

21.3 Higher the utilization of food supplements, lower is the anemia prevalence.

21.4 Higher the utilization of iron tablets, lower is the anemia prevalence.

21.5 Utilization of pica increases the anemia prevalence.

The knowledge of balance diet, and nutrient rich food is important for people of all age groups especially teenagers and women of reproductive age. Eating habits of reproductive age women allow the early detection of specific nutritional deficiency, which can be corrected for improving women health quality and pregnancy outcomes (Sato et al., 2010). Nutritional deficits such as of iron and folate deficiencies in the body are major causes of maternal and child anemia in Pakistan (WHO, 1989).

In the table 4.108, results of bivariate analysis are presented to elucidate the association of knowledge about balanced diet and diet related factors with anemia prevalence among married women. The first part of table shows the data about the knowledge of balanced diet and prevalence of anemia among the women. Less than half (45.0%) women had no knowledge about the balanced diet. Chi square value (11.96) at significance level (0.008) revealed significant association of knowledge about balanced diet and prevalence of anemia among women. The gamma value 0.180 shows positive relationship between anemia prevalence and no/inadequate knowledge about balanced diet among respondents. The odds of anemia were 1.45 time more among women, who had no knowledge about balanced diet.

The second part of table 4.108 shows the association of regularity in food intake and prevalence of anemia among the women. More than 22% women did not take meals regularly. Chi square value (46.77) at significance level ($3.89\times10^{-11)}$ reveals significant association of regularity in food intake and prevalence of anemia among women. The gamma value (0.268) showed positive relationship between occurrence of anemia among women and irregularity in food intake. The odds of anemia were 2.75 times more among women, who were not taking meals regularly.

Table 4.108

Association of knowledge about balanced diet, regularity in food intake, use of food supplements, iron tablets and pica with the occurrence of anemia among married women

Parameter	Normal %(f)	Mild %(f)	Moderate %(f)	Severe %(f)	Total %(f)	Odd Ratio
Knowledge about balanced diet						
Yes	45.8(186)	21.9(89)	29.3(119)	3.0(12)	45.0(406)	Reference
No	36.8(183)	20.7(103)	36.8(183)	5.6(28)	55.0(497)	1.45
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100.0(903)	
Chi-Square = 11.96	p-value=0.008		Gamma=0.180		p-value=0.001	
Regularity in food intake						
Yes	45.8(322)	21.9(154)	28.9(203)	3.4(24)	77.9(703)	Reference
No	23.5(47)	19.0(38)	49.5(99)	8.0(16)	22.1(200)	2.75
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100.0(903)	
Chi-Square=46.77	p-value=3.89×10^{-11}		Gamma=0.268		p-value=1.28×10^{-11}	
Use of food supplements						
Yes	46.0(46)	24.0(24)	28.0(28)	2.0(2)	11.1(100)	Reference
No	40.2(323)	20.9(168)	34.1(274)	4.7(38)	88.9(803)	1.27
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100.0(903)	
Chi-Square=3.62	p-value=0.306		Gamma=0.142		p-value=0.088	
Intake of iron tablets						
Yes	43.9(61)	29.5(41)	24.5(34)	2.2(3)	15.4(139)	Reference
No	40.3(308)	19.8(151)	35.1(268)	4.8(37)	84.6(764)	1.16
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100.0(903)	
Chi-Square=11.48	p-value=0.009		Gamma=0.155		p-value=0.026	
Pica intake						
Yes	46.9(247)	22.6(119)	27.9(147)	2.7(14)	58.4(527)	Reference
No	32.4(122)	19.4(73)	41.2(155)	6.9(26)	41.6(376)	1.84
Total	40.9(369)	21.3(192)	33.4(302)	4.4(40)	100.0(903)	
Chi-Square=32.85	p-value=3.4×10^{-7}		Gamma=0.294		p-value=2.32×10^{-8}	

The third part of table 4.108 shows the association of use of food supplements and occurrence of anemia among the women. High majority of the women (88.9%) did not use food supplements and only 11.1% used them. The odds of anemia were 1.27 times more among women who did not use food supplements, however, the results did not reveal significant association between use of food supplements and prevalence of anemia among women (Chi square value 3.62, significance level 0.306). The gamma value 0.142 showed positive relationship between prevalence of anemia and use of food supplements.

The fourth part of table 4.108 shows the association of use of iron tablets and anemia prevalence among the women. Majority of women (84.6%) were not using iron tablets and only 15.6% were using them. The odds of anemia are 1.16 times higher among women who did not used iron tablets. The results of bivariate analysis revealed significant association between use of iron tablets and prevalence of anemia among women (Chi square value 11.48, significance level 0.009). The gamma value 0.155 showed positive relationship between anemia prevalence and use of iron tablets. The use of iron and dietary supplements can be helpful to lower the anemia prevalence among women. Numerous studies recommended to use dietary supplements during preconception and pregnancy for reducing the risk of adverse pregnancy and fetal outcomes associated with nutritional deficiencies (WHO, 2016b, McKenna et al., 2017). Nisar and Dibley (2014) aver that IFA supplementation played a significant role in reducing early neonatal deaths.

The fifth part of table 4.108 presents the association of pica intake and anemia prevalence among women. Majority of the women (58.4%) consumed or are currently consuming pica. The odds of anemia were 1.84 times more among women who were/are consuming pica. Chi square value (32.85) at significance level (3.4×10^{-7}) revealed significant association between pica intake and anemia among women. The gamma value (0.294) showed positive relationship between anemia prevalence and use of pica. Similar results were reported by Miao et al., (2015) who reported that the consumption of pica is significantly associated with increased risk for anemia and low hemoglobin level.

In the table 4.109, results of bivariate analysis are presented to elucidate the association of knowledge about balanced diet and diet related factors with the anemia among adolescent girls. The first part of the table shows data about the knowledge of balanced diet and anemia prevalence among adolescent girls. Sixty percent girls had no knowledge about the balanced diet. Chi square value (3.22) at significance level (0.358) did not reveal significant association of knowledge about balanced diet and prevalence of anemia among adolescent girls. The gamma value 0.012 shows positive relationship between anemia prevalence and no/inadequate knowledge about balanced diet among respondents. The odds of anemia are 1.05 time more among girls, who had no knowledge about balanced diet.

The second part of table 4.109 shows the association of regularity in food intake and occurrence of anemia among adolescent girls. More than 23% girls did not take meals regularly. Chi square value (17.85) at significance level significance level (4.72×10^{-4}) reveal the significant association of regularity in food intake and occurrence of anemia among adolescent girls. The gamma value 0.261 shows positive relationship between anemia prevalence and irregularity in food intake. The odds of anemia were 1.88 times higher among girls, who were not taking meals regularly.

The third part of table 4.109 shows the association food supplements use and anemia prevalence among adolescent girls. High majority of the adolescent girls (93.0%) did not consume food supplements and only 7.0% used them. The results reveal significant association between use of food supplements and prevalence of anemia among girls (Chi square value 10.99, significance

Table 4.109

Association of knowledge about balanced diet, regularity in food intake, use food supplements, iron tablets and pica with prevalence of anemia among adolescent girls

Parameter	Normal %(f)	Mild %(f)	Moderate %(f)	Severe %(f)	Total %(f)	Odd Ratios
Knowledge about balanced diet						
Yes	52.8(133)	17.5(44)	27.4(69)	2.4(6)	40.3(252)	Reference
No	51.6(193)	22.5 (84)	23.0(86)	2.9(11)	59.7(374)	1.05
Total	52.1(326)	20.4(128)	24.4(155)	2.7(17)	100.0(626)	
Chi-Square = 3.22	Sig. level =0.358		Gamma=-0.012		Sig. level=0.867	
Regularity in food intake						
Yes	55.7(267)	20.0(96)	21.1(101)	3.1(15)	76.5(479)	Reference
No	40.1(59)	21.8(32)	36.7(54)	1.4(2)	23.5(147)	1.88
Chi-Square =17.85	Sig. level =4.72×10^{-4}		Gamma=0.261		Sig. level=0.001	
Use of food supplements						
Yes	36.4(16)	20.5(9)	34.1(15)	9.1(4)	7.0(44)	Reference
No	53.3(310)	20.4(119)	24.1(140)	2.2(13)	93.0(582)	0.50
Chi-Square = 10.99	Sig. level =0.012		Gamma=-0.320		Sig. level=0.017	
Intake of iron tablets						
Yes	57.1(20)	5.7(2)	34.3(12)	2.9(1)	5.6(35)	Reference
No	51.8(306)	21.3(126)	24.2(143)	2.7(16)	94.4(591)	1.24
Chi-Square = 5.48	Sig. level =0.140		Gamma=-0.013		Sig. level=0.938	
Pica intake						
Yes	55.1(103)	18.7(35)	24.6(46)	1.6(3)	29.9(187)	Reference
No	50.8(223)	21.2(93)	24.8(109)	3.2(14)	70.1(439)	1.19
Total	52.1(326)	20.4(128)	24.4(155)	2.7(17)	100.0(626)	
Chi-Square = 2.07	Sig. level =0.558		Gamma=0.070		Sig. level=0.341	

level 0.012). The gamma value (0.320) showed positive relationship between prevalence of anemia and use of food supplements. The odds of anemia were 50% less among girls who did not use food supplements. The reason is that only those girls were using food supplements, who were suffering from anemia. Secondly, the authenticity of results is questionable due to the smaller proportion of girls consuming food supplements.

The fourth part of table 4.109 shows the association of use of iron tablets and anemia prevalence among adolescent girls. Majority of the girls (94.6%) were not using iron tablets and only 5.4% were using them. The odds of anemia were 1.24 times more among girls who did not use iron tablets. The results of bivariate analysis did not reveal significant association between use of iron tablets and prevalence of anemia among girls (Chi square value 5.48, significance level 0.140). The gamma value (0.013) showed positive relationship between anemia prevalence and use of iron tablets.

The fifth part of table 4.109 shows the association of pica intake and occurrence of anemia among adolescent girls. About 30% girls were consuming pica and the odds of anemia were 1.19 times higher among girls who were consuming pica. Chi square value (2.07) at significance level (0.558) did not reveal significant association between pica intake and anemia prevalence among girls. Gamma value (0.070) showed positive relationship between anemia prevalence and use of iron tablets.

4.3 Multivariable Linear Regression Analysis

This section describes the model for explaining hemoglobin level of women and adolescent girls within the sociocultural context. The multiple linear regression (MLR) assesses the association of more than one explanatory (independent) variable and a response (dependent) variable (Jaccard et al., 2006). Before conducting MLR, its suitability was assessed based on the normality, linearity, homoscedasticity and collinearity assumptions. There are variety of ways to assess how well model meets the assumptions (Casson & Farmer, 2014), however, it is easy to visually examine the data and residuals (Batool, 2010). In this research work, histograms and scatterplots of data and residuals are used to assess MLR assumptions.

The normality assumption is checked by constructing the histogram of residuals and/or by normal probability-probability (P-P) plot of regression standardized residuals. Linearity and homoscedasticity are examined by constructing the scatter plot of regression standardized residuals versus regression standardized predicted value (Pallant, 2001). A random spread suggests that data satisfies the assumptions of linearity and homoscedasticity (Batool, 2010; Casson & Farmer, 2014). Multicollinearity assumption occurs when independent variables are uncorrelated (Keith, 2006). SPSS performs collinearity diagnostic by using two collinearity statistics tolerance and variance inflation factor (VIF). To satisfy the assumption of multicollinearity, tolerance should be >0.1 and VIF should be <10 (Pallant, 2001). The multicollinearity can also be examined by Pearson correlation coefficient, which should be less than 0.7 (Pallant, 2001).

After satisfying MLR assumptions stepwise regression is used to analyze the data. Stepwise selection technique combines advantages of forward and backward selection (Draper & Smith, 1981). This approach uses automatic procedure for the selection of predictive variables (Draper & Smith, 1981). The forward approach initially starts from no variable and adds a predictor variable whose inclusion is good fit for the model. The process is repeated until none of them improves the model to a statistically significant level.

Multiple linear regression is used to find the relationships of different socio-economic, demographic, cultural and nutritional variables (independent variables) with Hb level (dependent variable) of the respondents. Anemia is determined by levels of Hb for married women and adolescent girls. Two regressions models (one for married women and one for adolescent girls) are developed to estimate regression coefficients. Stepwise regression is used to measure three coefficients (standardized regression coefficients, unstandardized regression coefficient and coefficient of determination R^2), which are then used to identify the relative importance of each of the independent variable in the regression model.

4.4.1 MLR model for married women. Multiple linear regression is used to find the relationships of different socio-economic, demographic, cultural and nutritional variables (independent variables) with hemoglobin level (dependent variable) of the respondents. Anemia is determined by Hb level for married women. The SPSS procedures generate numerous confusing outputs for MLR. For better understanding, the results are described and interpreted in the following four steps.

A. Checking assumptions of MLR: Assumptions of MLR are examined by visual inspection of data and residual plots. In the figure 4.4, histogram of regression standardized

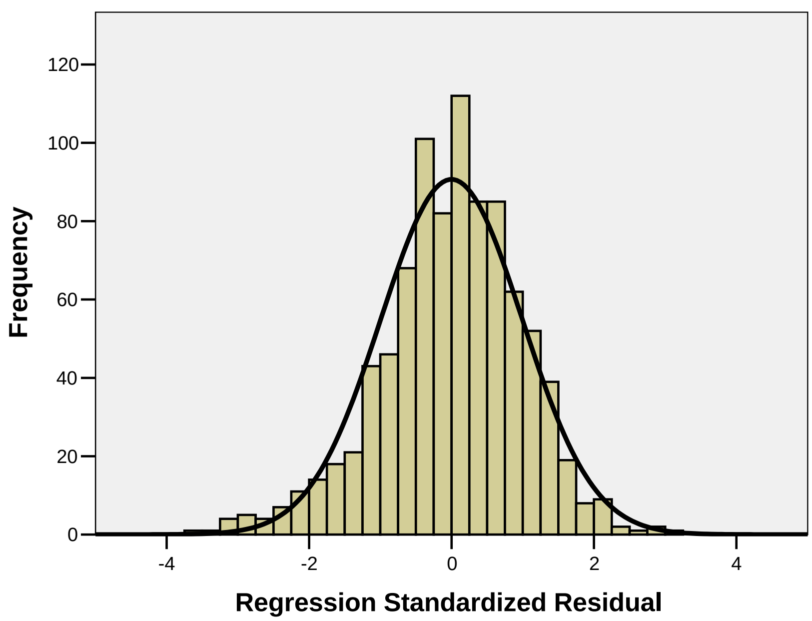

Figure 4.4: Histogram of regression standardized residuals (for women)

residuals are constructed by imposing a normal curve. It is evident from the figure, that residuals are normally distributed.

Figure 4.5 shows the P-P plot of standardized residuals that are used to compare the distribution of residuals against a normal distribution by displaying their respective cumulative probabilities. The points lie close to the diagonal line from bottom left to top right, suggesting no major deviation from normality. Thus, both histogram and P-P plots reveal that residuals fulfill the assumption of normality.

In figure 4.6, scatterplot of regression standardized residuals is shown. The spread of residuals at all predicted values is even and randomly distributed, showing a roughly rectangular pattern with most of the points scattered around 0. This suggests that residuals do not violate the

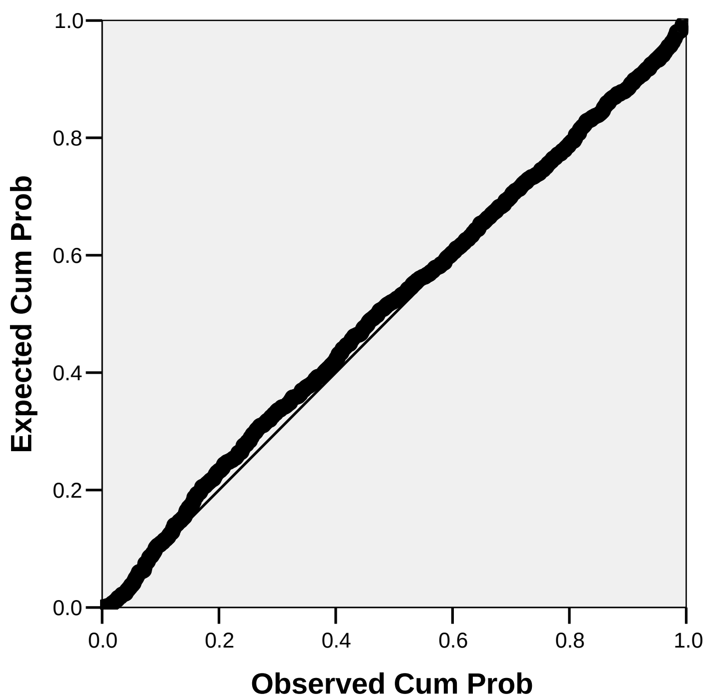

Figure 4.5: P-P plot of regression standardized residuals (for women)

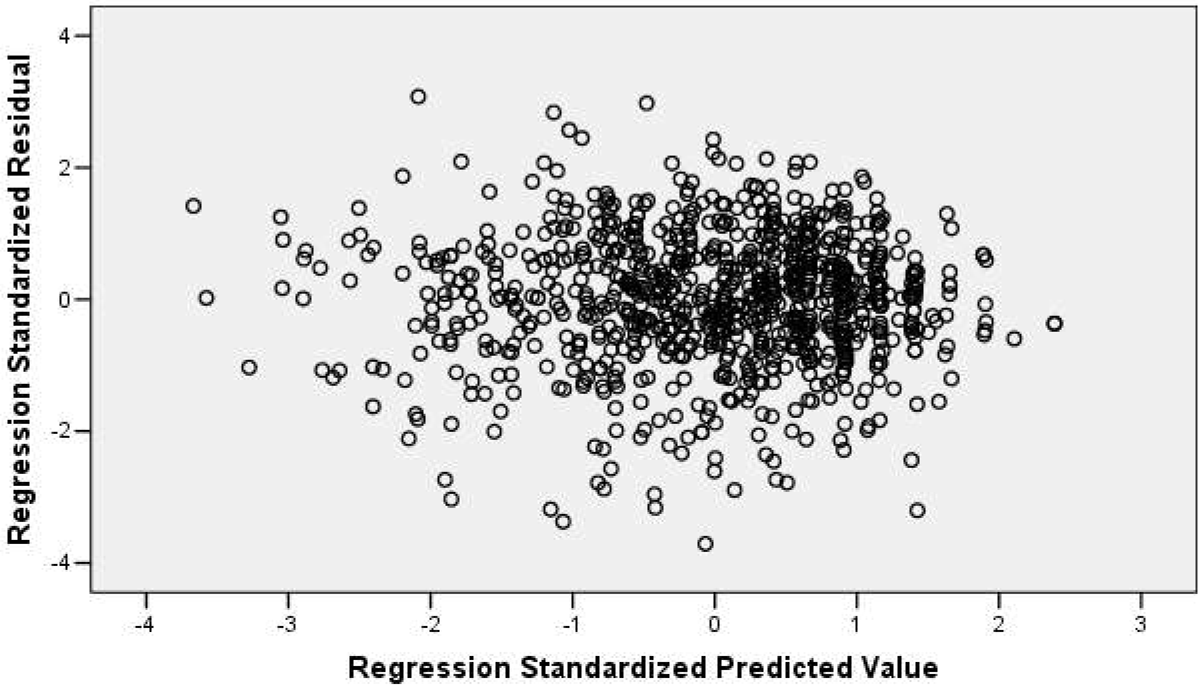

Figure 4.6: Scatterplot of regression standardized residuals (for women)

assumption of homoscedasticity. Multicollinearity is assessed by performing SPSS collinearity diagnostic using two collinearity statistics tolerance and variance inflation factor (VIF). The tolerance <0.1 and VIF <10 suggests that data is not multicollinear. Pearson correlation coefficient is <0.7 for all independent variables, which depicts that correlation between each of independent variables is not too high. Since independent variables are not highly correlated, therefore multicollinearity does not exist. The non-existence of multicollinearity contributes to a good regression model.

B. Model evaluation: In table 4.111, results of the model summary and analysis of variance (ANOVA) are presented.

The first part of table shows the model summary, which reports the strength of the association between the regression model and the dependent variable. The value of R is 0.520, which indicates a strong linear correlation between observed and predicted values of the dependent variable. R^2 (R square) represents proportion of total variance in the dependent variable explained by the model that varies between 0 and 1. In the table R^2 is 0.27, this means that model explains 27% variance in the dependent variable (hemoglobin level). This is considerably good result compared to the R^2 values that are reported in social science surveys. Adjusted R^2 statistics correct the optimistic overestimation of R^2 statistics that penalizes models when small sample is involved with large numbers of parameters. In this research sample size is not small, therefore it is better to report results in R^2 statistics rather than adjusted R^2 statistics.

The second part of table 4.111, shows the results of ANOVA statistics to test variance explained by the MLR model is statistically significant. The table displays sum of squares, degree of freedom (df), mean square, F-statistics and significance (Sig.) value. The significance value of

Table 4.111

MLR Model summary and ANOVA statistics for married women

Model summary					
R		R^2	Adjusted R^2	Standard error of estimates	
0.520		0.270	0.260	1.49	
ANOVA statistics					
Model	Sum of squares	df	Mean Square	F	Sig.
Regression	732.53	12	61.04	27.43	<0.0005
Residual	1980.49	890	2.23		
Total	2713.02	902			

F-statistics (<0.0005) reveals that amount of variance explained by MLR model is statistically significant.

C. Evaluation of independent variables in MLR: The table 4.112 shows the results to evaluate the contribution of each independent variable (societal determinant of anemia) to predict Hb level (dependent variable) in the MLR model. The table displays the predictor variables, unstandardized coefficients, standardized coefficients, t-statistics and their associated p-values to test whether a given coefficient is statistically different from 0. In predictor variable column, first variable (constant) is the y-intercept (predicted value of Hb level when all other variables are 0). In the second column unstandardized coefficients (B) are the coefficient of independent variables that are used for constructing the regression equation. Beta under standardized coefficients is obtained by standardizing all independent variables in the regression model (putting all variables on the same scale). It depicts the magnitude and direction of effects on the predicted outcome variable. Larger beta values are linked to larger t-values and lower significance level, which reveals that results are statistically significant.

Knowledge about barriers in the treatment of anemia has profound effect on the hemoglobin level. It contributes 0.213 units increase in the hemoglobin at significance level < 0.0005. The women who had better knowledge about barriers in the treatment of anemia can take adequate measures to overcome them. The value of beta -0.137 at significance level <0.0005 reveals that exposure to violence has significantly negative effect on the hemoglobin level. The results of study are in line with the study of Batool (2010), which revealed that violence is the contributing factor of anemia among women in Pakistan. Domestic violence poses an extensive risk to the women's physical (Plichta, 2004) and psychological health (Lee et al., 2002). The exposure to domestic violence is a psychosocial issue, which can be associated with anemia decreased

Table 4.112

Evaluation of predictor (independent) variables to predict the Hb level in the MLR model (married women)

Predictor variables	Unstandardized Coefficients		Standardized Coefficients	T	Sig
	B	Std. Error	Beta		
Constant	9.921	0.399		24.840	<0.0005
Knowledge about barriers in the treatment of anemia (X_1)	0.807	0.12	0.213	6.73	<0.0005
Violence (X_2)	-0.695	0.167	-0.137	-4.158	<0.0005
Heavy blood loss (X_3)	-0.528	0.114	-0.135	-4.158	<0.0005
Communicable diseases (X_4)	-0.703	0.154	-0.134	-4.570	<0.0005
Meals regularity (X_5)	0.518	0.123	0.124	4.219	<0.0005
Family monthly income (X_6)	0.219	0.058	0.118	3.79	<0.0005
Average birth interval (X_7)	0.218	0.070	0.092	3.096	0.002
Eating non-food items (X_8)	-0.314	0.109	-0.085	-2.894	0.004
Knowledge about anemia as a health problem (X_9)	0.432	0.156	0.084	2.762	0.006
Exercise (X_{10})	0.120	0.053	0.066	2.265	0.024
Relation with spouse (X_{11})	-0.232	0.094	-0.082	-2.478	0.013
Household structure (X_{12})	0.077	0.037	0.062	2.070	0.039

Excluded variables: BMI of respondent, age at marriage, educational level, monthly income, proper latrine, sewerage system, number of pregnancies, number of live births, prenatal care visits, knowledge about balance diet, relation with in-laws, knowledge about symptoms, cause and prevention of anemia.

weight among women and their children (Lee et al., 2002). Physical violence may result in severe injury, miscarriage and gynecological complications, that may cause heavy blood loss (HBL), which can increase the vulnerability of women to become anemic (UNICEF, 2000). HBL during menstruation and childbirth (beta= -0.135, sig.<0.0005), communicable diseases (beta= -0.134, sig.<0.0005), eating non-food item (beta= -0.085, sig.=0.004) and tension with husband (beta= -0.082, sig.<0.024) showed significant negative effect on the hemoglobin level. Batool (2010) also reported similar results that heavy blood loss, eating non-food items and communicable diseases showed a declining tendency in Hb level among women in Pakistan. The communicable diseases are directly linked with poor socio-economic conditions and nutritional deficiency and children and the pregnant women are the most vulnerable populations (Caulfield & Black 2004).

Meals regularity (beta= 0.124, sig.<0.0005), family monthly income (beta= 0.118, sig.<0.0005), higher average birth interval (beta= 0.118, sig.<0.0005), knowledge about anemia (beta= 0.084, sig.=0.006), physical workout (beta= 0.066, sig.<0.024), good household structure (beta= 0.037, sig.=0.039) showed positive significant association with hemoglobin level. Batool (2010) reported similar that meals irregularity, low family income, short birth interval determinantal factors of anemia among Pakistani women. Numerous studies revealed that lower income is the predisposing factor to the anemia among women (Sharma et al., 2007; Batool, 2010; Habib 2013; Sadeghian et al., 2013). Family income is negatively associated with anemia prevalence among Pakistani female (Sharma et al., 2007; Batool, 2010). Poor socio-economic is associated with lowest hemoglobin level and vice versa (Sharma et al., 2007). Habib (2013) reported that severe and moderate anemia prevalence is very high among women who do not earn and are economically dependent. Exercise training might be a potential, safe and cost- effective method to reduce anemia (Hu & Lin,2012). Aerobic exercises in conjunction with medication has better effect on Hb level and scores of total symptoms of anemia instead of medication only (El Nahas & Gabr 2017). However, intensive exercise is a risk factor of developing IDA, particularly in young females (Wouthuyzen-Bakker & van Assen, 2015). Household and environmental factors such as nonconcrete houses, poor latrine facility, improper sewerage systems, unclean fuel and passive smoking are the major determinants of anemia (Baranwal et al., 2014).

D. Estimated Equation: The regression equation for predicting the hemoglobin level of women from the independent variable is constructed using unstandardized coefficients (B) as detailed in second column of table 4.112.

$$\text{Hemoglobin (Women)} = 9.921 + 0.807X_1 - 0.695X_2 - 0.528X_3 - 0.703X_4 + 0.518X_5 + 0.219X_6 + 0.218X_7 - 0.314X_8 + 0.432X_9 - 0.120X_{10} + 0.232X_{11} + 0.077X_{12}$$

4.4.2 MLR model for adolescent girls. MLR is also used to find the relationship of societal determinants with hemoglobin level (dependent variable) of the adolescent girls. The description and interpretation of results are reported by following four steps.

A. Checking assumptions of MLR: Assumptions of MLR are examined by visual inspection of data and residual plots. The assumption of normality is checked using histogram and P_P plots of residuals. Histogram of regression standardized residuals is constructed (Figure 4.7) with a normal curve imposed. It is evident from the figure that residuals are normally distributed. It is evident from P-P plot (Figure 4.8) points lie close to the diagonal line from and reveal no major deviation from normality. Both histogram and P-P plots reveal that residual fulfill the assumption of normality. Scatterplot of regression standardized residuals (Figure 4.9) shows that spread of residuals at all predicted values is even and randomly distributed, showing a roughly rectangular pattern with most of the points scattered around 0. This suggests that residuals do not violate the assumption of homoscedasticity.

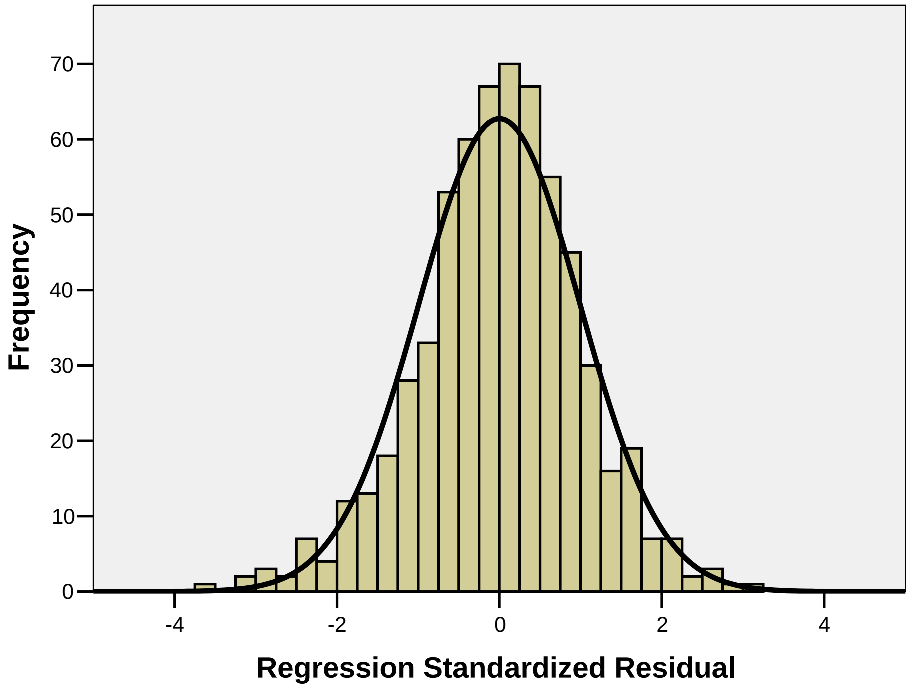

Figure 4.7: Histogram of regression standardized residuals (adolescent girls)

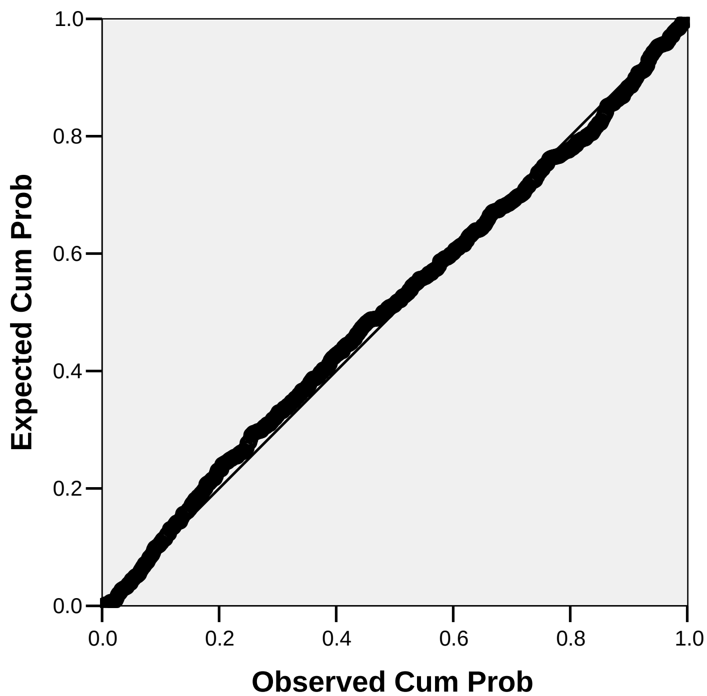

Figure 4.8: P-P plot of regression standardized residuals (adolescent girls)

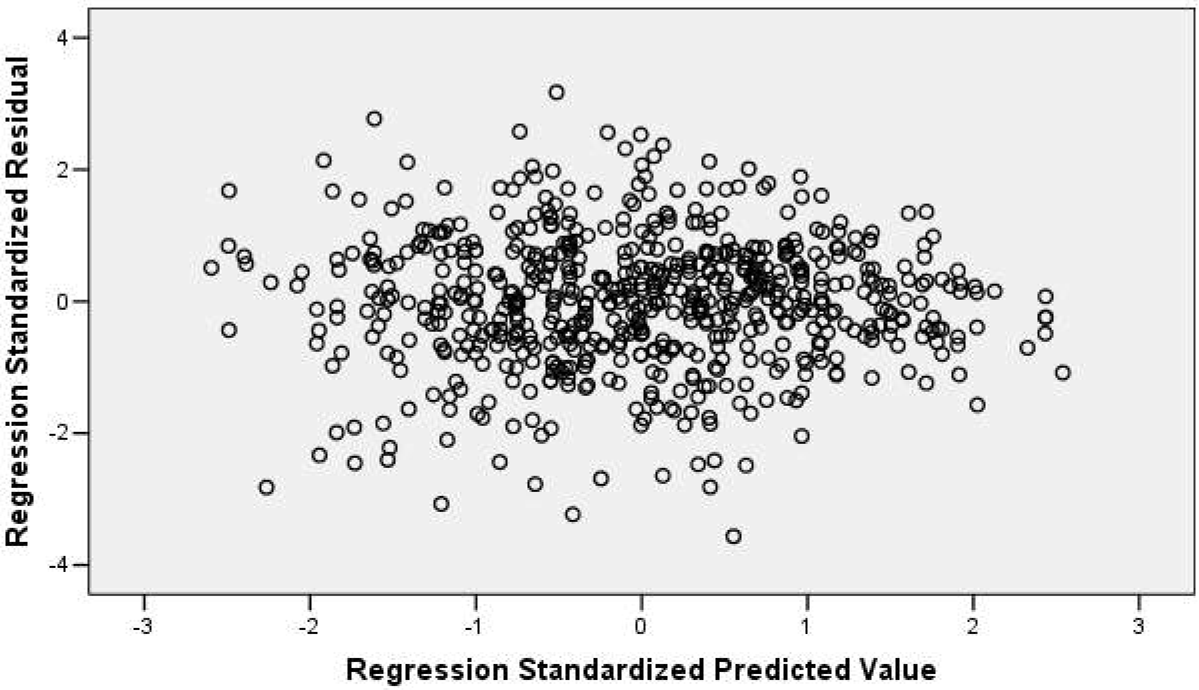

Figure 4.9: Scatterplot of regression standardized residuals (adolescent girls)

The existence of multicollinearity is not an indicator of a good regression model. Multicollinearity is assessed by performing SPSS collinearity diagnostic using two collinearity statistics tolerance and VIF. The tolerance <0.1 and VIF <10 suggest that data is not multicollinear. Pearson correlation coefficient is <0.7 for all independent variables, which reveals that independent variables are highly correlated. Since independent variables are highly correlated, which indicates that multicollinearity does not exist and hence reveals good model fit.

B. Model evaluation: In table 4.112, results of the model summary and ANOVA statistics are presented.

The first part of table 4.113 shows the model summary, which report degree of association between regression model and Hb level (dependent variable). The table displays the results for R, R^2, adjusted R^2 and standard error. The value of R is 0.362, which specifies a sturdy linear correlation between observed and predicted values of the Hb level. R^2 (R square) represents proportion of total variance in the Hb level explained by the model that varies between 0 and 1. In the table R^2 is 0.131, this means that model explains 13.1% variance in the Hb level). This value is not very impressive but not bad compared to the R^2 values that are reported in social science surveys.

The second part of table 4.113, shows the ANOVA statistics to assess variance explained by the MLR model which is statistically significant. The table displays sum of squares, degree of freedom (df), mean square, F statistics and significance (Sig.) value. The significance value of F-statistics (<0.0005) reveals that amount of variance explained by MLR model is statistically significant.

C. Evaluation of independent variables in MLR: Table 4.114 shows the results to evaluate the contribution of each independent variable to predict the Hb level, which is the dependent variable. Communicable diseases have profound inverse effect on the hemoglobin level of adolescent girls with beta -0.182 at significance level <0.0005. The menstruation duration has negative association

Table 4.113

MLR Model summary and ANOVA statistics for adolescent girls

Model Summary					
R		R^2	Adjusted R^2	Standard error of estimates	
0.36		0.130	0.122	1.59	
ANOVA Statistics					
Model	Sum of squares	df	Mean Square	F	Sig.
Regression	234.57	6	39.05	15.54	<0.0005
Residual	1557.29	619	2.52		
Total	1791.86	625			

with level of hemoglobin in adolescent girls (Beta=-0.203 and significance level<0.0005). Menstrual disorders such as irregular, heavy, prolonged and/or painful periods are common among adolescent girls and can have a significant effect on daily activities and quality of life (Williams, C.E. & Creighton, 2012; Toheed et al., 2017). Heavy MBL is one of the major causes of anemia among adolescent girls (Barr et al. 1998; Toheed et al., 2017). Heavy blood loss and communicable diseases showed a declining tendency in hemoglobin level among women in Pakistan (Batool, 2010).

Table 4.114

Evaluation of predictor (independent) variables to predict the dependent variable in the MLR model (adolescent girls)

Predictor variables	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Constant	11.123	0.442		25.171	<0.0005
Communicable diseases (X_1)	-0.666	0.14	-0.182	4.827	<0.0005
Menstrual duration(X_2)	-0.324	0.67	-0.203	-4.837	<0.0005
Family monthly income (X_3)	0.252	0.072	0.135	3.516	<0.0005
Physical workout (X_4)	0.208	0.66	0.118	3.313	0.002
Meals regularity (X_5)	0.400	0.151	0.100	2.650	0.008
Respondent education (X_6)	0.065	0.030	0.093	2.199	0.028

Excluded variables: Father's education, mother's education, mother's profession, father's profession, father's monthly income, mother's monthly income, heavy blood loss and healthcare utilization.

Family monthly income (beta= 0.135, sig.<0.0005), physical workout (beta= 0.118, sig.=0.002), meals regularity (beta= 0.100, sig.=0.008 and respondent's education (beta= 0.093, sig.=0.028) showed positive significant association with hemoglobin level. The results clearly demonstrate that low income and economic wellbeing are the determinantal factor of anemia among female population. The results are consistent with several studies conducted across the globe and in Pakistan (Hyder, 2004; Dhakal et al. 2006; Sharma et al., 2007; Rao et al., 2007; Batool, 2010; Habib, 2013; Sadeghian et al. 2013; Harding et al. 2017). Meals irregularity and low family income are determinantal factors of anemia among female (Batool, 2010). Exercise training might be a potential, safe and cost-effective method to reduce anemia and to improve Hb level (Hu & Lin,2012; El Nahas & Gabr, 2017). Education creates awareness among adolescent about risk factors of anemia, iron rich dietary intake, use of iron and food supplementation to reduce anemia among girls.

D. Estimated Equation: The regression equation for predicting the hemoglobin level of adolescent girls from the independent variable is constructed using unstandardized coefficients (B) as detailed in second column of table 4.114.

Hemoglobin (Girls)= $11.123 - 0.666X_1 - 0.324X_2 - 0.252X_3 - 0.208X_4 + 0.400X_5 + 0.065X_6$

4.4 Anemia Prediction using Data Mining Techniques

Following section presents the results of data mining techniques to classify anemic and non-anemic respondents by using socio-cultural risk factors. LDA, SVM with its linear (SVML), radial (SVMR), polynomial (SVMP), sigmoid (SVMS) kernels, k-NN and random forest (RF) learning algorithms are used for classifying anemic and non-anemic groups. Respondent education, respondent's monthly income, family monthly income, BMI, age at marriage, household structure, proper latrine facility, sewerage system, number of pregnancies, number of live births, average birth interval, heavy blood loss, prenatal care visits, meals regularity, knowledge about balance diet, eating non-food items, physical workout, relation with spouse, violence, relation with in-laws, communicable diseases, knowledge about symptoms, causes, preventive measures and barriers in the treatment of anemia are feature sets used for classification of normal and anemic women.

In machine learning it is mandatory to have training and testing data sets in supervised learning. Training datasets are used to train the classifiers and testing data set was used to measure the efficiency of a classifier. Exhaustive and non-exhaustive cross-validation are two types of cross validation techniques which are further divided to many sub types. In this research 10-fold cross validation technique was used for evaluating the performance of classifiers for different features extracting strategies. A confusion matrix was constructed that provides fundamental bases for evaluating the performance of different machine learning (ML) algorithms. The performance of different ML algorithms was evaluated by computing sensitivity, specificity, Kappa, total accuracy, precision and F_1-measure.

In the table 4.115, performance evaluation of different machine learning algorithms for classifying normal and anemic women based on the sociocultural factors is detailed. It is evident from the table that all the classifiers classified normal and anemic subjects accurately except k-NN algorithm. Sensitivity also called true positive rate (TPR), is the ability of a classifier to correctly identify diseased women. Higher sensitivity values near to 1 depict that the classifiers correctly identified anemic women as anemic. Specificity also called true negative rate (TNR) is the ability of a classifier to correctly identify non-anemic women as normal. Higher values of specificity close to 1 reveal that classifier correctly recognized non-anemia women as normal.

Table 4.115

Performance evaluation of different machine learning algorithms for classifying normal and anemic women based on the sociocultural factors.

Classifiers	Sensitivity	Specificity	Accuracy	Kappa	Precision		F_1-Score	
					A	N	A	N
LDA	0.99	1.00	99.45	0.99	1.00	0.99	1.00	0.99
SVML	1.00	1.00	100.00	1.00	1.00	1.00	1.00	1.00
SVMR	1.00	0.98	99.34	0.99	0.99	1.00	0.99	0.99
SVMP	0.99	0.93	96.23	0.92	0.95	0.98	0.97	0.95
SVMS	0.98	0.98	98.12	0.96	0.98	0.98	0.98	0.98
RF	1.0	1.00	99.89	1.00	1.00	1.00	1.00	1.00
k-NN	0.77	0.55	68.22	0.33	0.71	0.63	0.74	0.59

Accuracy is the metric used to evaluate classification models. The accuracy value 0.98 means that classifier makes 98 correct predictions out of 100 total predictions. Higher accuracy shows that the classification algorithms accurately classified anemic and non-anemic women. Kappa is the most commonly used measure in the medical literature for assessing interobserver agreement (Viera & Garret, 2005). The value of Kappa varies between 0 (equate Kappa to chance agreement) and 1 (perfect agreement) (Viera & Garret, 2005). It is evident from the Kappa values near to 1 revealing perfect agreement for all classifiers except k-NN classifier. Precision also called positive predictive value describes performance of the ML algorithms. It is the ratio of true positive predictions made by a classifier to the total positive predictions. The findings reveal high precision for all classifiers except k-NN. These classifiers with high precision have low false positive rate.

F1-Score is evaluation metric that considers both false positives (FP) and false negatives (FN). It is the weighted average of Precision and Recall (sensitivity). Accuracy works well when cost of FPs and FNs is similar, however, it is better use F1-score when costs of FPs and FNs are different. All the classifiers other than k-NN show F1 score is high depicting that both precision and recall of the classification algorithms indicate good results.

In table 4.116 performance evaluation of different machine learning algorithms for classifying normal and anemic adolescent girls based on the sociocultural factors is shown.

Respondent's education, father's education, mother's education, mother's profession, father's profession, father's monthly income, mother's monthly income, family monthly income,

Table 4.116

Performance evaluation of different machine learning algorithms for classifying normal and anemic adolescent girls based on the sociocultural factors.

Classifiers	Sensitivity	Specificity	Accuracy	Kappa	Precision		F1-score	
					A	N	A	N
LDA	0.97	1.00	98.72	0.97	1.00	0.98	0.99	0.99
SVML	1.00	1.00	100.00	1.00	1.00	1.00	1.00	1.00
SVMR	0.99	1.00	99.36	0.99	1.00	0.99	0.99	0.99
SVMP	0.90	0.99	94.41	0.89	0.99	0.91	0.94	0.95
SVMS	0.97	0.96	96.49	0.93	0.95	0.98	0.96	0.97
RF	1.00	1.00	100.0	1.00	1.00	1.00	1.00	1.00
k-NN	0.68	0.75	71.41	0.43	0.71	0.72	0.73	0.43

menstrual duration, heavy blood loss, healthcare utilization, meals regularity, physical workout and communicable diseases are used as feature sets for girls. SVML and RF are the classifiers which showed sensitivity 1.0, specificity 1.0, accuracy 100%, Kappa value 1.0 and F1-score 1.0 reveals 100% prediction of anemic and non-anemic among adolescent girls. The performance of kNN classifiers was least, whereas SVMR, SVMP and SVMS algorithms also showed almost 100% accurate classification of anemic and normal individuals.

Chapter 5

Summary, Conclusion and Recommendations

This chapter presents the summary of major research contributions, and conclusions drawn from the results. To highlight importance of the results by performing univariate and bivariate analysis, the findings are presented through socio-economic, demographic, cultural and nutritional variables. This chapter elucidates summarized results to reveal the relationship of different socio-economic, demographic, cultural and nutritional variables (independent variables) with hemoglobin level (dependent variable) by employing multiple linear regression (MLR) model. The chapter outlines the findings of data mining techniques to classify anemic and non-anemic respondents. The outcomes of the study in context of social model of the health are briefly discussed. In addition, chapter provides policy recommendation to reduce anemia prevalence in the married women and adolescent girls as per guidelines of WHO. This chapter also highlight limitations of the study and future recommendations to get maximum benefits from this research endeavor.

5.1 Socio-economic Determinants of Anemia

Socio-economic factors directly influence social and economic well-being of an individual and the community. In this research work education, family income, occupation, family type, household and environmental factors are explored as the socio-economic determinants of anemia in women and adolescent girls.

5.1.1 Education. Education has both direct (dietary awareness, utilization of better health, better family relations and better hygienic practices) and indirect effects (include better household income for acquiring health facilities and utilization good food) on the female and her family. Low education is associated with pregnancy related problems (WHO 2001) and decrease in the hemoglobin level (Bailey et al., 1997). Woman and her husband's education are significantly associated with the prevalence of anemia during pregnancy (Lokare et al., 2012). Parental educational level and socio-economic status are associated with prevalence of anemia in adolescent girls (Upadhye & Upadhye, 2017).

Mean education of women was 1.52 years less than their husband's mean education. The finding does not reveal massive disparity between respondent and her husband's years of schooling in the AJK with difference of 1.52 years. In Azad Kashmir, equal importance is given to the female education and educated women is respected, honored and valued by her husband, his family as well as by the society. The odds of anemia were 32-40% less for women with primary-middle education and 63% less for intermediate and above level of education compared to illiterate women. Chi-Square value 56.44 and significance level ≤ 0.0005 portrays highly significant association between women's education and anemia prevalence. The results are consistent with the findings of Batool (2010), Habib (2013) and Melku et al. (2014) regarding the association of education of women with anemia prevalence. The findings also revealed that knowledge about anemia, its causes, prevention and treatment increase with the increase in the educational level of married women.

The research outcomes elucidate that almost 100% adolescent girls were enrolled in the schools, which shows increasing importance of education from parental generation to their off-springs. Fathers of adolescent girls were comparatively more educated than mothers. The odds of occurrence of anemia were 0.39 (61% less) for adolescent girls whose fathers have intermediate and above level of education compared to girls whose fathers were illiterate. Anemia prevalence was 61% less among those girls whose mothers had educational attainment intermediate or above. This suggests that adolescent girls of educated family have better opportunity to utilize iron rich food and micronutrients, avail better healthcare services and live in a hygienic environment, which reduces the risk of developing anemia in them. The findings are similar to the results found by Choi et al. (2011) and Upadhye & Upadhye (2017) that children of highly educated mothers have lesser susceptibility of developing anemia compared to illiterate or low educated mothers.

5.1.2 Monthly income. Income is a profound determinant of utilization of good quality food and healthcare services. Globally the occurrence of anemia has decreased, but anemia prevalence in nonpregnant women and children is still high in the low and middle-income countries (LMICs) (Yang et. al., 2018). The present study examined prevalence of anemia in women based on the respondent income and her family income. The study reveals that majority of women were not involved in income generating activities and only 1.0% of them were earning 50,000 PKR or more. The prevalence of moderate and severe anemia was considerably high among low- and no-income women. The odds of occurrence of anemia were 82% less for women who had monthly income more than 50000 rupees compared to those who had no monthly income. The findings based on family monthly income aver that odds of anemia were 89% less for women who had family monthly income 100,000 PKR or more compared to those who had no monthly income.

The economic well-being of adolescent girls was determined based on their parental and family monthly income. The odds of occurrence of anemia were high for low income adolescent girls compared to high income girls. The findings clearly demonstrate that low income is the detrimental factor of anemia prevalence among both married women and adolescent girls. The results are in line with several studies conducted in Pakistan and across the globe (Hyder, 2004; Dhakal et al. 2006; Sharma et al., 2007; Rao et al., 2007; Batool, 2010; Habib 2013; Sadeghian et al. 2013; Harding et al. 2017).

5.1.3 Occupation. Woman or her husband's occupation or parental occupation for children are strongly related to income that affects the living standard of the family and utilization of health facilities. The research reported in the dissertation explored the association of occupation with the anemia prevalence in women and adolescent girls. The results highlight that majority of women (78.1%) were housewives and had insignificant role in income generating activities which is in line with the study of Batool (2010). The findings reveal the economic dependency of majority of women on their husbands and husband's occupation was found to be significantly associated with the prevalence of anemia in women. Majority of respondent's husbands were associated with government jobs and the anemia was considerably high among women whose husbands earn small from their occupation or were unemployed.

The analysis related to parental occupation revealed that majority of mothers were house wives and occupation of father was ultimate source of income for the family. The results of bivariate analysis revealed anemia was significantly associated with parental occupation among adolescent girls. The girls whose parents were doing government jobs had lower odds of anemia compared to those having low paid jobs or were unemployed. The results are in line to the study Kulkarni et. al., (2013), which reported that anemia is less prevalent among adolescent girls with maternal occupation as service or business compared to those girls whose mothers are housewives or laborers. Teji et al. (2016), reported that nutritional status and anemia prevalence in adolescent girls is independently associated with occupation of father.

5.1.4 Household structure and environment. Household structural, environmental and community factors influence prevalence of anemia (Baranwal et al., 2014). The present study explored the association of the household and its environmental factors including household structure, latrine facility, sewerage system and garbage disposal with the anemia in women and adolescent girls. The results elucidated that household structure was an important determinant of anemia among the respondent in AJK. The odds of anemia were 2.38 and 2.7 times more among women and girls respectively living in mud houses compared to those living in RCC house. The proper toilet facility at home was available to majority of respondents. The odds of anemia were 1.85 and 1.15 times more in women and girls respectively who did not have proper toilet facility. However, bivariate analysis revealed significant association between latrine facility and anemia prevalence in women but not for adolescent girls. The findings aver that almost 85% respondents had the facility of underground sewerage systems. The respondents residing in areas having underground sewerage system had significantly lower prevalence of anemia compared to those living in areas having open sewerage systems. The odds of anemia were 36% and 16% less in women and adolescent girls respectively who had underground sewerage systems compared to those having open sewerage systems. The mode of garbage disposal was significantly associated with the anemia prevalence in women but not in adolescent girls. The reason of disparity of anemia prevalence in women and adolescent girls because of household and its environmental factors may attributed to the fact that adolescent girls spend lesser time at home due to their schooling. The findings of the present study are similar to the results reported by Baranwal et al. (2014) that poor household and environmental factors (living in non-concrete house and poor toilet facility) are associated with prevalence of anemia. Better household and environmental conditions reduce parasitic infections and hence result in the lower anemia prevalence.

5.2 Demographic Determinants of Anemia

Demographic determinants are endogenous variables directly related with health of an individual which highly correlate with anemia status (Batool, 2010). Age at marriage, prenatal and postnatal care, number of pregnancies, birth interval, blood loss during menstruation/abortions and communicable diseases are taken as demographic variables for married women. Birth order, blood loss during menstruation and communicable diseases were taken as demographic variables for adolescent girls.

5.2.1 Age at marriage. Age for marriage in different areas of Pakistan is suggested just in teens (Batool, 2010). At this age girls are not physically, mentally and reproductively mature to cope with the responsibilities of married life. Early pregnancies cause severe health complications such as miscarriage and hemorrhage resulting in severe anemia in female. Children born to teen aged mothers have more probability to die in their first year compared to those born to mothers aged 27-29 (Finly et. al., 2011). The study revealed age at marriage is an important factor of anemia among married women and its prevalence was significantly high among women who got married at the age <=18 years. The odds of anemia were 42%, 47% and 51% lesser in women who married at the age 19 to 25 years, 26 to 30 years and 30+years respectively compared to those who married at the age <=18 years. The findings are supported by Dorsey & Murdaugh (2003), Batool (2010) and Habib (2013).

5.2.2 Healthcare utilization. Utilization of healthcare services is vitally important for early detection of abnormality and for timely therapeutic interventions. Healthcare utilization is important for all women, especially for women of reproductive age (WRA) before and after child birth. In this study, association of anemia with prenatal and postnatal visits for married women were explored. The association of visits for availing general healthcare were investigated with anemia in the adolescent girls.

Prenatal and postnatal care are associated with improved pregnancy and birth outcomes, decrease in child mortality and malnourishment (Kuhnt &Vollmer, 2017; WHO, 2013).

The results revealed that prenatal care visits were significant determinants of anemia among married women. The odds of anemia were 48%, 53% and 59% less among women who had 1 to 3, 4 to 6 and more than 6 prenatal care visits respectively compared to those who did not visit for prenatal care. The study highlighted the issue that majority of women (64.5%) did not visit to healthcare facility for postnatal care which is a point of concern from women and newborn health perspective. Long distances from healthcare, lesser economic resources, limited availability of beds in hospitals, burden of patients on hospitals and lesser staff at hospital are the major reasons of not utilizing postnatal care in AJK. The bivariate analysis did not reveal significant association of anemia with the postnatal care visits of women. This may be due to the fact majority of women were not utilizing postnatal care. Numerous studies highlight the importance of postnatal care from mother and child health perspective. Majority of changes related to wellbeing of mother and child occur during this period (WHO, 2013). More than two third newborns die during the first week of delivery, while up to 50% die within the first 24 hours (Lawn, 2006). The highest risk of mortality for both mother and newborn is during delivery, followed by the first hour and next few days after childbirth (Sines, et al., 2007).

Regarding the utilization of the healthcare facility of adolescent girls, majority (more than 93%) visited for medical care when they suffered from health issue. Generally, health issues of adolescent girls are treated at home by self-medication, homemade remedies and spiritual healing. The findings revealed significant association between number of healthcare facility visits and prevalence of anemia among adolescent girls. The odds of anemia were 55% and 70% less among girls who had visited healthcare sometimes and often respectively compared to those who did not avail this facility. Despite of the fact majority of girls were utilizing medical care, the prevalence of anemia was high among them. This may be due to fact that adolescent girls are unaware about their health issues and are hesitant to share it with family and doctors. The studies (Batool, 2010; Toheed et. al., 2017) also highlighted the issue that female especially adolescent girls in Pakistan do not share reproductive health and menstrual dysfunction related medical problems with family and doctors, which further worsen implications of these problems leading to anemia. The mothers and teachers at school should educate adolescent girls about changes occurring during this period and about utilization of medical care in case of health issue.

5.2.3 Heavy blood loss. Heavy blood loss during menstruation is one of the major determinants of IDA among women (Vercellini et al., 1993) and adolescent girls (Barr et al. 1998; Toheed et. al., 2017). Blood loss during abortion is significantly associated with the increase in symptoms of anemia in women (Batool, 2010). Menstrual disorders such as heavy or irregular bleeding affects the quality of life and daily activities such as absence from school (Williams, C.E. & Creighton, 2012; Toheed et. al., 2017). The results revealed the significant association of anemia with heavy MBL among married women and adolescent girls respectively. The odds of anemia were 34% less in the women and 45% in the adolescent girls who did not suffer from heavy bleeding during menstruation. The results are in line with the study of Batool (2010) for married women and Toheed et. al. (2017) for adolescent girls.

5.2.4 Number of pregnancies. Repeated pregnancies and miscarriages are the main reasons of anemia and low Hb level among women of developing countries (WHO, 1992; Vora & Gruslin,1998). The outcomes of the study elucidated that more number of pregnancies were significantly associated with anemia among women. The odds of anemia in women having 4 to 6 and 6+ pregnancies were 1.59 and 2.43 times more respectively than those women who had 1 to 3 pregnancies. The findings are similar with previous studies of Batool (2010), Habib (2013), Taner et al. (2015), Umar et al. (2015) and Tayade et al., (2018). The reasons of more number of pregnancies are early age marriages, son preference and non-utilization of contraceptive protection.

5.2.5 Communicable diseases. Communicable disease such as pneumonia, cholera, malaria, influenza, hepatitis and HIV/AIDS are highly prevalent in Pakistan (Batool, 2010). These diseases decrease the women immunity level especially in their reproductive period causing miscarriage, low birth weight, pre-term birth and other related health afflictions (Khan, 1995). Bivariate analysis reveals that communicable diseases such as pneumonia and cough in women, whereas pneumonia, cholera and cough in adolescent girls were significantly associated with prevalence of anemia. Studies like Caulfield et al. (2004) and Batool (2010) provided the evidence of association of communicable diseases with symptoms of anemia.

5.2.6 Average birth interval. Average birth interval is associated with women pregnancy outcome, maternal and child health. It provides a woman enough time to recover from the nutritional deficiency after childbirth. Shorter birth intervals are linked with rupture of membranes, anemia, hemorrhage, low birth weight, increased risk for preterm birth, maternal morbidity and mortality as well as infant and child mortality (Central Statistical Agency, 2011; USAID, 2005). The odds of anemia were 58% and 66% less among women who had birth interval 1 to 2 years and >2 years respectively compared to those women who had birth interval less than one year. The odds of anemia were 78% less among those women who had only one child. El-Shazley (1996) reported similar results that short birth interval is one of the risk factors of anemia in women and preschool children.

5.3 Cultural Determinants of Anemia

Culture refers to integrated pattern of belief and behavior held common by a group of people, a community or a nation. Cultural factors play a key role in understanding and identifying health related issues of any community. In this research work gender bias, family type, physical workout family relationships, violence and knowledge about anemia are the major cultural factors that were investigated to study respondent's anemia status.

5.3.1 Gender bias. Gender bias is strongly associated with anemia and malnutrition among females across the globe (Poureslami et al., 2004). This study explored the gender bias in terms of son preference and preference of food intake. In Pakistan, son preference is a complex phenomenon that exists in various forms across different cultures (Atif et al., 2016). The bivariate analysis results did not reveal significant association of anemia with preference in food intake among both married women and adolescent girls. The findings contradict the study of Batool (2010) that gender bias is associated with low level of hemoglobin in Pakistani women. Poureslami et al. (2004), who reported that gender preference is associated with malnutrition in female. The findings elucidated that gender bias is not as much prevalent in AJK compared to Pakistan. The reason may be that in AJK literacy rate is very high compared to Pakistan and people have more awareness about importance of women in this region.

5.3.2 Family type. Nuclear and joint families are most common in Pakistan and women living in nuclear families have higher or equal status compared to those in the joint/extended family (Batool, 2010). The results elucidate that majority of the respondents were living in nuclear families in Azad Kashmir. The disintegration of joint family system has resulted due to radical change in the social fabric after October 2005 earthquake. The bi-variate analysis did not show significant association between type of family and prevalence of anemia. The findings of this study contradict with the study of Batool (2010), who reported that level of hemoglobin was significantly high in the women belonging to nuclear family.

5.3.3 Exercise. Poor physical workout habits are associated with the lower levels of hemoglobin (Batool, 2010). Less exhaustive workouts are cost effective and safe methods for reducing anemia (Hu & Lin, 2012; El Nahas & Gabr 2017), however intensive exercises can be a risk factor of anemia in young female (Bread and Tobin, 2000; Hu and Lin, 2012; Wouthuyzen-Bakker & van Assen, 2015). The results of univariate analysis revealed that more than 57% women and almost 50% girls were living sedentary life. Bivariate analysis did not show significant association of exercise and anemia prevalence; however, odds of anemia were 33% and 22% less in the women who exercised sometime and often respectively compared to those who did not exercise. Regarding adolescent girls, odds of anemia were 62% and 40% less in the girls who exercise sometime and often respectively compared to those who were sedentary. Since odds of anemia were less for respondents exercising “sometimes” compared to those performing it “often”, it reveals that less exhaustive exercise is more effective in reducing anemia compared to intensive ones. The findings are supported by the studies of Batool (2010), Hu & Lin (2012) and El Nahas & Gabr (2017).

5.3.4 Family relationships and violence. Socio-economic and cultural setups affect the relation of a women with her husband and in-laws (Batool, 2010). The conflict in household/family relationships between wife and husband are worsened by the actions of in-laws. In this study women relationship with her husband and in-laws were investigated to reveal the association of family relationships with prevalence of anemia among them. The results of bivariate analysis showed significant association between respondent’s relationship with her husband and prevalence of anemia among them. The odds of anemia were 1.74 and 4.25 times more in women who had tension with their husbands to some extent and to great extent respectively compared to those who had good relationship with their husbands. The study also elucidated significant association between respondent’s relationship with their in-laws and prevalence of anemia among them. The findings clearly elucidate that relationship of the respondent with husband and in-laws is a determinantal factor of anemia among women.

Domestic violence is widely prevalent in the Pakistan and is the most underreported form of violence committed against women (NIPS & ICF International, 2013). More than half (52%) of women residing in Pakistan who experienced domestic violence never reported or sought it (NIPS & ICF International, 2013). In this study majority of women (87.4%) reported no violence was experienced by them. Bivariate analysis showed highly significant association of violence with the prevalence of anemia in the women. The odds of anemia were 3.65 times more among women who experienced violence compared to those who did not experienced it. Regarding girls more than sixty percent (61.3%) reported did not experienced violence. In the present study violence was not significantly associated with anemia in adolescent girls but in case of women, highly significant association of violence with anemia has been observed. The research outcomes of this study are in line with study of Batool (2010), who reported that violence is the determinantal factor of anemia in the Pakistani married women.

5.3.5 Knowledge about anemia. Knowledge about a disease, its detrimental factors, various symptoms, preventive measures and compulsory efforts are vital for devising the treatment and therapeutic interventions of any disease (Allen, 2000). Knowledge about etiology and causes of anemia, preventive measures and barriers in the treatment plays a key role in reducing anemia in the female. The findings did not reveal significant association between prevalence of anemia and knowledge about anemia as a health problem among women, however, respondent knowledge about symptoms, causes, preventive measures and barriers in the treatment of anemia were significantly associated with anemia among them. Regarding adolescent girls, knowledge about anemia, its symptoms, causes, preventive and barriers in the treatment were not significantly associated with anemia among them. The study also highlighted that married women and late adolescent girls who were more educated than early adolescent girls had significantly more knowledge about anemia, its symptoms, causes, preventive measures and its treatment. Lack of knowledge about anemia and its negative implications on the women health are major barriers in formulating preventive strategies and devising therapeutic intervention for treating anemia among women (Dreyfuss, 1998).

5.4 Nutritional Variables

Nutritional variables describe the nutritional status of the respondents that is directly linked with prevalence of anemia (Batool, 2010). In the present study important nutritional variables were knowledge about balanced diet, regularity in food intake, food and iron supplementation, and use of pica.

5.4.1 Knowledge about balanced diet. Balanced diet consists of diverse foods with adequate nutrients necessary for good health. Dietary diversity is an important factor for gauging the micronutrient adequacy in pregnant women. (Ali et al., 2014). Diverse food with adequate nutrients is essential for adolescents as 50% weight, 20% height and 50% skeletal mass is gained during this period (Shahid et al., 2010; WHO, 2006). In this study 45.0% women and 40.3% adolescent girls had the knowledge of balanced diet. The knowledge about balanced diet was significantly associated with anemia among married women, however, no significant association of knowledge of balanced diet with anemia prevalence was found among adolescent girls. The odds of anemia were 1.45 time more among women who had no knowledge about balanced diet. Knowledge about balanced diet was not significantly associated with occurrence of anemia in the girls. The findings are supported by the study of Batool (2010), that balanced diet has a significant negative association with anemia prevalence in the women. Men frequently eat lunch or dinner outside and have comparatively better knowledge about diverse foods than women. Thus, involving men in household dietary decisions will improve the dietary diversity and nutritious food. (Ochieng et al., 2017). Maternal education, residential status, school type, nutritional knowledge and economic wellbeing are associated with dietary diversity (Birru, et al., 2017; Worku et al., 2017; Oldewage-Theron et al., 2016; Belachew et al., 2013; Belachew et al., 2008).

5.4.2 Regularity in food intake. Eating irregularities decreases the working capability which ultimately leads to poor health status and illness (Batool, 2010). Women in Pakistan are engaged in household chores, looking after children and elderly people in the family, due to which they pay less attention on their eating habits. The finding revealed association of meals irregularity with anemia prevalence in the women and adolescent girls respectively. The odds of anemia were 2.75 and 1.88 times more in the women and adolescent girls respectively who take meals irregularly compared to those taking meals regularly. The study outcomes are supported by Batool (2010), that food irregularities have positive association with anemia prevalence.

5.4.3 Food and iron supplements. Food and iron supplements improve the micronutrient deficiency and iron status among women of reproductive age especially during pregnancy and postpartum periods. Unorganized distribution system of iron supplementation, misapprehensions about negative implications of iron supplements and spurring iron supplements intake and malnourishment are major contributing factors of this anemia (Rusia, 1995; Dreyfuss, 1998). The study highlighted that very small proportion of women were consuming food supplements (11.1%) and iron (15.4), which is an important concern. Bivariate analysis did not reveal significant association between food supplements utilization with anemia among women, however iron intake was significantly associated with anemia among them. The odds of anemia were found to be 1.27 and 1.16 times more in women who consumed food supplements and iron respectively compared to those women who did not consumed it. The WRA are usually recommended to use dietary supplements during preconception and pregnancy to avoid the negative pregnancy and fetal outcomes associated with malnutrition (WHO, 2016b, McKenna et al., 2017). WHO (2011b) has recommended the daily oral iron dose of 30–60 mg and folic acid supplementation 400µg for preventing anemia during pregnancy in areas of anemia prevalence ≥20% whilst for adolescent girls and non-pregnant women weekly iron and folic acid supplementation (WIFS) dose of 60mg iron and 2800µg folic acid to anemic girls is recommended (WHO, 2011b).

5.4.4 Pica intake. Eating pica, the craving for non-food items is the very significant reason of iron deficiency in mothers and children. Consumption of pica is the determinantal factor of low Hb level and anemia (Miao et al., 2015). The findings revealed that utilization of pica was significantly associated with anemia among married women, whilst no significant association was found between pica intake and anemia among girls. The odds of anemia were 1.84 times more among women and 1.19 times more among girls who were consuming pica. The findings are in line with the study conducted by Miao et al. (2015) that the consumption of pica is significantly associated with increased risk for low Hb level and anemia in women.

5.5 Multiple Linear Regression Analysis

Multiple linear regression (MLR) was used to find the relationships of different socio-economic, demographic, cultural and nutritional variables (independent variables) with hemoglobin level (dependent variable) of the respondents. Stepwise regression was used to measure three coefficients standardized regression coefficients, unstandardized regression coefficient and coefficient of determination R^2 to identify the importance of each of the independent variable in the regression model.

5.5.1 MLR model for married women. Sociocultural risk factors of anemia called predictors that contributed to predict hemoglobin level of women in MLR model are knowledge about barriers in the treatment of anemia, violence, heavy blood loss, communicable diseases, meals regularity, family monthly income, average birth interval, eating non-food items, knowledge about anemia as a health problem, physical workout, relation with spouse and household structure. The regression coefficient values of knowledge about barriers in the treatment of anemia, meals regularity, family monthly income, adequate birth interval, knowledge about anemia as a health problem, exercise (0.066) and household structure (0.062) revealed significantly positive effect on the women's hemoglobin. The regression coefficient values of violence, heavy blood loss, communicable diseases, pica intake and exacerbate relationship with spouse revealed significantly negative effect on the women's hemoglobin. The findings are supported by numerous studies reporting that lack of knowledge about anemia (Dreyfuss, 1998, Batool, 2010), violence (Lel, 2008; Batool, 2010), heavy blood loss (Batool, 2010), communicable diseases (Caulfield et al., 2004; Batool, 2010) meals irregularities (Batool, 2010) are predisposing factors of anemia in the women. Numerous evidences support that family monthly income (Hyder, 2004; Dhakal et al. 2006; Sharma et al., 2007; Rao et al., 2007; Batool, 2010; Habib 2013; Sadeghian et al. 2013; Harding et al. 2017), average birth interval (Batool, 2010) and physical workout (Batool 2010; Hu & Lin, 2012; El Nahas & Gabr,2017) are sociocultural risk factors of anemia among married women.

5.5.2 MLR model for adolescent girls. Sociocultural risk factors of anemia called predictors that contributed to predict Hb level of adolescent girls in MLR model are communicable diseases, menstrual duration, family monthly income, physical workout, meals regularity and respondent education. The regression coefficient values of communicable diseases, menstrual duration showed significantly negative, whereas, family monthly income , exercise, meals regularity and respondent education showed significantly positive effect on the hemoglobin level of adolescent girls. The findings are supported by studies reporting that communicable diseases (Caulfield & Black 2004), menstrual disorder (Barr et al. 1998; Williams, C.E. and Creighton, 2012; Toheed et. al., 2017), family monthly income (Hyder, 2004; Dhakal et. al. 2006; Sharma et. al., 2007; Rao et. al., 2007; Batool, 2010; Habib 2013; Sadeghian et. al. 2013; Harding et. al. 2017), exercise (Hu & Lin,2012; El Nahas & Gabr, 2017), meals regularity (Batool, 2010) and respondent education (Batool, 2010) are the societal determinants of anemia in female.

5.6 Classification of Anemic & Normal Groups Using Data Mining Techniques

In Present study, data mining techniques LDA, SVM with its linear (SVML), radial (SVMR), polynomial (SVMP), sigmoid (SVMS) kernels, k-NN and random forest (RF) learning algorithms are used to classify anemic and non-anemic groups based on societal determinants of anemia as feature sets. All the classification algorithm classified anemic and non-anemic respondents (both women and adolescent girls) with almost 100% accuracy using different performance evaluation measures except k-NN approach. Numerous studies supported research finding that data mining techniques can be used for prediction and classification of anemia (Sanap et al., 2011; Ahmed and Sitara, 2012; Yu et al., 2017). Sanap et al. (2011) reported that decision tree classifiers are robust for classification of anemia based complete blood count (CBC) reports along with for anemia severity. Ahmed and Sitara (2012) demonstrated the correlation between depression and anemia and its adverse effects on the pregnancy outcomes. Yu et al. (2017), used multilayer perceptron model to predict post-operative anemia.

5.7 Research Findings and Social Model of Health

Anemia is a public health problem that originates from a broader background involving both biological and societal determinants of this disease. The present study was conducted to identify the societal determinants of anemia among adolescent girls and married women in Muzaffarabad division of AJK that is helpful for developing effective prevention strategies. The findings indicate that prevalence of anemia in women was 59.1% (21.3% mild, 33.4% moderate and 4.4% severe) and in adolescent girls was 47.1% (20.4% mild, 24.8% moderate and 2.7% severe). According to WHO classification, the prevalence of anemia in both married women and adolescent girls in this study is a severe public-health problem (≥40%). The findings are in line with WHO report that anemia in Pakistan is a severe public-health problem in all the population categories (WHO, 2015). About 51% non-pregnant and 50% pregnant women are victims of anemia in Pakistan (WHO, 2015). Nazir et al. (2011) reported anemia among pregnant women in Pakistan varies from 43% to 60% with 10% severe cases. Batool (2010) reported that occurrence of mild, moderate and severe anemia was 33.3%, 42.3% and 11.1% respectively.

The results presented through socio-economic, demographic, cultural and nutritional variables demonstrated some common and some specific risk factor of anemia in women and adolescent girls. All the findings reported in this dissertation are supported by Dahlgren and Whitehead's social model of health which contributed to the first health for all (HFA) strategy in the Europe (Dahlgren & Whitehead, 1991). The model represents determinants of health (here anemia) as four concentric arcs around the individual life style factors (arc1), mapping the relationship between the individual and community (arc 2), their environment (arc 3) and mediator of health/disease (arc4). First arc represents individual life style factor such as smoking habits and physical activity etc. Arc 2 represents the interaction of individuals with their peers and immediate community. Arc 3 represents an individual's ability to maintain his/her health, which is influenced by the environment such as living and working conditions, occupation, education, water and sanitation, food supply and access to essential goods and healthcare services. Arc 4 represents the mediator of population health (economic, cultural and environmental influences) prevailing in the society.

The findings are also supported by model explained by UNICEF (1998), Evans and Stoddart health model (1990), Brunner and Marmot (1999) and Najman's model of health (2001). Various Sociological theories such as functionalist perspective (Parson, 1951), symbolic interaction (Goffman, 1959), Porotic Hyperostosis (Robinson, 1972) and the theory of self-care management (Orem 1971; Dorsey & Murdaugh, 2003) support the findings of the study.

5.8 Recommendations

The findings of this research demonstrate that anemia is a severe public health problem among both married women and adolescent girls in AJK. To drastically decrease the anemia in the vulnerable groups, treating its underlying causes is critical for broader sustainable development. The preventive measures to combat iron deficiency and anemia cannot be dealt with the same approach for all populations and in all settings. An integrated approach is required for combating malnutrition by alleviating poverty, improving economic wellbeing, healthcare utilization, educational status and attaining sustainable food security. Reduction of anemia among WRA is one of the six global nutritional targets endorsed by WHA, which aims to attain 50% reduction of anemia among them (WHO, 2014a; Korenromp, 2015). The end of all forms of malnutrition by the end of 2030 is the second target of SDG2 (Zero hunger). Achieving the nutritional targets can act as a catalyst to reduce the prevalence of anemia in all age groups. The malnutrition has numerous and multifactor causes which are closely connected to work being done to achieve other SDGs (Development Initiatives, 2017). The improved nutritional status is also interlinked with other SDGs such as SDG1(no poverty), SDG3 (good health and wellbeing), SDG4 (quality education), SDG5 (gender equality), SDG6 (clean water and sanitation) and SDG9 (decent work and economic growth). Pakistan has taken an early start to translate global SDGs framework into national action plan, which can be step forward for achieving the global target of 50% reduction of anemia. The table 5.1 presents short, medium, or long-term strategies that can be implemented for improving iron status and reducing anemia among female in AJK, Pakistan.

In case of adolescent girls, no short-term strategies have been devised to prevent anemia and iron deficiency. It is suggested that in areas of anemia prevalence > 20%, Government should constitute a health committee at the school level comprising of 2 to 3 teachers and a representative of education department. The health department of AJK should be responsible to provide the services of a medical doctor and two lady health visitors (LHVs). The school health committee will be responsible to coordinate with the medical doctor and LHVs for screening anemia on annual basis and for provision of WIFS 60mg iron and 2800μg folic acid to anemic girls as per recommendations of WHO (WHO, 2011b). At household level, non-anemic WRA and adolescent

Table 5.1:

Short, medium- and long-term strategies for combating anemia

Type of Plan	Strategy	Agencies/organization involved
Short term	• Annual screening of anemia in adolescent girls at school. • Provision of WIFS (weekly iron and folic acid supplementation) to anemic girls at schools. • Provision of 2 to 4 months iron and folic acid supplementation to adolescent girls and non-pregnant women annually at household level. • Educate women and monitor the use of iron and folic acid supplementation required dose during pregnancy & 3 months after it.	• Medical team from health department assisted by school health committee need to be involved screening. • Involving school committee to coordinate with medical team from health department for provision of WIFS on specific agreed day of week. • LHVs may be involved for the provision of supplements with coordination of parents and other family members. • Health department may utilize the services of LHVs to create awareness, provision of such supplements and its periodic monitoring.
Medium term	• Developing Water, sanitation and hygiene (WASH) infrastructure and its monitoring • Launch awareness campaigns about anemia similar to polio vaccination. • Involve stakeholders to educate and create awareness about use of balanced diet, diverse food, negative implications of early marriage and child birth, birth spacing and related consequences of anemia. • Mandatory fortification of staple food.	• School health committee and education department with the help of UNICEF Pakistan should create WASH related awareness sanitation clubs at school level and launch health and hygiene sensitization programs at schools. • Educational institutions, media, health department, religious scholars and influential people may be involved. • Media, education department, government and non-government organizations may be involved to educate and create awareness about balanced and diverse food etc. • Engage food & agri-extension departments to train millers and to educate people about the health benefits of utilizing fortified foods by following guidelines of UK program to alleviative malnutrition in Pakistan.
Long term	• At present no adolescent nutrition programs are run in Pakistan (UNICEF, 2017). Start nutrition programs for adolescent girls. • Support farmers to grow nutrient rich crops. • Maintaining food quality and food security. • Strategies for avoiding domestic violence.	• Government of AJK should allocate budget to launch nutritional programs for adolescent and also involve UNICEF and UNFPA for this purpose.. • Educational programs through farmer field schools & agri-extension services to aware the farmers about rapid developments in science & technology for improved crop yield, enriched nutrition and higher income. • Involve Food Department, Agriculture, Agri-extension and livestock departments for monitoring food quality. • Involve motivational speakers to give educational and inspiring insights for combating aggression to alleviate domestic violence. Involving media for reporting the violence and law enforcement agencies to take timely actions. Sociologists and psychologists may be involved to highlight the consequences of domestic violence. Involving religious scholars to educate people about rights of wife on her husbands and importance of this relationship according to Islamic theology and in the light of Quran during Jumma sermons.

girls should be provided 3 to 4 months annually iron and folic acid supplementation by involving LHVs for the provision of supplements with coordination of parents and other family members to reduce future chances of anemia among them. The government through health department should educate women and monitor the use of iron and folic acid supplementation required dose during pregnancy and 3 months after it at home by utilizing the network of LHVs.

Like Pakistan, in AJK water, sanitation and hygiene (WASH) in schools are not adequately available and those schools which have these facilities have lack of processes and resources for their proper running and maintenance. Government should facilitate the schools to promote water, sanitation and hygiene (WASH) infrastructure to promote safe menstrual hygiene management and to avoid health problems such as reproductive tract infections, which can be an important step of reduce anemia. The UNICEF Pakistan has started a process to develop WASH in school strategy, which can serve as a guiding document for school health committee to scale up WASH infrastructure in School facilities. The school health committee should create WASH related awareness sanitation clubs at school level and launch health and hygiene sensitization programs at schools. The government should devise WASH monitoring processes and involve education department to monitor WASH facilities at schools. Community based programs with focus to disseminate information about menstrual hygiene management and WASH to improve female health should be designed and implemented.

Quality education particularly of girls is directly linked to improved and diverse nutrition of their children and in utilization of healthcare services. Government should take measures to incorporate health education in the curriculum from primary level and onwards. Educated women exercise comparatively more freedom in socioeconomic and cultural decision making, which directly or indirectly affects women health. More qualified teachers with better knowledge of health and nutritional aspects can prove more fruitful in this regard. Their subsequent training after induction and periodical courses may also be helpful.

Early marriages and pregnancies when growth period is not yet over double the risk of anemia. Therefore, anemic girls become anemic mothers of the next generation that can continue to persist throughout the reproductive age and perpetuates spiteful cycle of malnutrition. Although constitutional amendments have been made to stop early marriages, however, government should have to develop a strict monitoring mechanism for observing this policy to avoid adverse birth outcomes and anemia in female. Although government has launched awareness campaigns about benefits of family planning interventions in delaying pregnancy and to avoid adverse birth outcomes. However, comprehensive awareness campaigns are needed to highlight the benefits of family planning for allowing women enough time to build up and maintain iron stores in the body and to prevent other micronutrient deficiencies for avoiding anemia. Government should ensure 24/7 services in the basic health unit (BHU) for birth delivery, formulate adequate policies to ensure the availability of lady doctors during delivery and provision of ambulances for quick access to well-equipped hospitals for emergent help in case of high-risk deliveries. In addition to create awareness about family planning, LHVs should be trained to create awareness about anemia, iron and micronutrient deficiencies and their consequences on the physical and reproductive health of female similar to polio vaccination awareness campaigns. Electronic, print and social media campaigns can also be handy for creating awareness among masses. In Pakistani, religious scholars (ulama) are genuine opinion makers and have much influence in society who can play significant role to advocate for reproductive health programs (Akram and Abbas, 2014). They can be used to bridge the gap where other conventional channels are unsuccessful due to conflict, lack of media reach and non-availability of health workers at community.

There are numerous pathways nutrition can play a vital role for achieving various SDGs and accomplishing the SDGs can also be beneficial for the nutrition. Appropriate interventions to combat iron and other nutritional deficiencies during adolescence period in girls can provide a best prospect to reduce prevalence of anemia in women. At present no adolescent nutrition programs are running in Pakistan (UNICEF, 2017). Government of AJK should allocate budget for “Food for Adolescents” program and involve other stakeholders such as government of Pakistan, UNICEF and UNFPA for starting this nutritional program in AJK. The program should highlight the importance of quality and diversity of food, intake of iron rich food, utilization of fortified food and micronutrient supplementation to prevent anemia in girls and later stages in life. Government should socially mobilize the community through social and electronic media about nutritional requirements of the girls during adolescence period, utilization of nutrition rich diet and consequences of malnourishment and anemia during this period on the physical, mental and reproductive health. NGOs and local communities may jointly arrange awareness campaigns on anemia as a health problem and educate female to use diverse and nutritious food instead of consuming substandard beverages. Parents need to pay special care to healthy brought up of adolescent girls, their education, diverse and balanced food intake and avoid early marriages.

The food fortification is one of the cost-effective ways for combating nutritional deficiencies and anemia. The United Kingdom is steeping its efforts by investing 6 billion rupees over next 5-years for alleviating malnutrition in Pakistan, especially among WRA and children (Tay, 2017). The program is working on 100 edible oil and 1000 wheat flour mills as well as training millers and to educate people about the health benefits of utilizing fortified foods. The program’s goal is to provide fortified wheat to 50% population and fortified edible oil and ghee to two thirds of population in Pakistan within five 5 years (Tay, 2017). Although majority of food supply AJK is from Pakistan, however government of AJK should launch awareness campaigns to educate the people to utilize fortified foods. The prices of fortified foods are comparatively quite high, and government should provide fortified foods at subsidized rates in areas where anemia prevalence ≥20%.

Agriculture plays a pivotal role in producing and accessing the nutritious food which is critical to healthy lives. The links between agriculture and nutrition is bidirectional, agriculture is the foundational for better nutrition and nutrition is crucial for affluent agricultural livelihoods. Pakistan is an agricultural country and the focus of agricultural sector is to increase crop productivity for increasing income with little focus on the nutritional perspective of food. It is crucial to combine nutrition and agriculture for greater impact; however, farmers face inimitable challenges and need support programs to ensure their success. The government needs to start education programs through farmer field schools, agriculture extension services and animal husbandry projects to aware the farmers about rapid developments in science and technology for improved crop yield, enriched nutrition and higher income.

Food security is equally important for both developing and developed countries and is much emphasized in international commitments such as MDGs and SDGs (Ishaq et. al., 2018). A country is considered food secure if its people have adequate economic, social or physical access to food (Ishaq et. al., 2018). Despite of the fact Pakistan is food surplus country, 60% of its population suffers from food insecurity (Seely, 2019). Pakistan has badly suffered from fiscal, food, fuel, functional democracy, frontier conflict and fragile climate after 2008. These crises have produced a cumulative effect on food security in the country, which caused food price inflation and substantially increased poverty. Pakistan must address this issue to promote sustainable food production, alleviate poverty and eradicate huger by involving food department and other stakeholders. Until this issue is resolved, the government may launch income support programs with strict monitoring by involving national and international organizations.

Domestic violence or abuse can emotionally, psychologically and physically damage the victims. It is dangerous for life of the victim and keeping silence on such violence is much more dangerous. Women should report about domestic violence committed against her to their elders at first stage and even to the law enforcement agencies if difficult to control by family elders. The government should involve motivational speakers to give educational and inspiring insights for combating various kinds of aggression to alleviate domestic violence. Involving media for reporting the violence and law enforcement agencies to take timely actions. Sociologists and psychologists may be involved to highlight the consequences of domestic violence. Involving religious scholars to educate people about rights of wife on her husbands and importance of this relationship according to Islamic theology and in the light of Quran during Jumma sermons.

5.9 Conclusion

The research reported in this dissertation identified the importance of societal determinants of anemia among adolescent girls and married women in Muzaffarabad division of AJK. The findings elucidated that anemia is a severe public-health problem in AJK. The results presented through socio-economic, demographic, cultural and nutritional variables demonstrated some common and some specific risk factors of anemia among women and adolescent girls.

Bivariate analysis of socio-economic variables revealed that education of the respondent and her husband, respondent and her husband's occupation, respondent and her family monthly income, household and environmental factors (household structure, proper latrine at home, type of sewerage system and garbage disposal) were significantly associated with the anemia among women. Multiple linear regression (MLR) analysis showed that linear regression coefficient values of family monthly income and household structure had significantly positive effect on the women's hemoglobin. In adolescent girls, socio-economic variables such as parental education, parental and family monthly income, father's profession and type of sewerage system were significantly associated with prevalence of anemia. Multiple linear regression (MLR) analysis showed that linear regression coefficient values of family monthly income and respondent's education had significantly positive effect on the Hb level of adolescent girls.

Demographic variables such as age at marriage, prenatal care, heavy blood loss, number of pregnancies, average birth interval and communicable diseases were significantly associated with prevalence of anemia in married women. The regression coefficient values of communicable diseases and heavy blood loss revealed significantly negative effect on women's hemoglobin. Bivariate analysis of healthcare utilization, heavy blood loss and communicable diseases showed significant association with adolescent girl's hemoglobin level. The regression coefficient values of communicable diseases revealed significantly negative effect on the hemoglobin level of adolescent girls.

In this study, association of cultural variables such as knowledge about contraceptive behavior, gender bias, exercise, family type, attitude towards cultural restriction of food, family relationships, violence and knowledge about anemia (as health problem, symptoms, causes, preventive measures and barriers in the treatment) with prevalence of anemia in the respondents was explored. Bivariate analysis revealed that cultural variables; family relationships, violence and knowledge about anemia, its causes, preventive measures and barriers in its treatment were significantly associated with anemia among married women. The regression coefficient values of exacerbate relationship, violence and knowledge about anemia had a significant effect on women's hemoglobin. Bivariate analysis revealed that cultural variables exercise and knowledge about anemia symptoms, its causes, preventive measures and barriers in the treatment were significantly associated with anemia among the adolescent girls. The regression coefficient values of physical workout (exercise) showed significantly positive effect on the Hb levels of adolescent girls.

The study also investigated the association of nutritional variables such as knowledge of balanced diet, meals regularity, use of food and iron supplements and pica intake. Bivariate analysis revealed that knowledge of balanced diet, meals regularity, use of iron supplements and pica intake were significantly associated with anemia prevalence in the women. The regression coefficient values showed that meals regularity had significantly positive and pica intake had significantly negative effect on the hemoglobin level of married women. Bivariate analysis of nutritional variables revealed that meals regularity and use of food supplements were significantly associated with anemia prevalence in the adolescent girls. Regression coefficient values of meals regularity had significantly positive effect on the Hb level of adolescent girls. The findings demonstrate that with some common risk factors, etiology of anemia in adolescent girls is different from married women. High prevalence of anemia among girls is precursor of anemia among women and the risk anemia further aggravates during childbearing after marriage. Thus, adolescence provides the best prospect to meet global target of 50% reduction in anemia among WRA by 2025 by intruding appropriate interventions of iron and micronutrient deficiencies, which are most common causes of anemia in female. Alleviating anemia among female could enhance their productivity, give boost the national economy, reduce healthcare costs, and improve quality of lives.

5.10 Limitations and Future Directions

This study explored the socio-economic, demographic, cultural and nutritional risk factors of anemia in adolescent girls and married women to highlight the importance of each factor to determine anemia status of the respondent. Due to financial and time constraints, anemia in this study was determined based on the symptoms and Hb levels. Blood Hb concentration was measured using a HemoCue Hb 301 analyzer. It is recommended for future studies that anemia should be diagnosed by complete blood count (CBC), which is a broad screening tool to check hemoglobin level, hematocrit and red blood cell count (RBC). The CBC measures RBCs, white blood cells, Hb, hematocrit and platelets. Thus, CBC drew the exact pictures of anemia level, percentage and counts of different components of blood which can be one of the future directions of research.

AJK has three divisions and this study is conducted in one division only. Further studies are needed to compare socio-economic, demographic and nutritional factors affecting anemia at districts, divisions, state and national level so that effective measures can be taken by government according to the need of the specific location. The study explored association of overall violence with the prevalence of anemia in the women and adolescent girls. Further studies are recommended to explore the association of different types of violence (verbal, physical and mental) with anemia prevalence and its effect on the physical, mental and reproductive health.

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APPENDIX

Appendix-A

AN ANALYSIS OF SOCIO-CULTURAL DETERMINANTS OF ANEMIA AMONG FEMALE OF AZAD JAMMU AND KASHMIR

(For Women)

A. Socio-economic characteristics of the respondent.

1. What is your age?

2. What is your husband's age?

3. How old were you at the time of marriage?

4. What is your current marital status?

i. Married ii. Widowed iii. Divorced iv. Separated

5. What is the highest level/grade in education that you attained?

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	16+

6. What is the highest level/grade in education that your husband attained?

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	16+

7. Which of the following describes you?

i. House Wife ii. Government Servant iii. Private Servant

iv. Self Employed v. Farm Labor/Others

8. Which of the following describes the profession of your husband?

i. Government Service ii. Private Service iii. Businessman

iv. Skilled Labor v. Unskilled Labor/Others

9. What is your monthly income? Rs.

10. What is the monthly income of your husband? Rs.

11. What is your total family monthly income from all sources? Rs.

12. Who is the household head?

i. Respondent ii. Husband iii. Father-in-law iv. Mother-in-law v. Others

13. What is the structure of your house?

i. RCC ii. Mud iii. Wooden iv. Shelters

14. Do you have proper latrine/toilet in your house?

i. Yes ii. No

15. What is the type of sewerage system in your locality?

i. Open sewerage system ii. Underground sewerage system

16. How do you dispose off garbage?

i. Burn ii. Bury iii. Municipality drums

iv. Collect outside house v. Others

17. Which type of water do you use to drink?

i. Tape water ii. Spring water iii. Filtered water

iv. Mineral water v. Others

18. Are you satisfied with the quality of water?

i. Yes ii. No

19. If no, what is the reason?

Reason	**Yes**	**No**	**Reason**	**Yes**	**No**
Due to smell			Due to taste		
Due to color			Heavy Water		

20. What is the type of family you are living in?

i. Nuclear ii. Joint

21. How many members are there in your family?

i. Male: ____________ ii. Female: ____________ iii. Total: _______________

B. Assessing respondent's anemia on the basis of symptoms

22. To what extent you agree about your following health related issues?

Symptoms	To great extent	To some extent	Not at all
Usually feel tired or fatigued			
Usually experience weakness			
Experienced usually pale skin			
Experienced decreased pinkness in lips/gums			
Have unusually pale nail beds			
Feel dizziness or become faint			
Experienced shortness of breadth			
Experience heart palpitation			
Feel Depressed			
Decreased working capacity			
Feel Unusually cold			

23. What do you do after feeling shortness of breath, fatigue, heart palpitation or becoming faint?

Reason	Yes	No	Reason	Yes	No
Rest			Visit Hakeem		
Visit doctor			Visit Peer		
Take food			Take multivitamins		

C. To assess reproductive characteristics and contraceptive behavior of the respondent.

24. How many times you got pregnant?

25. What was the number of miscarriages /abortions?

26. What was the number of live births?

i. Boys: __________ ii. Girls:` ________ iii. Total:_________

27. What was the number of still births?

i. Boys: __________ ii. Girls:________ iii. Total:_________

28. Average birth interval in all pregnancies.

i. <1 year ii. 1-2years iii. >2 years iv. N.A.

29. Do you have knowledge about contraceptive methods used for family planning?

i. Yes ii. No

30. If yes from where you got this knowledge?

i. Family ii. Friends iii. Doctor
iv. LHV v. Media

31. Have you used any contraceptive method for family planning?

i. Yes ii. No

32. If yes, which contraceptive method you have used?

Contraceptive Method	**Yes**	**No**	**Contraceptive Method**	**Yes**	**No**
Oral pills			Injection		
Condoms			IUD/Copper T		

33. If no, what was the reason?

Reason	**Yes**	**No**	**Reason**	**Yes**	**No**
Religious beliefs			Husband dislike		
Family Restriction			Non-availability		
Fear of side effect			No need		

D. Blood loss/blood disorder due to menstruation and other health issues.

34. Are you still having menstrual periods?

i. Yes ii. No

35. If yes, what is the duration of menstrual periods?

i. 2-3 days ii. 4-5 days iii. More than 5 days

36. Do you have heavy blood loss during menstrual periods and/or abortions?

i. Yes ii. No

37. Do you have hemorrhoids bleeding?

i. Yes ii. No

38. Do you have blood loss with stool?

i. Yes ii. No

39. Do you have any bleeding disorder?

i. Yes ii. No

E. Utilization of non-food item.

40. Did you eat non-food items during your last pregnancy?

i. Yes ii. No

41. Are you still consuming following non-food items (Pica)?

Non-food Items (Pica)	**Yes**	**No**	**Non-food Items (Pica)**	**Yes**	**No**
Ice			Clay/Mud		
Paper			Dry wall/paint		
Leaves			Uncooked rice		

F. Complications during last pregnancy, utilization of prenatal and postnatal healthcare services and breast feeding.

42. What were the complications/problems that occurred during last pregnancy/delivery?

Complications	**Yes**	**No**	**Complications**	**Yes**	**No**
Vaginal Bleeding			High blood pressure		
Hand and facial Swelling			Diabetes		
Anemia			Fits		
Cramps/Abdominal pain			Urinary complications		
Water bag broke			Prolonged labor		

43. How often did you visit for prenatal care during last pregnancy?

i. None ii. 1 to 3 visits iii. 4 to 6 visits iv. 6+ visits

44. From where you got prenatal care?

i. Govt. Hospitals ii. Private Hospitals/Clinics iii. BHU vi. Others v.NA

45. What is the distance of health care facility from your home?

i. <1 km ii. 1 to 5 km iii. 6 to 10 km iv. >10km

46. Who attended you during prenatal care?

i. Doctor ii. Mid Wife iii. Nurse vi. Others v.NA

47. If you need to go to hospital for checkup who normally accompanies you?

Statement	Often	Few times	Not at all
You go alone.			
You go with husband.			
You go with some other family member.			
Wait until someone available to accompany.			

48. Where was your last baby born?

i. Govt. Hospitals ii. Private Hospitals/Clinics iii. BHU

iv. Home v. Others

49. How was your last baby born?

i. Normal ii. C-Section

50. How often did you visit for postnatal care within 40 days after last delivery?

i. None ii. 1 to 2 iii. 3 to 4 iv. 4+

51. What was the birth order of your last child?

i. First ii. Second iii. Third iv. Fourth v. Fifth and Above

52. Was your last baby preterm?

i. Yes ii. No iii. Don't know

53. What was the birth weight of your last baby?

i. <2.5 kg ii. 2.5 to 3 kg iii. >3 kg iv. Don't know

54. Did you breast feed your last baby?

i. Yes ii. No

55. If yes, what was duration?

i. < 1 month ii. Up to 6 months iii. Up to 1 year iv. Up to 2 years

56. If no, what was the reasons?

i. Baby sickness ii. Your sickness iii. Difficulty in feeding iv. Any other

57. What is your current status?

i. Pregnant ii. Non-pregnant iii. Lactating iv. Pregnant & Lactating

G. Attitude towards preferred gender.

58. What is your preferred gender of the baby?

i. Son ii. Daughter iii. Does not matter

59. What is preferred baby gender of your husband/family?

i. Son ii. Daughter iii. Does not matter

60. If you/your family prefers son over daughter, to which extent you agree with following statements?

Reason	To great extent	To some Extent	Not at all
A woman feels secure.			
A woman is given respect within family & society.			
Boys are source of prestige in the family & society.			
Boys are helpful to get stronger position in the society.			
Boys are source of earning.			
Boys are helpful in old age.			
Girls are economically burden on parents.			

H. Utilization of balanced diet, food supplements, food taboos and physical exercise.

61. Do you know what balance diet is?

i. Yes ii. No

62. What is your frequency of taking meals in a day?

i. 2 ii. 3 iii. 4 iv. 5

63. How often do you eat following foods in a week (i- 1 to 2 times, ii. 3 to 4 times , iii.5 to 6 times, iv . 7 times or more v. Not at all).

Groups	Food Intake	Frequency	Groups	Food Intake	Frequency
Carbohydrates	Wheat		Fats	Ghee	
	Rice			Oil	
	Maze			Butter	
Proteins	Meat		Vitamins	Milk	
	Chicken			Vegetables	
	Fish			Fruits	
	Beans			Juices	

64. Do you take meals regularly?

i. Yes ii. No

65. If no, what is the reason?

Reasons	Yes	No	Reasons	Yes	No
Due to Work			Due to look after aged members		
Due to child care			Due to economic problems		

66. Do you take any food supplements?

i. Yes ii. No

67. Do you take iron tablets?

i. Yes ii. No

68. In your opinion, who needs more /better food in the family?

i. Male ii. Female iii. Both

69. Do you think foods have hot and cold effects?

i. To great extent ii. To some extent iii. Not at all

70. Do you agree with following perceptions about the perhaiz or restricted use of hot/cold food?

Perception about hot food	**Yes**	**No**	**Perception about cold food**	**Yes**	**No**
Cause pimples			Cause cough/cold		
Causes allergy			Cause chest congestion		
Increases blood pressure			Causes sore throat		
Stomach burning			Delays growth of adolescent		
Heart palpitation			Cause repeated infection		
Diarrhea			Cause headaches		
Increase weight			Causes joint pain		
Difficult to digest			Causes asthma		

71. Which of the following food items are culturally restricted during pregnancy?

Food items	**Yes**	**No**	**Don't know**	**Food item**	**Yes**	**No**	**Don't know**
Eggs				Fish			
Half cooked meat				Dairy products			
Organ meat				Peanuts/others			

72. In your opinion what are the reasons for not consuming certain foods during pregnancy?

Reason	**Yes**	**No**	**Don't know**	**Reason**	**Yes**	**No**	**Don't know**
Miscarriage/abortion				Hypertension			
Premature delivery				Rigors			
Increase in baby size				Seizures			
Difficult labor				Hot/cold food			

73. How often do you exercise?

i. Daily ii. 1 to 2 times in a week

iii. 3 to 4 times in a week iv Weekly v. Not at all

74. What type of exercise do you take?

Exercise	Yes	No	Exercise	Yes	No
Walking			Gym		
Running			Yoga/Dance		

F. Assessing addiction attitude of respondent.

75. Do you use any of the followings? If yes, how often daily.

Items	Yes (Frequency)	No	Item	Yes (Frequency)	No
Cigarettes			Paan/Chaliya		
Chilum			Heroin		
Naswar			Sleeping pills		

I. Knowledge about importance of personal hygiene and its utilization.

76. How much your personal hygiene is important for you?

i. To great extent ii. To some extent iii. Not at all

77. How often do you do the followings?

Statements	Always	Often	Not at all
Wash hands after dusting and cleaning.			
Wash hands after using toilet.			
Wash hands before cooking.			
Wash the vegetables or meat before you cook them.			
Cover eatables/food.			

J. Violence and its impact on the reproductive & general health and on routine matters of the respondent.

78. How do you describe your relation with your partner?

i. No tension ii. Some tension iii. Full tension

79. How do you describe your relation with your in-laws?

i. No tension ii. Some tension iii. Full tension

80. How will you describe the violence of spouse/family?

Violence	Spouse			In-laws		
	Often	Sometimes	Not at all	Often	Sometimes	Not at all
Embarrass or abuse in front of family and/or friends						
Tease you verbally						
Prevent you to spend time with your family or friends						
Threaten you with weapon						
Grab your hairs						
Slap/kick you						
Beat you with a stick						

81. Do you suffer from following reproductive health problems due to violence?

Reproductive health problems	To great extent	To some Extent	Not at all
Viginal bleeding or infection			
Decreased sexual desire			
Pain during intercourse			
Irregular/heavy menstruation			
Infertility			
Abortion/miscarriage			

82. I would like to know your level of awareness about the impact of violence on the routine matters in terms of the following statements.

Issues	To great extent	To some Extent	Not at all
Decreased working capacity			
Neglect children and family			
Inability to take decision			
Poor appetite			
Decreased self-confidence			
Intolerance			
Do not pay proper attention on yourself			

K. Prevalence of communicable diseases.

83. Did you suffer from any of the following communicable diseases during last one year?

Diseases	Yes	No	How often	Diseases	Yes	No	How often
Cholera				Diarrhea			
Pneumonia				Tuberculosis			
Measles				Cough			
Tetanus				Polio			

L. Knowledge of the respondent about anemia, its symptoms, causes and prevention.

84. Do you think anemia is a health problem?

i. Yes ii. No

85. In your opinion what are the Symptoms of anemia?

Symptoms of anemia	Yes	No	Symptoms of anemia	Yes	No
Pale skin, lips and nails			Eating non-food items		
Tiredness			Weight loss		
Weakness			Heart palpitation		
Decreased working capacity			Shortness of breath		

86. In your opinion what can be the causes of anemia among married women?

Knowledge about causes of anemia	Yes	No
Repeated Pregnancies		
Malnutrition		
Poor socio-economic status		
Excessive bleeding		
Heredity condition		
Non-consumption of animal protein		
Communicable disease		
Violence		

87. I would like to know your knowledge about preventive measures for anemia?

Knowledge about prevention of anemia	**Yes**	**No**
Eating plenty of green leafy vegetables		
Taking food supplements		
Taking iron tablets and folic acid		
Utilization of red meat/organ meat		
Deworming		
Utilization of hygienic food		
Personal hygiene/ Keep environment neat and clean		
Avoiding violence		

88. In your opinion what are the barriers in the treatment of anemia?

Barriers about treatment of anemia	**Yes**	**No**
Lack of available food supplements in healthcare centers		
Poor socio-economic condition		
Lack of knowledge about anemia		
Inadequate guidance		
Compliance of patients with food supplements		
Long waiting hours at healthcare facility		

Appendix-B

AN ANALYSIS OF SOCIO-CULTURAL DETERMINANTS OF ANEMIA AMONG FEMALE OF AZAD JAMMU AND KASHMIR

(Adolescent Girls)

A. Socio-economic characteristics of the respondent.

1. What is your age?

2. What is your mother's current age?

3. What is the conjugal period of your parents?

4. What is the current marital status of your mother?

i. Married ii. Widowed iii. Divorced

5. What is the highest level in education that you attained?

0	1	2	3	4	5	6	7	8	9	10	11	12	12+

6. What is the highest level in education that your father attained?

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	16+

7. What is educational attainment of your mother?

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	16+

8. Which of the following describe your mother?

i. House Wife ii. Government Servant iii. Private Servant

iv. Self Employed v. Farm Laborer/Others

9. Which of the following describes the profession of your father?

i. Government Service ii. Private Service iii. Businessman

iv. Skilled Labor v. Unskilled Labor/Others

10. What is the monthly income of your father? Rs.

11. What is the monthly income of your mother? Rs.

12. What is your family monthly income from all sources? Rs.

13. Who is the household head?

i. Father   ii. Mother   iii. Grandfather   iv. Grandmother   v. Others

14. What is the structure of your house?

i. RCC   ii. Mud   iii. Wooden   iv. Shelters

15. Do you have proper latrine/toilet in your house?

i. Yes   ii. No

16. What is the type of sewerage system in your locality?

i. Open sewerage system   ii. Underground sewerage system

17. How do you dispose off garbage?

i. Burn   ii. Bury   iii. Municipality drums

iv. Collect outside house   v. Others

18. Which type of water do you use to drink?

i. Tape water   ii. Spring water   iii. Filtered water

iv. Mineral water   v. Others: Specify

19. Are you satisfied with the quality of water?

i. Yes   ii. No

20. If no, what is the reason?

Reason	**Yes**	**No**	**Reason**	**Yes**	**No**
Due to smell			Due to taste		
Due to color			Heavy Water		

21. What is the type of family you are living in? ☐

i. Nuclear ii. Joint

22. How many members are there in your family?

i. Male: __________ ii. Female:__________ iii. Total:_____________

23. How many siblings you have?

i. Brothers:___________ ii.Sisters:___________ iii. Total:__________

24. What is your number according to the birth order?

i. 1st ii. 2nd iii. 3rd iv. 4th v. 4+ ☐

B. Assessing respondent's anemia on the basis of symptoms

25. To what extent you agree about your following health related issues?

Symptoms	To great extent	To some Extent	Not at all
Usually feel tired or fatigued			
Usually experience weakness			
Experienced usually pale skin			
Experienced decreased pinkness in lips/gums			
Have unusually pale nail beds			
Feel dizziness or become faint			
Experienced shortness of breadth			
Experience heart palpitation			
Feel Depressed			
Decreased working capacity			
Feel Unusually cold			

26. What do you do after feeling shortness of breath, fatigue, heart palpitation or becoming faint?

Reason	Yes	No	Reason	Yes	No
Rest			Visit Hakeem		
Visit doctor			Visit Peer		
Take food			Take multivitamins		

C. Blood loss/blood disorder due to menstruation and other health issues.

27. Do you have menstruation? If no, then go to Q29?

i. Yes ii. No

28. What is the duration of your menstrual periods?

i. 2-3 days ii. 4-5 days iii. More than 5 days iv. N.A

29. Do you have heavy blood loss during menstrual periods?

i. Yes ii. No

30. Do you have any bleeding disorder?

i. Yes ii. No

31. Do you have hemorrhoids bleeding?

i. Yes ii. No

32. Do you experience blood loss with stool?

i. Yes ii. No

D. Utilization of healthcare facility.

33. What is the distance of nearest health care facility from your home?

i. <1 km ii. 1 to 5 Km iii. 6 to 10 km iv. >10km

34. Do you visit hospital or clinic when you become ill?

i. Often ii. Sometimes iii. Not at all

35. Whenever you go to hospital for checkup who normally accompanies you? Please answer in terms of the following statements.

Statement	Often	Sometimes	Not at all
You go alone.			
You go with mother.			
You go with father/brother.			
Wait until someone available to accompany.			

E. Attitude towards preferred gender.

36. What is preferred baby gender of your parents?

i. Son ii. Daughter iii. Does not matter

37. What is preferred baby gender of your family?

i. Male ii. Female iii. Does not matter

38. If your parents/ family prefers son over daughter, to which extent you agree with following statements?

Reason	To great extent	To some Extent	Not at all
A woman feels secure.			
A woman is given respect within family & society.			
Boys are source of prestige in the family & society.			
Boys are helpful to get stronger position in the society.			
Boys are source of earning.			
Boys are helpful in old age.			
Girls are economically burden on parents.			

F. Utilization of balanced diet, food supplements, hot & cold food dichotomy and nonfood items.

39. Do you know what balance diet is?

i. Yes ii. No

40. What is your frequency of taking meal in a day?

i. 2 ii. 3 iii. 4 iv. 5

41. How often do you eat following foods in a week (i- 1 to 2 times, ii. 3 to 4 times , iii.5 to 6 times, iv . 7 times or more, v. Not at all).

Groups	Food Intake	Frequency	Groups	Food Intake	Frequency
Carbohydrates	Wheat		Fats	Ghee	
	Rice			Oil	
	Maze			Butter	
Proteins	Meat		Vitamins	Milk	
	Chicken			Vegetables	
	Fish			Fruits	
	Beans			Juices	

42. Do you take meals regularly?

i. Yes ii. No

43. If no, what is the reason?

Reasons	**Yes**	**No**	**Reasons**	**Yes**	**No**
Due to Work			Due to look after aged members		
Due to siblings care			Due to economic problems		
Watching TV			Playing games		

44. Do you take any food supplements?

i. Yes ii. No

45. Do you take iron tablets?

i. Yes ii. No

46. In your opinion, who needs more /better food in the family?

i. Male ii. Female iii. Both

47. Do you think foods have hot and cold effects?

i. To great extent ii. To some extent iii. Not at all

48. Do you agree with following perceptions about the perhaiz or restricted use of hot/cold food?

Perception about hot food	**Yes**	**No**	**Perception about cold food**	**Yes**	**No**
Causes pimples			Cause cough/cold		
Causes allergy			Cause chest congestion		
Increases blood pressure			Causes sore throat		
Stomach burning			Delayed growth in adolescents		
Heart palpitation			Cause repeated infection		
Diarrhea			Cause headaches		
Increase in Weight			Causes joint pain		
Difficult to digest			Causes asthma		

49. Do you like to eat fast foods?

Fast Food	Often	Sometimes	Not at all	Fast Food	Often	Sometimes	Not at all
Noodles				Burgers			
Potato chips				Pizza			
Pakora/Samosas				Sand witches			

50. Which of the following food items are avoided during menstruation?

Food items	To great extent	To some extent	Not at all	Food item	To great extent	To some extent	Not at All
Badi food				Cold food			
Oily food				Cold water			
Salty & sore food				Dates			

51. In your opinion what are the reasons for not consuming certain foods during menstruation?

Reason	Yes	No	Don't know	Reason	Yes	No	Don't know
Heavy bleeding				Indigestion			
Irregular periods				Abdominal pain			
Causes smell				Causes allergy			

52. Do you take following non-food item (Pica)?

Non-food item (Pica)	Often	Sometimes	Not at all
Ice			
Paper			
Leaves			
Clay/Mud			
Dry wall/paint			
Un cooked rice			

53. How often do you exercise?

i. Daily ii. 1 to 2 times in a week iii. 3 to 4 times in a week

iv Weekly v. Not at all

54. What type of exercise do you take?

Exercise	Yes	No	Exercise	Yes	No
Walking			Gym		
Running			Yoga/Dance		

G. Knowledge about importance of personal hygiene, its utilization.

55. How much your personal hygiene is important for you?

i. To great extent ii. To some extent iii. Not at all

56. How often do you do the followings?

Statements	Always	Often	Not at all
Wash hands after dusting and cleaning			
Wash hands after using toilet			
Wash hands before cooking			
Wash the vegetables or meat before you cook them.			
Cover eatables/food			

H. Personality of respondent and her interaction with other.

57. What kind of person you are?

i. Shy ii. Friendly iii. Compromising

58. How you describe your relation with your father and or brother?

i. Kind ii. Mature iii. Harsh

59. How do you describe your relation with your mother and or sister?

i. Kind ii. Mature iii. Harsh

60. How you describe your interaction with family/friends?

Interaction	To great extent	To some Extent	Not at all
Does your father spend time with you?			
Does your mother spend time with you?			
Do your siblings spend time with you?			
Do your friends spend time with you?			

I. Violence and its impact on the general health and routine matters of the respondent.

61. How would you describe the violence experienced by you from Parents/family members?

Violence	Often	Sometimes	Not at all
Embarrass/abuse in front of family and/or friends			
Tease you verbally			
Prevent you to spend time with your friends			
Grab your hairs			
Slap/kick you			
Beat you with a stick			

62. How will you describe the violence of teachers?

Violence	Often	Sometimes	Not at all
Embarrass/abuse in front of your classmates.			
Tease you verbally.			
Prevent you to spend time with your friends.			
Threaten you to fail.			
Grab your hairs.			
Slap/kick you			
Beat you with a stick			

63. Do you suffer from following general health problems?

Health problems	To great extent	To some Extent	Not at all
Headache.			
Mental stress.			
Sleeping disorder.			
Eating disorder.			
Think about self-harm.			

64. I would like to know your level of awareness about the impact of violence on the routine matters in terms of the following statements.

Issues	To great extent	To some extent	Not at all
Decreased working capacity.			
Inability to take decision.			
Do not pay proper attention on yourself.			
Low self-esteem.			
Poor appetite			

I. Prevalence of communicable diseases.

65. Did you suffer from any of the following communicable diseases during last one year?

Diseases	Yes	No	How often	Diseases	Yes	No	How often
Cholera				Diarrhea			
Pneumonia				Tuberculosis			
Measles				Cough			
Tetanus				Polio			

J. Knowledge of the respondent about anemia, its symptoms, causes and prevention.

66. Do you think anemia is a health problem?

i. Yes ii. No

67. In your opinion what are the Symptoms of anemia?

Symptoms of anemia	Yes	No	Symptoms of anemia	Yes	No
Pale skin, lips and nails			Eating non-food items		
Tiredness			Weight loss		
Weakness			Heart palpitation		
Decreased working capacity			Shortness of breath		

68. In your opinion what can be the causes of anemia in unmarried adolescent girls?

Symptoms of anemia	Yes	No	Symptoms of anemia	Yes	No
Violence.			Heredity condition.		
Malnutrition.			Non-consumption of animal protein.		
Poor socio-economic status.			Communicable disease.		
Excessive bleeding.			Worms.		

69. I would like to know your knowledge about preventive measures for anemia?

Prevention of anemia	Yes	No
Eating plenty of green leafy vegetables.		
Taking food supplements.		
Taking iron tablets and folic acid.		
Utilization of red meat/organ meat.		
Deworming.		
Utilization of hygienic food.		
Personal hygiene.		
Keeping environment neat and clean.		

70. What in your opinion are the barriers in the treatment of anemia?

Barriers about treatment of anemia	Yes	No
Lack of available food supplements in healthcare centers.		
Poor socio-economic condition.		
Lack of knowledge about anemia.		
Inadequate guidance.		
Compliance of patients with food supplements.		
Long waiting hours at healthcare facility.		