POOR QUALITY OF DRINKING WATER AND SANITATION: DETERMINANTS OF ACUTE DIARRHEA, TYPHOID AND POVERTY AMONG URBAN POOR OF ISLAMABAD

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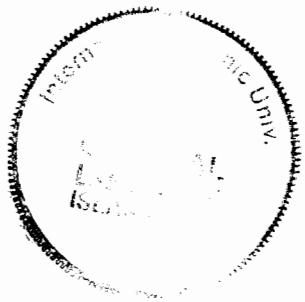
11-FBAS/MSES/F07

Submitted in partial fulfillment of the requirements for the
Master of Philosophy in Environmental Sciences
at the faculty of Basic and Applied Sciences
International Islamic University,
Islamabad.



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October, 2009

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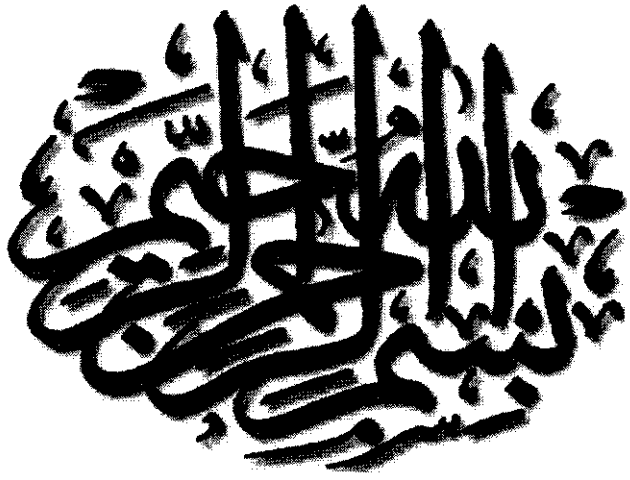

DEDICATION

(Acceptance by the Viva Voice Committee)

Title of Thesis	Poor quality of drinking water and sanitation: Determinants of Acute Diarrhea, Typhoid and Poverty among urban poor of Islamabad.
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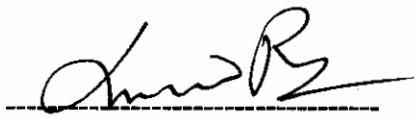
Accepted by the Faculty/Department of Environmental Science INTERNATIONAL ISLAMIC UNIVERSITY, ISLAMABAD, in partial fulfillment of the requirements for the Master of Philosophy in Environmental Science with specialization in Public Health Safety issues.

Viva Voice Committee



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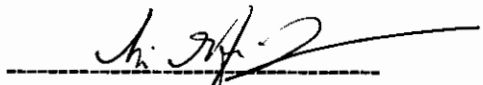

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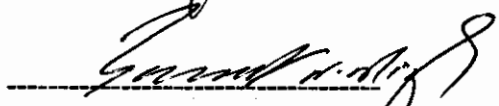

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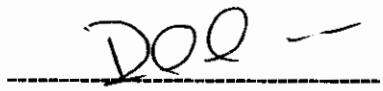

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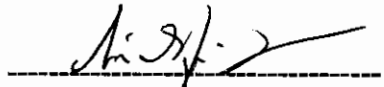

Member

October 14, 2009

ABSTRACT

The aim of the current study was to determine the prevalence of water-borne diseases including; Typhoid, Diarrhea and to asses the extent of poverty because of poor health and low income in squatter settlement (sector I-11/1 Islamabad). The associated aspects including water quality, sanitation and waste management were also covered in the study.

Eighty households were selected and sixty questions were asked from each household pertaining to demographic issues, water sources, diseases, sanitation, waste management, income and expenditure. Data was collected through Random Walk Sampling technique. The study area had three hand pumps, 2 wells and a source of piped water supply. Three samples were taken from each source to analyze the degree of contamination. Data was processed and analyzed using statistical software programs including SPSS, Minitab and excel.

Result showed that 85% of the households responded positively for typhoid, 72% for Diarrhea, 50% jaundice and 80% for typhoid considering previous three months period. Children less than five years of age were infected with diarrhea in most of the cases, the water quality test results were also positive for total coli form, fecal coli form and E- coli having 93.10% total coliform, 75.86% fecal coliform and 55.17% E-coli. Poverty and income ratio was observed, and it was found that 40% of total income of the households being studied (Rs. 268900), was spent on health. The contribution of Diarrhea for the same expenditure was observed to be 28% (Rs. 30758) whereas typhoid 32% (Rs. 37449) for Jaundice 20 %(Rs. 21970) and for Malaria 32% (Rs. 35152). The total share of

income spent on health (diseases) was found to be Rs. 109850. Statistical analysis (chi square analysis) was done to work out the association between diseases, water source and sanitation facilities. The major reason that seemed to be exacerbating economic, financial crisis was the fact that a major proportion of income was spent on health which could otherwise be utilized for better livelihood.

The current study clearly reveals that the responding families were heavily suffering from water borne diseases mentioned above which had better be controlled through prevention instead of receiving treatment at hospital and spending a major share of the income. Therefore, public participation, true governance, health education and provision of good quality drinking water and adequate sanitation should be top priorities in squatter settlement of sector I-11/1 Islamabad.

Government should play a positive role in this regard, conceding to the fact that the said squatter settlement has developed due to poor policy and administration, the policy responses should be on humanitarian grounds and in the favor of the poor of this squatter settlement.

The recommendations for the squatter settlement include raising awareness among the squatter settlers, introducing cost effective water treatment, schooling facilities for both genders, provision of water from near by water pipeline or installation of a filtration plant, construction of a water storage tank, provision of flush to septic tank latrines, paving of streets, provision of a free dispensary and either giving property rights to squatter settlers or provision of an alternate place to reside where they may have a sense of belonging and better living environment.

ACKNOWLEDGEMENT

All acclamation and appreciations are for Almighty Allah, who bestowed the mankind with knowledge and wisdom and granted the vigilances on earth. The merciful who split the seed and the kernel, who has placed the stars to guide us through darkness on land and sea. All the respect, honor and countless salutations are upon Holy Prophet Muhammad (PBUH) for enlightening with the essence of the faith on Allah, who led our lives to success and density and who is forever a model of guidance and knowledge for humanity.

I feel pleasure to place on record my deep sense of thankfulness to my honorable supervisor, Dr. Rashid Saeed Assistant Professor Department of Environmental science, International Islamic University Islamabad, for his kind supervision dexterous guidance, intensive scholarly teaching and sympathetic attitude and help throughout my research and in preparation of this manuscript.

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A great depth of gratefulness to Mr. Akram Aziz for his moral support for conducting water test at PCRWR, I feel pleasure to mention the unforgettable company of my class fellows Atif Bukhari, Feroz Khan, Jamshid Iqbal, and Mushabir Subhan for their encouragement and help during course work.

I wish to pay my sincere thanks to my brother Mushtaq Hussain Mughal, Chief Provincial Officer WFP for supporting me to continue my study and I am very grateful to Nadia Ajaz, Head of Department of Biology, Hamza Army Public College Rawalpindi and Reham Ejaz, Subject specialist Computer Sciences, Hamza Army Public College for their help during the computation of this manuscript.

Cordial thanks to my beloved mother, my hardworking father, affectionate sisters and helpful brothers for their prayers, prolonged patience and all of my family members who brought me up and lent a hand to complete my education.

Muhammad Ibrahim Mughal

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CHAPTER 1

INTRODUCTION

According to Ahmed and Nasir (1995) environment is the aggregate of external conditions that influence the life of man. Environment ultimately determines the quality and survival of life-organisms and environment is in constant change. Some changes are very rapid and others take thousands of years. The environment is not more complex than we think; it is more complex than we can think. The environment is not sums of all the material things that constantly interact which each other and which make up the mosaic of the country side landscape- It is much more then this. It also includes the economic structure and the out look and habits of people in different parts of the world. The environment as a world therefore includes not only the physical or materials factors but the socioeconomic and the cultural ones as well. To improve the quality of environment, public participation and awareness is the prime requirement which can be achieved through managing and developing environmental education and environmental strategies.

Poverty reduction and environmental protection was given importance at the dawn of 21st century and it was greatest challenge faced by the global community to save the natural environment from human destructions. Natural environment already creates problems for human livelihood across large part of the world. Without proper attention such problems will jeopardize the low income or developing countries in the future. Pressure on environment, climate change, soil degradation, water and

sanitation and biodiversity loss, are considerable concerns for future management of natural resources. WBGU (German Advisory Council on global change).

In developing countries resources are utilized more as compared to the developed countries.1.3 billion people are facing the problems of clean and safe water and 3 billion people have no access to safe and adequate sanitation. Water diseases are the main problem of developing countries, estimated 10,000 die every day because of water and sanitation related diseases and thousands of people are suffering from infectious diseases and poor people are more susceptible to these diseases because of low income. The Poor make their own arrangement. They fetch water from long distance and pay high prices for water and water sources management. (WHO, 2002a).

The present study was taken to asses the quality of water, sanitation facilities, poverty and water- borne diseases in the squatter settlement of I-11/1 Islamabad. The squatter area is situated near the Pakistan carriage factory opposite to Pir Wadhai moor. The estimated population of squatter area is 1200-1500 households. The people staying here are mostly Pukhton/Pathan. The people are living in the squatter settlement for more than 15 years. The source of income of the people of this settlement is, driving, fruit hackers and private business. Mostly people of this settlement are suffering from water-borne diseases and have no safe water to drink and also no adequate sanitation facilities.

Water and sanitation are very important in case of diseases. These diseases keep children out of school; human waste increases the social cost and cause pollution of river and ground water. NGO's governmental sectors are trying to provide the safe drinking water to people and easy access to adequate sanitation. (UNICEF, 2004). Lack of access to resources arises from income shortage to meet the needs of poor people of urban settlement. These areas are not facilitated with piped water supply for clean water. Urban poor have not be given the property right for legal settlements and have no political voice to represent themselves. People are spending more for digging the well and other sources used for water. Both poor and rich are facing the problems of polluted water but higher income households can afford to get the safe and adequate sanitation and these solution remains expensive for the poor people. Adapted from Gender in Education and Training for Water Supply and Sanitation: A Literature Review. International Water and Sanitation Center (IRC). 1997. Unpublished).

Safe drinking water has great importance and very important when we discuss the water-borne diseases. Diarrhea and dysentery are because of contaminated water or poor water supply especially in developing countries including Pakistan (Arif and Ibrahim, 1998). According to the source which is free of disease are the piped water supply and bottled water while river water, ponds, lakes and streams are sources of contaminated water. In Pakistan piped water supply is not limited but it declined over time. This facility was reduced both in rural and urban areas. It was reduced in Sindh and NWFP while remained unchanged in Punjab. (Pakistan Integrated household survey 1995-97 and 1998-99).

For sustainable environment, goal 7 of millennium development goals shows clear cut concern that up to 2015 half of the population of the world will be provided safe drinking water through the piped water supply and water contamination will be reduced under certain dynamic actions. The aggregate coverage rose from 77% to 88% between 1990-2006.where 90% coverage is in urban areas to provide safe drinking water. The rural area open defecation is common. Half of the population of south Asia defecates in open fields, where 18% is the total population of the world who defecate in open fields.

In September 2000, The United Nations Millennium Summit showed intensive concern over poverty and determine the measure to combat the poverty in developing countries. It was also mentioned to combated hunger, illiteracy, environmental degradation and discrimination against woman. Goal 7 of "Millennium Development Goals" is to ensure sustainable development of environment and target 11 was to gain improvements in the lives of 100 million slum residents in squatter areas.

Human beings and animals are the carriers for water-borne diseases, typhoid, diarrhea, cholera; polio and hepatitis A and B. Million of people in the world have no access to safe drinking water and sanitation. They have no toilet facilities about 1.2 billion people are facing the problems of safe drinking water. (Warner, Drinking water supply and environmental sanitation for health presented at conference of water and sustainable development, Paris, March, 19-21, 1998.p.1-10).

Diarrhoeal diseases are because of poor sewerage treatment in many developing countries. The human waste, ditches, and latrines are spread over croplands. An estimated 4 billion cases of diarrhoeal diseases occurred in the developing countries every year. Where 3-4 million deaths occurred due to the water-borne diseases mostly among the children. Olshansky. (S. J; Carnes, B; Rogers; and smith L.infectious disease now and ancient threats to world health. Population bulletin 52(2): 2-43.July .1997.). 1.7 million Deaths occurred in a year world wide because of diarrhea. (Ash bolt, 2004). Diarrhea is because of contaminated water which spreads very quickly. It causes morbidity and mortality among children under age five especially in developing countries. The mortality rates ranges from 2.5-3.5 million deaths, 80% deaths in children are due to diarrhea (Kosek et al., 2003). Morbidity rate is 4 billion in a year while 1.2 billion (30%) deaths are because of contaminated water (Ford, 1999). Human excreta and households hygiene are the major sources of transmission of infectious diseases, including typhoid, malaria, polio and ascariasis etc. WHO estimated that 2.2 million people are dying every year from diarrhoeal diseases. Among them 10% population is being infected from developing countries and they have no proper removal methods of waste and garbage. (Murray and Lopez 1996; WHO 2000a). It was found that diseases produced by the excreta mostly affect the children under age five and the poor. The diarrhoeal disease occurs in developing countries affect the children. (WHO, 1999).

The disease due to the unsafe water and sanitation was first examined at global level in 1990(Murray & Lopez, 1996), the same estimate was observed in 2002 (WHO 2002; Prüss et al, 2002; Prüss-Üstün et al. 2004). The estimate was revised on

systematic and transparent methods. Again it was suggested that diseases burden is because of unsafe water (Cairncross and Valdmanis 2006). The disease burden was presented in a more comprehensive way by (WHO 2007), which describes that one tenth of disease's burden is due to the water and sanitation services. Malnutrition, sickness, and other health problems in developing worlds are because of the water-borne diseases. The parasitic ingestion causes the absorption of the essential nutrients in the stomach and intestine walls. The excessive absorption of water causes malnutrition in children and weight loss of the children under age of five. (Esrey, Habicht and Casella, 1992; Esrey, 1996; Checkley et al., 2004).

Land degradation, destruction of ecosystem, soil pollution and climate change also contribute malnutrition. Two percent burden of malnutrition is because of climate change (WHO, 2002). Where as 50% malnutrition is because of environment (Prüss-Üstün and Corvalán, 2006), having water and sanitation. The concern about waterborne diseases was enhanced at the global level in 1990 (Murray and Lopez 1996a).It was suggested that water and sanitation are the major cause for the diseases to corporate risk factor. The risk factor was observed 5.3% of all deaths and 6.8% was observed of all disability adjusted life years (Daly's).

The diseases can be checked by providing good water quality and good sanitation facilities, Esrey et al. (1991). It was observed that water-borne diseases are because of poor water quality and bad sanitation. It was also observed that faeces were found from the patient of diarrhea [Dupont et al. 1989]) the pathogen may enter from mouth to stomach and associated with water that has been contaminated. (Barwick et al.

2000). Water contamination is not because of poor water quality in developing countries but it also occurs due to storage of water at home for long time. (Van Derslice and Briscoe 1993). In developing countries poor health and poverty exacerbate mortality and morbidity associated with bad sanitation. Children are mostly infected with diarrhea (WHO 2000b). Rice *et al.* (2000) found that low weight children are more likely to accept diarrhea under age five and reduce their weight. The malnutrition is 50% because of diarrhoeal diseases in children. Water and sanitation are very important factors, it is estimated the water-borne diseases are due to the ingestion of microbiological risk due to water contamination being caused by human excreta and animal dung. (WHO, 2004a). In 2000 it was estimated that about a billion of people in the world lack access to safe water and 2.4 billion people are being infected by bad sanitation.

Water-borne diseases are because of poor water supply and bad sanitation but it was observed that only safe water reduce diarrhoeal diseases and lessens the death rates. (Esray et al 1985, 1981). However diseases can be checked when both water and sanitation are adequate. People take the water from the pumps and contamination occurred especially when people store water at home for long time. So water quality alone has remarkable effect on health (Sobsey et al., 2003). A study about water and sanitation was observed by Clasen and Cairncross (2004). About water and sanitation that both are important incase of diseases. Fewtrell and Colford, (2004) found that water-borne disease; diarrhea and typhoid can be reduced by improving microbiological water quality reducing the risk of diarrhea and other diseases. They suggested water quality analysis to reduce the chances of diarrhea and removal of

pathogens. Bacteria, pathogens and viruses are main sources that cause diarrhea and typhoid. People infected with diarrhea lose both water and electrolyte, causing dehydration and some time deaths, 1.8 million deaths occurs per year due to diarrhoeal diseases, 1.6 million deaths occur in children less than five years. Water and sanitation are main determinants causing diarrhea. Washing of hands reduce diarrhea by one third but the most important is to provide good sanitation facilities to cease the diseases. (WHO /UNICEF, 2006).

Objectives of the study:

The study was undertaken to fulfill the following objectives

- To test the quality of water (Microbiological Analysis) in the study area (squatter development of I-11/1 Islamabad)
- Prevalence of Diarrhea and Typhoid among urban poor of Islamabad: water quality and sanitation issues.
- Linking poverty and water borne diseases diarrhea and typhoid among urban poor of Islamabad Pakistan.

Rationale

Water-borne diseases were found to be the most serious problems of the study area. Inadequate sanitation and low income due to disease burden has made their lives calamitous. There was no proper way or satisfactory documentation showing the magnitude of problems regarding health facilities. Different reasons were worked out by dividing this rationale. Firstly, negligible work was done in squatter settlement of I-11/1 Islamabad; therefore, this research study was aimed to explore new

information, knowledge that may be added to already existent, insufficient knowledge.

Secondly, the main objective of research was to determine the burden of water-borne diseases and the research work or the findings will be useful in planning, management and evaluation of health services in other squatter settlement as well. The information will also be helpful to provide better health system with public participation to curb the problem of water-borne diseases. This study will also provide opportunities for future studies to fill in the gaps that this study could not address. Finally, on completion, the research will be published both in regional and international journals. That is, the environmentalists, researchers and decision makers will benefit towards devising new policies for squatter settlements in Islamabad and other cities.

CHAPTER 2

REVIEW OF LITERATURE

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(Pakistan Integrated household survey) 1995-97 and 1998-99. In Pakistan piped water supply is not limited but it declined over time. This facility was reduced both in rural and urban areas. It was reduced in Sindh and NWFP while remained unchanged in Punjab. Rural areas were not given this facility as in urban households entertaining the piped water supply.9%households in rural areas were provided piped water supply in 1998-99.

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CHAPTER 3

MATERIALS AND METHODS

3.1 Experimental Area

To study "poor quality of drinking water and sanitation: Determinants of Diarrhea, Typhoid and poverty among the poor of a squatter settlement Islamabad" eighty (80) households were selected. The study area is among the habitats of sector I/11/1 (Islamabad) near mega mall shopping centre (Metro). According to the study the estimated population of this area is approximately 1200-1500 households, more than 40 percent of studied population is dwelling in this squatter settlement for almost 15 years.

3.2 Sampling Strategy

The strategy was made after the area was examined. Random walk sampling was chosen within the target area and then an interview was started. The number of possible convenient starting points were selected and one randomly chosen. The method was time saving as no household or group of households were pre selected for sampling. No time was lost or spent looking for the household or the area we require for survey and it was easy to carry out the study without the requirement of any form of map or information relating to household. Hence it was feasible to cover a large section of study area.

3.3 Pilot Testing

The pilot testing was conducted at Ghosiabad Rawalpindi for the same purpose. The next important step was to test the validity and reliability of the questionnaire. The researcher personally visited and administered relevant questionnaire and respondents were requested to give their suggestions freely for the improvement of the questionnaire. The questionnaire was valid but not reliable. For determining the reliability of these instruments, Cronbach's Alpha was applied to calculate internal consistency of items. These results of the pretest were analyzed by using the Software Package for Social Sciences (SPSS version 14).

No. of items	Alpha
60	0.838

3.4 Households Interviews

Eighty (80) households were interviewed. The questionnaire was designed in simple local language after getting baseline information of the study area. Some of the questions were adopted being used by the world health organization and UNICEF. The questionnaire was modified and improved after pilot study according to the area needs. The questionnaire was simple and common comprising of 60 questions. Each of eighty households was asked to answer 60 questions within a time period of 30-40 minutes. The questions were structured keeping in view the study objectives, i.e.;

demographic issues, diseases, sanitation, sources of drinking water, income, expenditure, and waste management.

3.5 Household Sampling

Eighty households were selected randomly according to the total prevalence (percentage) of diarrhea in Pakistan by using the formula [$n = Z^2 \times P\ (1\text{-}P) / e^2$] within the study area. The questionnaire was handed over to the head of the household or to any member of the household in case of his absence.

3.6 Data Collection

Data was collected from primary sources by conducting household interviews. The interviews were conducted using semi-structured questionnaire. The information related to households, health, education, water and sanitation was embedded in the interview schedule.

3.7 Water Quality Tests (Microbiological Analysis)

The source of drinking water (drivers) in the study area were three(3) hand pumps, two(2) unprotected private wells and a source of piped water supply in surrounding area. Three samples were collected from each source (hand pump, unprotected private well and piped areas) whereas ten (10) samples were collected from the households, randomly, to test the stored water quality for contamination. All techniques and

precautions were observed during collection of water samples. The water tests were finally conducted at PCRWR (Pakistan Council for Research in Water Resources).

Test for Escherichia Coli (E.coli) was analyzed (MPN Method) to see the contamination. E.coli is a major indicator for viruses, pathogens and protozoa that is responsible for diarrhea, typhoid fever and other diseases which can be ingested by food and water.

3.8 Data Processing, Analyzing and Interpretation

MS-excel, SPSS and Minitab computer programs were used for the processing of the data. All the information gathered was classified and tabulated as per the nature of the data and was analyzed using above mentioned statistical soft wares.

For statistical analysis to see the association between two criteria of classification chi square test was applied in order to bring the results up to the mark. For this purpose computer software program, Minitab was applied to see the relationship between diseases and the factors that were causing water and sanitation related diseases in the study area. Whereas SPSS program was used for reliability test and MS excel was used to form charts and graphs.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Responses of Questionnaire

This chapter describes the over all results after collecting the data. The results given below are the frequencies of all the questions that were asked from eighty households.

Respondents' Socio -Economic and Demographic Characteristics

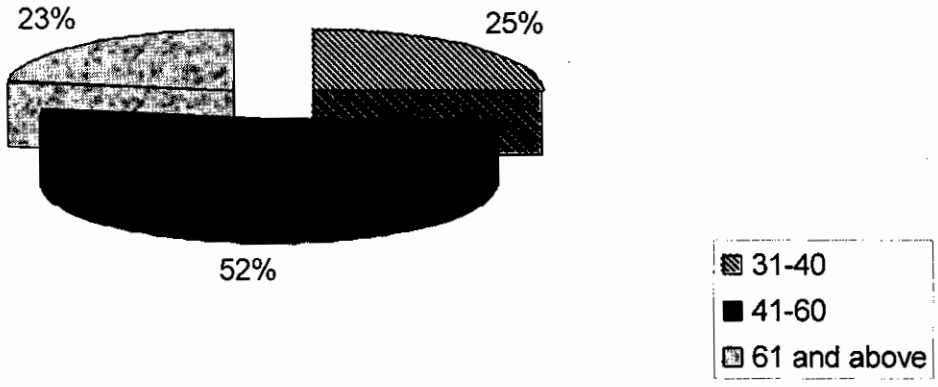

Figure 4.1.1 Distribution of respondents according to age

Figure 4.1.1 shows that there were 25 % (20) respondents whose age was 31-40 years and there were 52.5 % (42) households whose age was between 41-60 years and 22.5 % (18) respondents had an age of 60 years and above. These groups show the household members who were interviewed. The members above the age of sixty were mostly jobless.

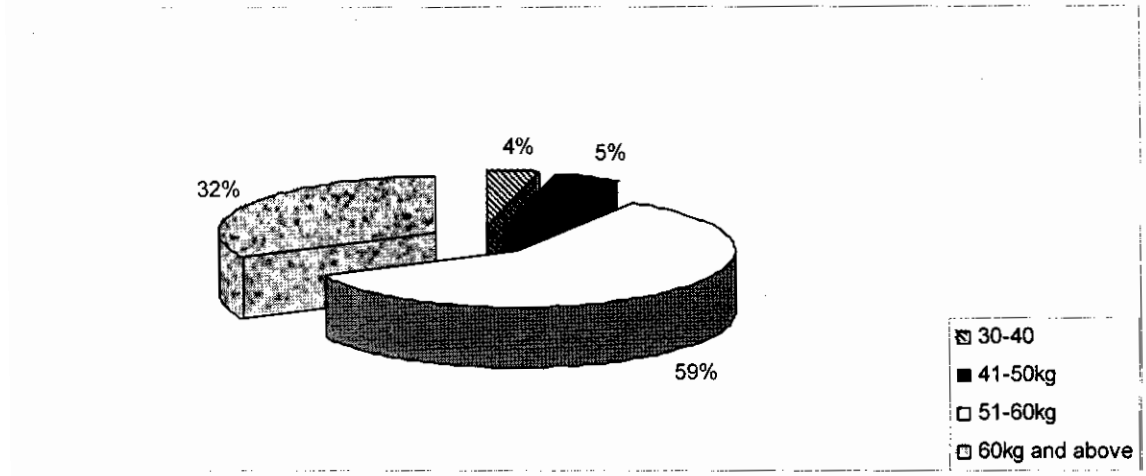

Figure 4.1.2 Distribution of respondents according to the weight

Figure 4.1.2 shows that there were 3.8 % (3) respondents whose weight was 30-40 kg. There were 5 % (4) respondents whose weight was 41-50 kg and that of 58.8 % (47) respondents whose weight was 51-60 kg and 32.5 % (26) respondents had weight of 60 kg and above. Mostly the weight of the members was less than sixty kg because of improper diet and poor health, as more was spent on health problems than balanced diet.

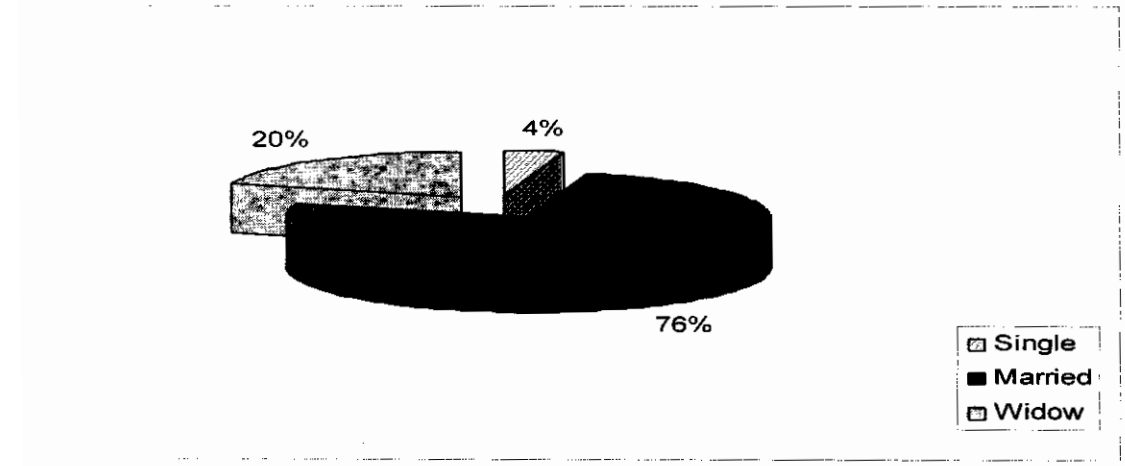

Figure 4.1.3 Distribution of respondents according to marital status

Figure 4.1.3 shows that 3.8% (3) respondents were single (unmarried) while 76.3 % (61) Respondents were married and 20 % (16) households (women) were widows. Seventy six households had children between 6 to 10 years of age. The redundancy/unemployment seemed to be the major factor behind heavy population growth of this squatter settlement.

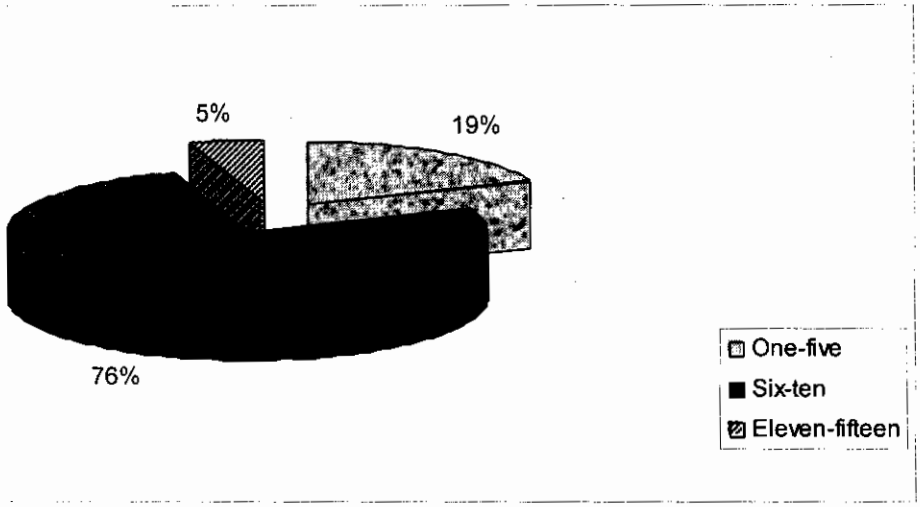

Figure 4.1.4 Distribution of respondents according to the family members

Figure 4.1.4 shows that 18.8 % (15) respondents had 1-5 family numbers while 76.3% (61) respondents had 6-10 persons in their households and 5% (4) respondents had 11-15 family members. A high number of six to ten children was recorded because most of the male respondents were bigamous or polygamous.

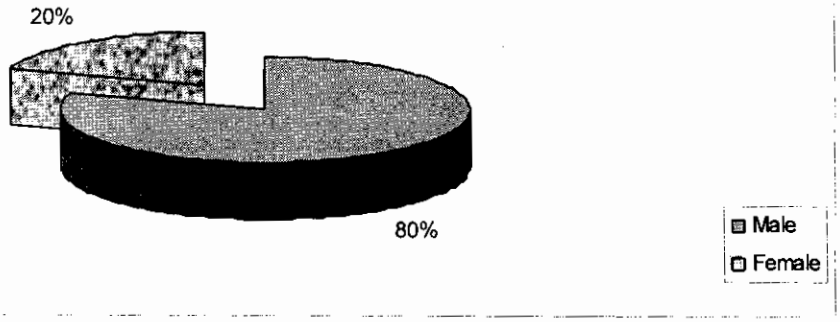

Figure 4.1.5 Distribution of respondents according to sex

Figure 4.1.5 shows that 80% (64) households' respondents were male and 20 %(16 respondents were female). During interview only 20% women were interviewed who were widows or their husbands were infected with diseases and were not able to turn up as respondents.

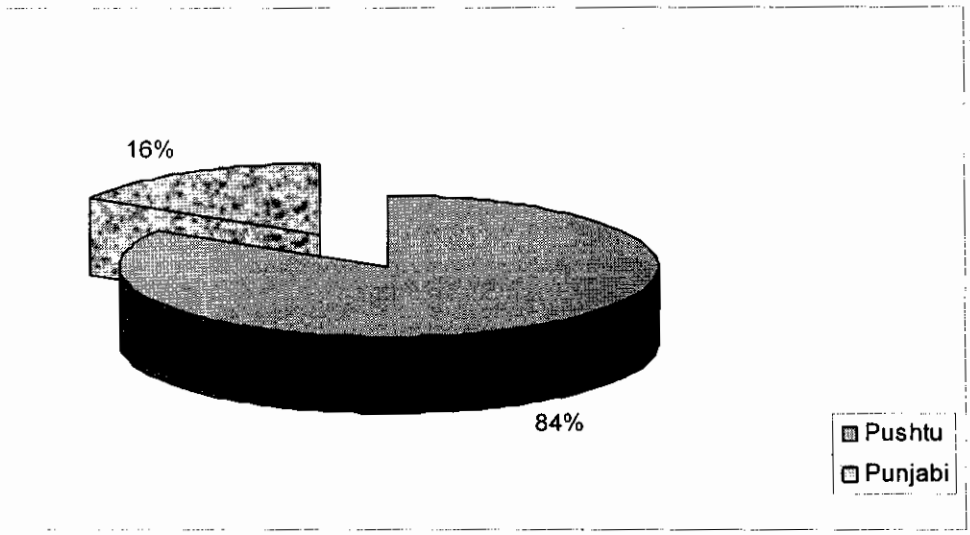

Figure 4.1.6 Distribution of respondents according to mother tongue

Figure 4.1.6 shows that 83.8% (67) respondents had Pushtu as their mother tongue and 6.3% (13) were Punjabi speaking. The result show that 99 % inhabitants of this area had come from NWFP and some were refugees from Afghanistan who had been settled there for more than 15 years.

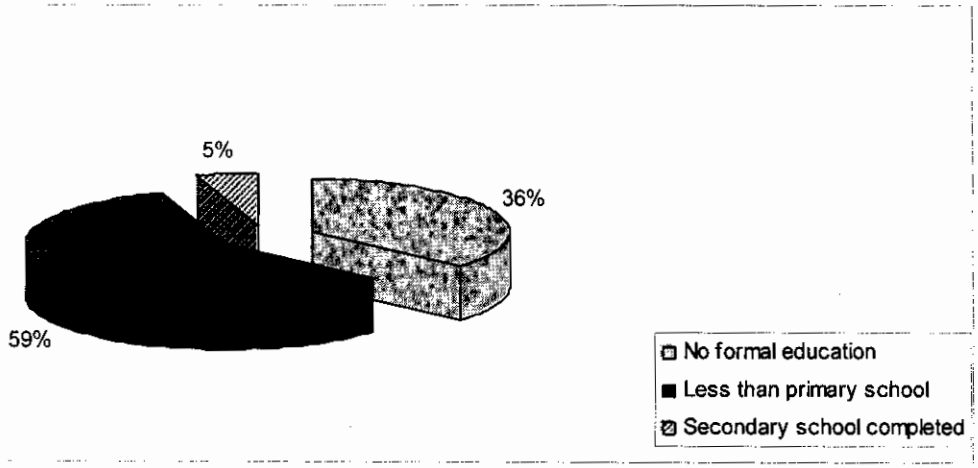

Figure 4.1.7 Distribution of respondents according to education

Figure 4.1.7 shows that 36.3% (29) respondents had received no formal education. While 58.8% (47) respondents had less then primary school education and 5 % (4) respondents had completed their secondary school education. Mostly household members were illiterate even not to read or write and their children had no educational facilities either. Because of prevailing poverty they responded that they could not pay the school fees and the main reason was the sickness that kept the children out of school.

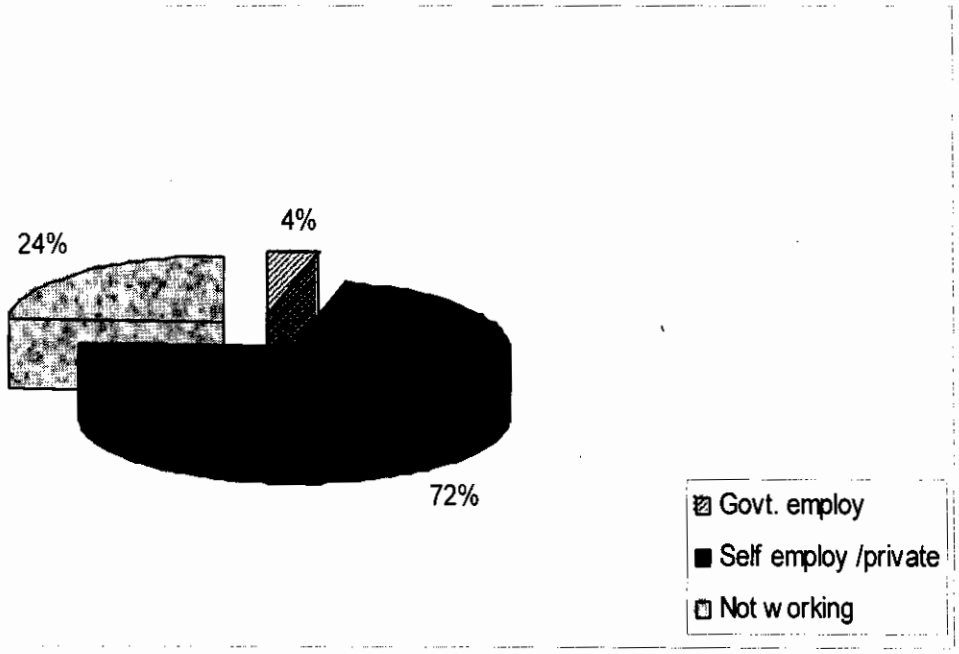

Figure 4.1.8 Distribution of respondents according to occupation

Figure 4.1.8 shows that 3.8% (3) respondents were government employees and 72.5% (58) respondents were working as self employee/private business while as 23.8% (29) respondents were not working, had no source of income. Twenty four percent respondents had no income and were not working. Some of them responded that they were infected with diseases during many years and some of them were

handicapped during the war of Afghanistan. The respondents who were working were earning less than Rs, 8000 per month as an average.

Water Supply and Use

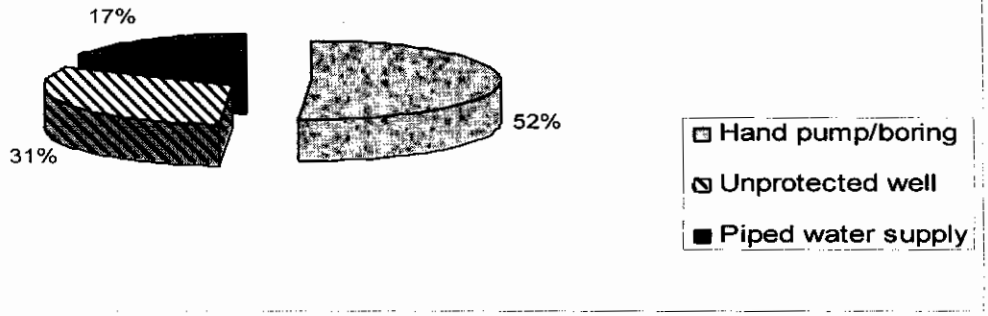

Figure 4.1.9 Distribution of respondents according to drinking water resources

Figure 4.1.9 shows that 41(51.3%) respondents were found to be taking drinking water from the hand pump as a sources and 25 (31.3%) respondents responded that they were getting water from the unprotected private well where as 14 (17.5%) respondents responded that they were getting water from the surrounding piped supply area.

These sources of water were very near to each other and people were coming from a far off distance to fetch the water resulting in time loss and mishandling of water was also observed.

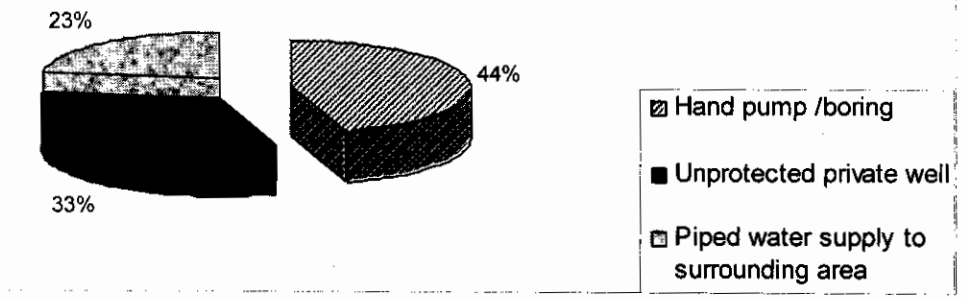

Figure 4.1.10 Distribution of respondents according to cleaning water resources

Figure 4.1.10 shows that 44 % households were consuming water from the hand pump while 33 % were using from unprotected private well and 23 % were using water from the surrounding areas for cleansing purpose.

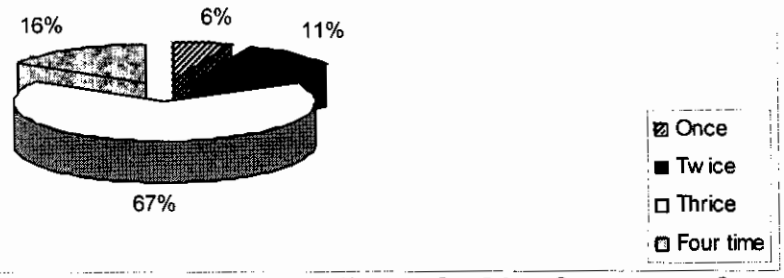

Figure 4.1.11 Distribution of respondents according to fetching frequency of drinking water

Figure 4.1.11 shows that 6% respondents were fetching water from a long distance and only once a day where as 11.3% responded that they were fetching water from the source twice a day. Similarly 67% and 16% responded that they were getting water from the sources thrice and four times a day respectively. Fetching of water was a problem for the respondents because all water sources were not distributed randomly. People were covering a long distance to fetch the water, taking a time about 40-60 minutes.

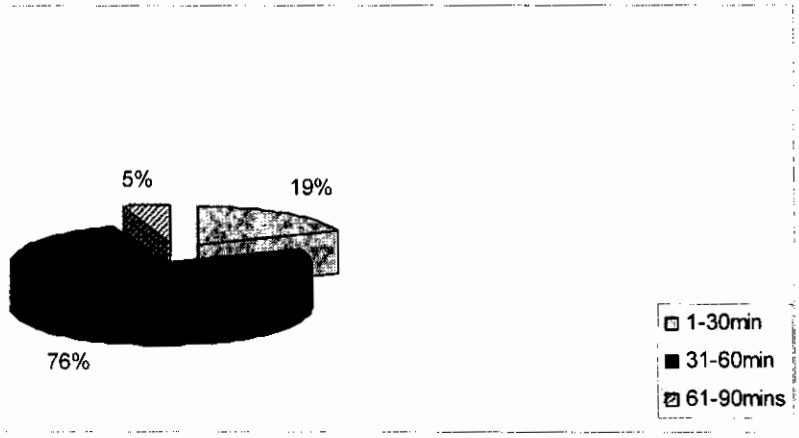

Figure 4.1.12 Distribution of respondents according to the time of collecting the water.

Figure 4.1.12 shows that 18.8 % (15 households) said that they spent a long time to go and fetch the water taking almost 130 minutes, other 76.3% responded that they carried it to their houses in31-60 minutes and 5% said that they spent a time of 61-90 minutes. Distance from the sources was a problem for the households even to get the safe drinking water and were using the contaminated water available at the least

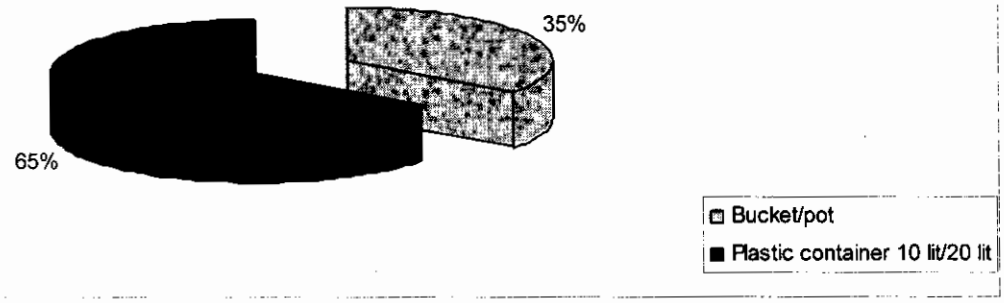

Figure 4.1.13 Distribution of respondents according to water fetching containers

Figure 4.1.13 shows that 35 % (28) respondents were collecting water in buckets made of iron and 65% (52) households were fetching water in plastic containers having capacity of 10 to 20 liters. The pots and containers used were not hygienically safe and the sources with the storage containers at houses were also unsafe. Storage containers were not safe to protect the water and it was later proved through water quality test that there was contamination in the stored water.

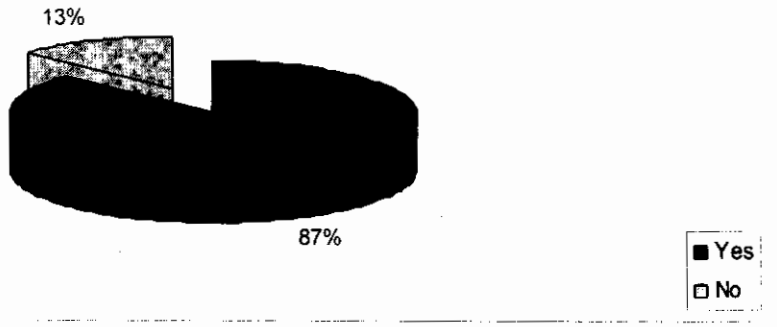

Figure 4.1.14 Distribution of respondents according to storage of water at home

Figure 4.1.14 shows that 87 % (70) respondents stored water at houses where 13 % (10) respondents were not storing water at houses. The respondents who were storing water at houses were found to be infected with diarrhea and typhoid, whereas number less number of respondents was found to be infected with said diseases who were not storing water at houses for long duration.

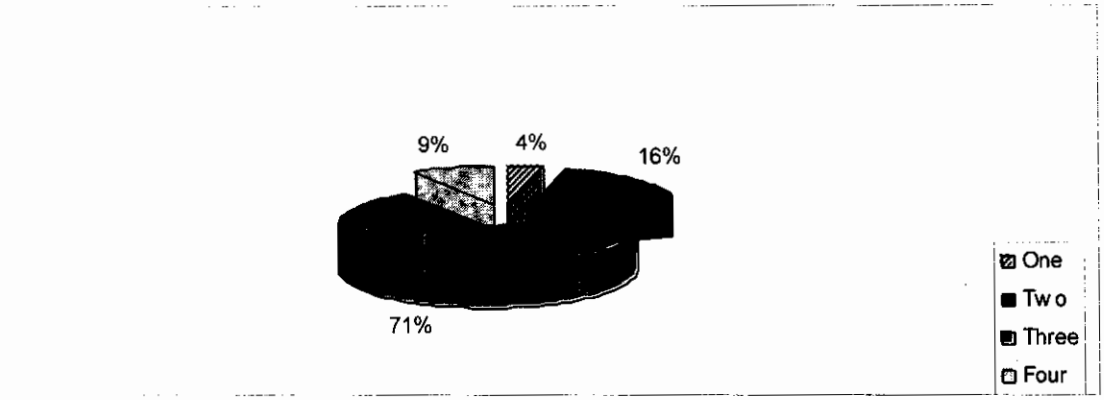

Figure 4.1.15 Distribution of respondents according to number of container possessed.

Figure 4.1.15 shows that 3.8% (3) respondents said that they had 1 storage containers for storing water at houses where as 16.3% had two containers and 71.3% had three storage containers to store the water at home and also 8.8% respondents that they had four containers to store the water at houses.

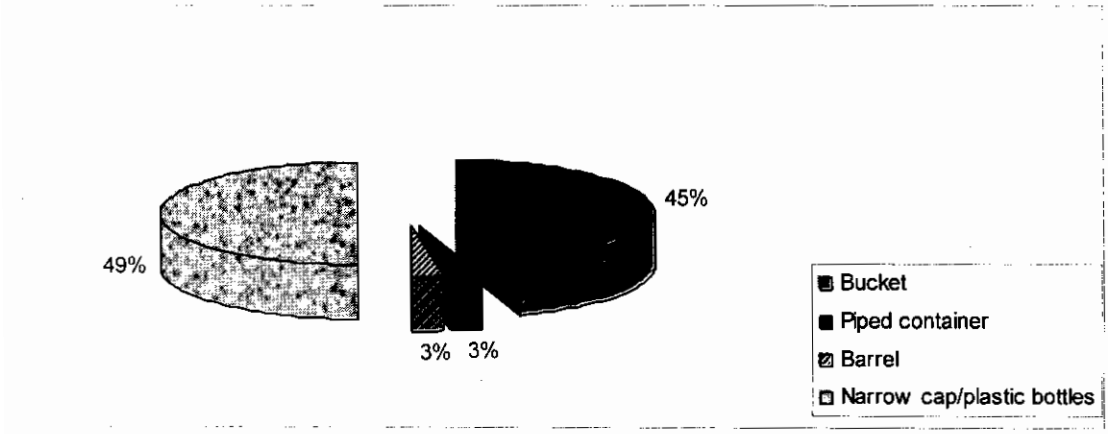

Figure 4.1.16 Distribution of respondents according to storage containers

Figure 4.1.16 shows that 45% (36) respondents were using the bucket containers, 2.5% were using the piped metal containers, 2.5% were using the barrels and 50% were using the narrow cap plastic bottles. The storage containers were not found to be hygienically safe to store the water.

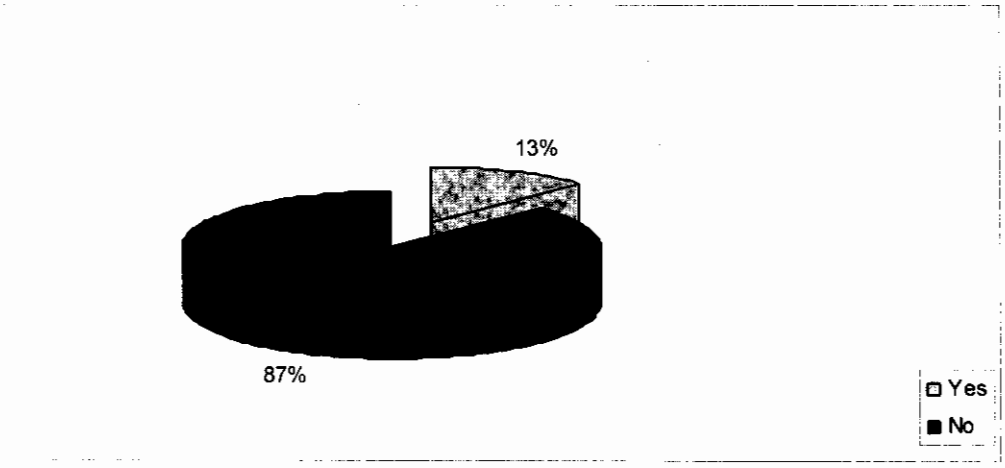

Figure 4.1.17 Distribution of respondents according to water treatment.

Figure 4.1.17 shows that 12.5 % (10) respondents were using water after treating it while 87.5 % (70) households were not able to treat the water. The households treating the water were less infected with diseases and the households which were not treating were more likely to suffer from water-borne diseases.

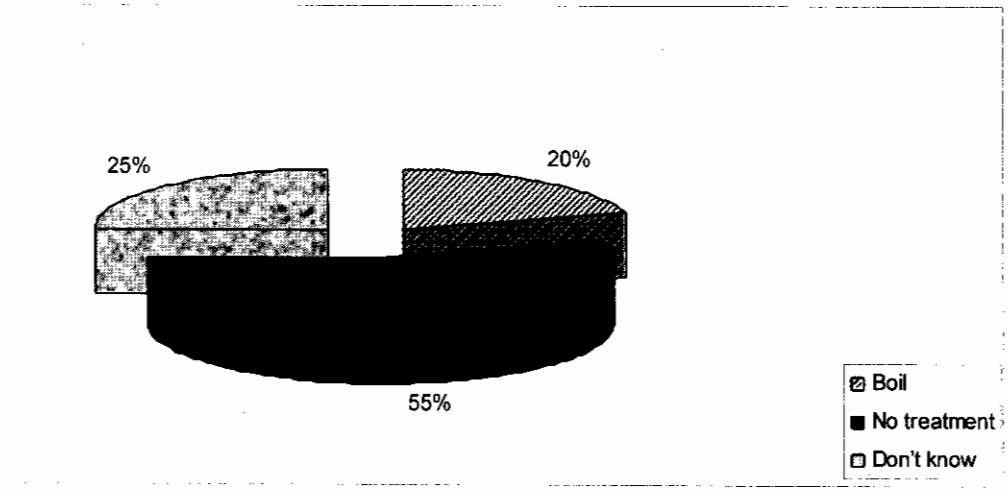

Figure 4.1.18 Distribution of respondent according to type of treatment

Figure 4.1.18 shows that 20% households were treating the water by boiling it and 55% were not treating the water through any source and 25% households responded that they did not have an idea of treating the water.

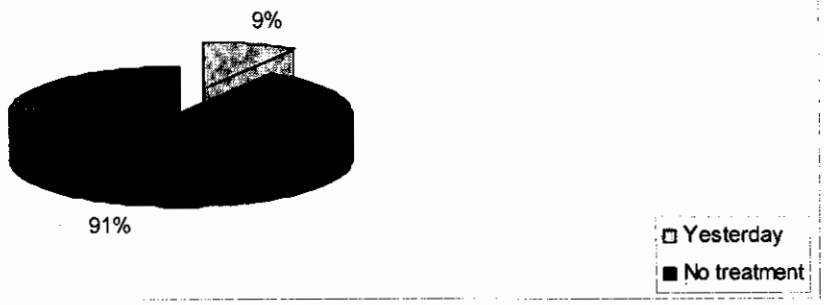

Figure 4.1.19 Distribution of respondents according to time for treating water.

Figure 4.1.19 shows that the treatment method was not efficient, 8.8% (7) households used to treat (boil) the water a day later and 91.3% (73) respondents were not using any method to treat the water. The household income in most of the cases was insufficient to bring the fuels to houses in order to treat (boil) the water or any other source so that they could protect themselves against diseases.

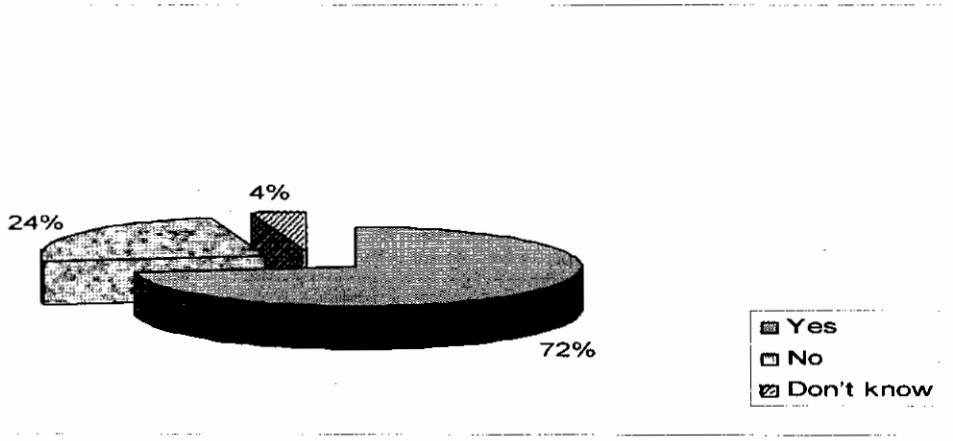

Figure 4.1.20 Distribution of respondents according to the prevalence of diarrhea and vomiting

Figure 4.1.20 shows that there were 72.5% respondents who said that they had diarrhoea and vomiting within last three months and 23.8 % had no diarrhoea and vomiting while 3.8% households said hat they do not know about these ailments. The test results as explained in preceeding sections for water showed contamination. Only two sources were found hygienically safe for drinking and other source were found to be contaminated.

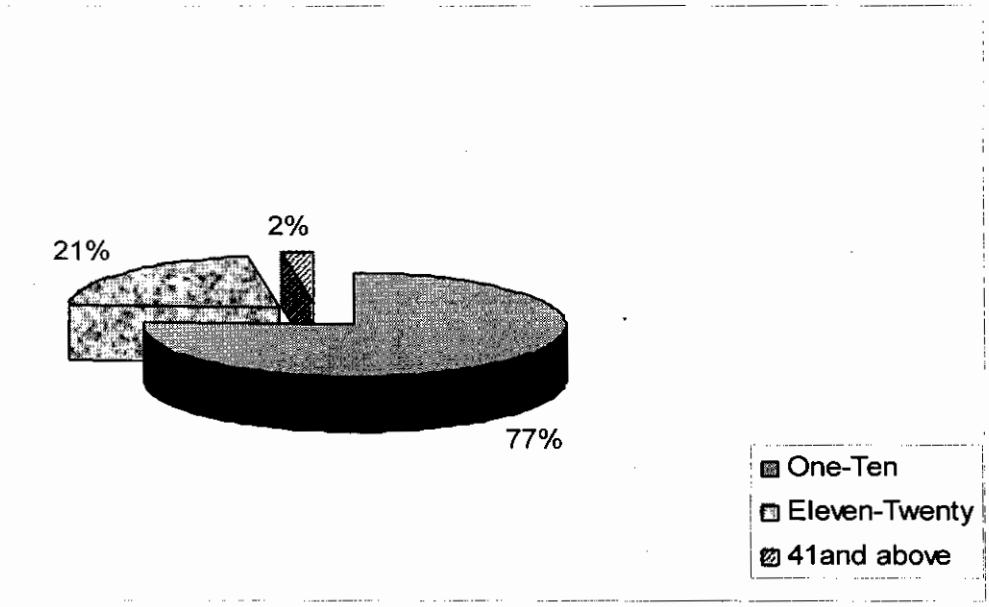

Figure 4.1.21 Distribution of respondents according to age and prevalence of diarrhoea.

Figure 4.1.21 shows that there were 76.3 % respondents who said that they had diarrhea and their ages were 1-10 years while 21.3% responded that they had diarrhea and their age were 11-20 years. Similarly 2.3% responded that they had diarrhea and their ages were 41years and above. The heaviest diarrhea prevalence was observed in children having age 1-10 year and mostly the children who were less than 5 years of age.

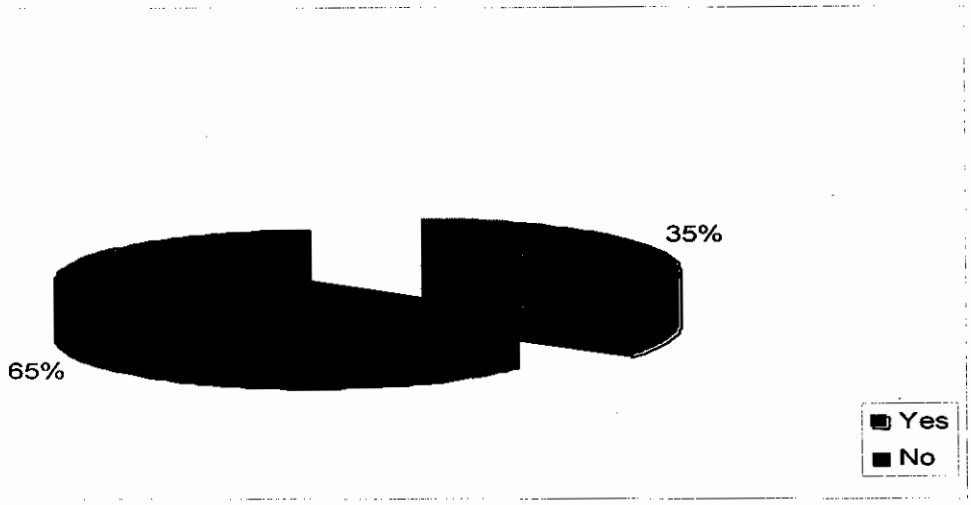

Figure 4.1.22 Distribution of respondents according to prevalence of stool with blood.

Figure 4.1.22 shows that 35 % (28) responded that they had blood in stool and 65% said that they had no blood in their stool within last three months. The common outbreak was observed for diarrhea and Typhoid; however blood in stool was because of prolonged diarrhea.

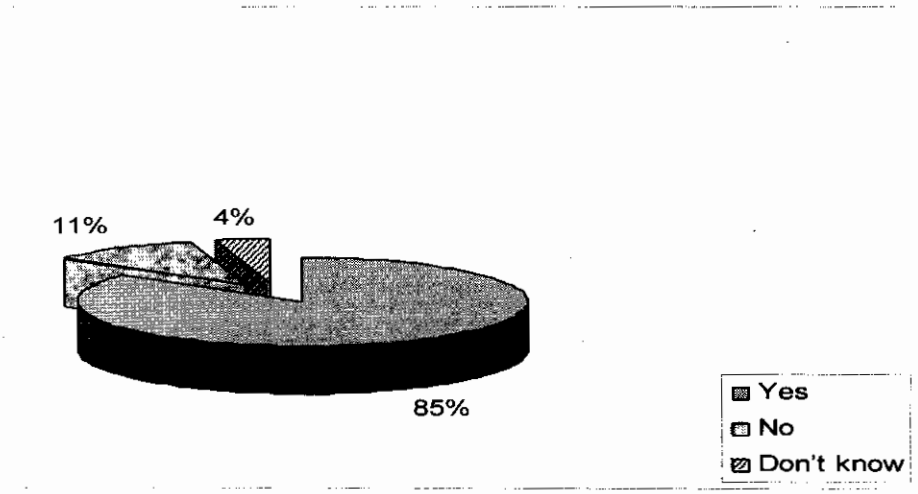

Figure 4.1.23 Distribution of respondents according to the prevalence of typhoid fever

Figure 4.1.23 shows that there were 85% (68) respondents who had fever more than three days within last three months. Other 11.35% responded negatively and 3.8% (3) respondents said that they did not know about the disease and its symptoms.

It was observed that mostly the respondents had no awareness for the disease, hygiene or precautionary measures.

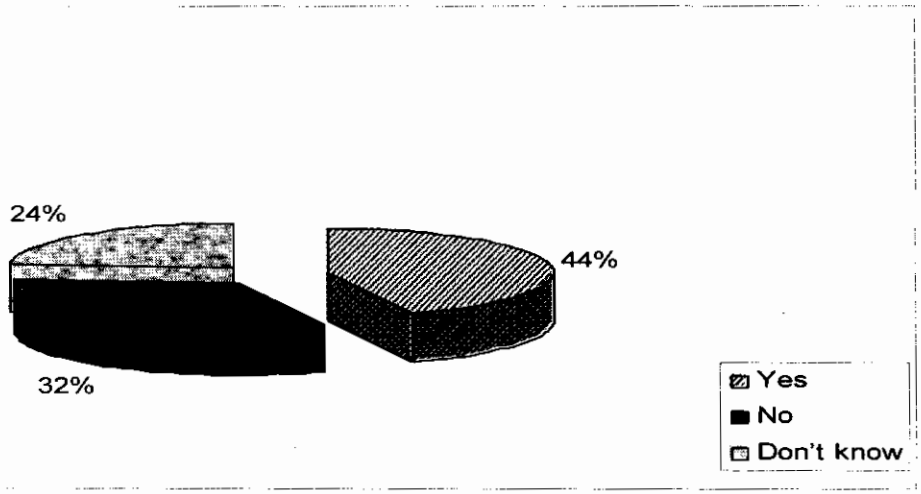

Figure 4.1.24 Distribution of respondents according to prevalence of jaundice

Figure 4.1.24 shows that 43.8% (35) respondents had suffered from Jaundice within last three months and 32.5% (26) said that they had no jaundice while 23.8%(19) respondents said that they did not know about the disease.

Sanitation Facilities

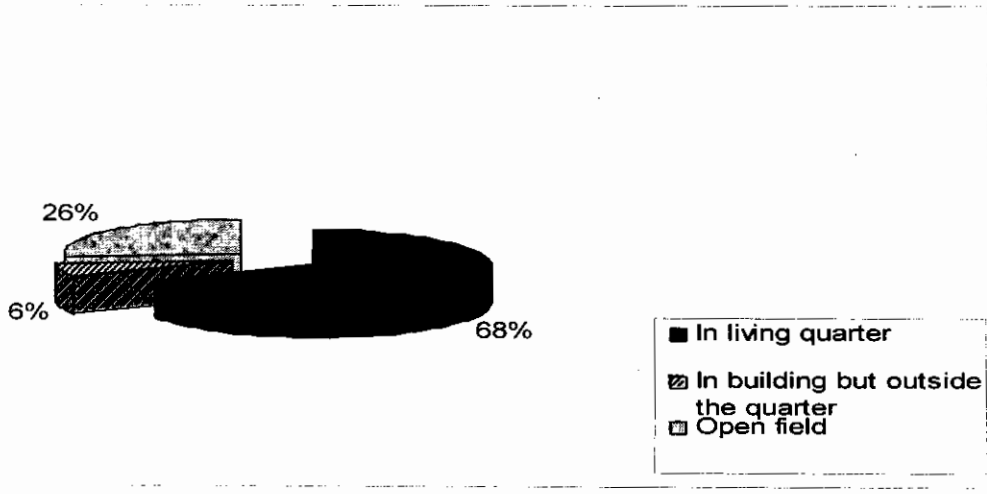

Figure 4.1.25 Distribution of respondents according to toilet facility location

Figure 4.1.25 shows that 67.5% (54) respondents had toilet facilities inside the building and 6.3% (5) inside the premises but outside the building while 26.3% (21) households had no facilities and they were using open fields for defecation. The sanitation condition was very poor, shortage of water and unsafe water seemed to cause diseases in the study area.

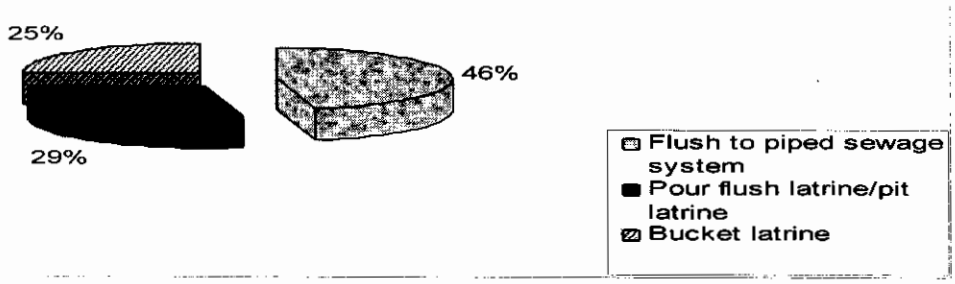

Figure 4.1.26 Distribution of respondents according to toilet facility

Figure 4.1.26 shows that 46.3% (37) respondents had poor flush to septic tank 28.8%(23) were using poor flush latrine /pit latrine where as 25% (20) respondents were using bucket latrines. Mostly women were using bucket latrine where pit latrines were also not present.

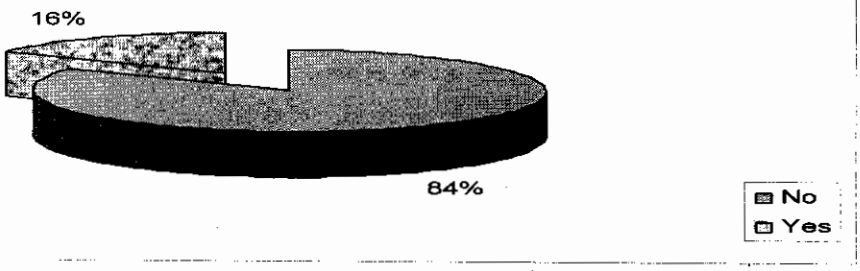

Figure 4.1.27 Distribution of respondents according to shared toilet facility.

Figure 4.1.27 shows that 83.8 % (67) respondents responded that they were not sharing toilet facilities with other households where as 16.3% (13) said that they were sharing these facilities with other households.

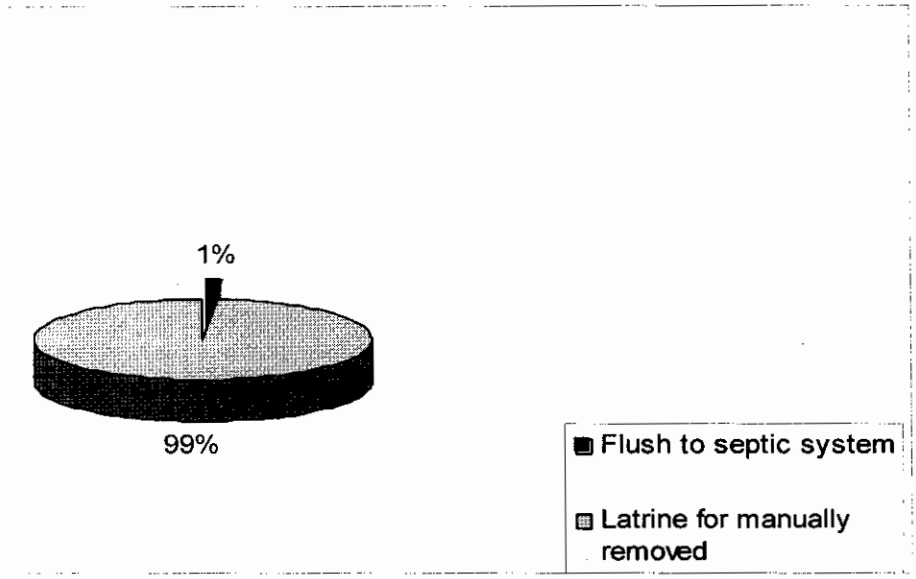

Figure 4.1.28 Distribution of respondents according to sewage

Figure 4.1.28 shows that 1.3 % (1) respondents had a flush to septic system and 98.7% (79) respondents had latrine with manually removal system.

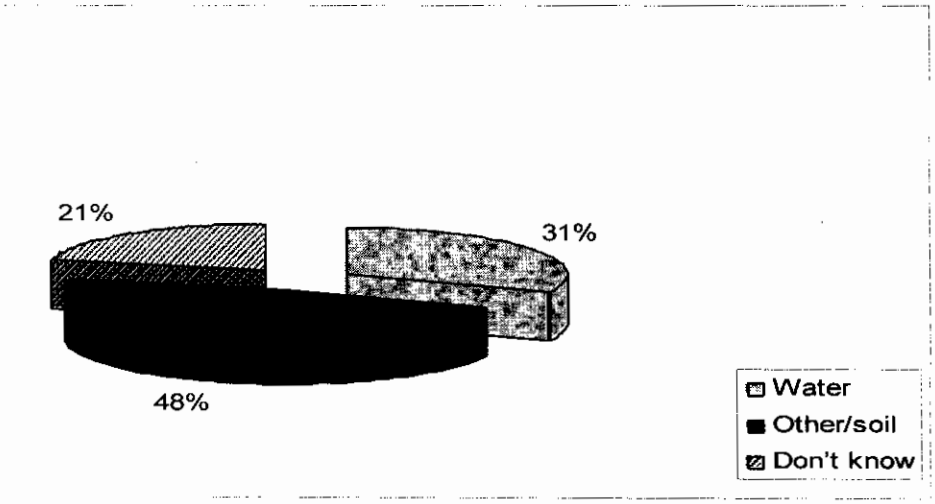

Figure 4.1.29 Distribution of respondents according to facility used after defecation

Figure 4.1.29 shows that 31.3 % (25) respondents were using water after defecation and 67.5% used soil after defecation where as 1.3% responded that they did not know. After defecation it is necessary to wash hands with soap, it was observed that majority of respondents were not using soap and were found to be infected previously mentioned diseases.

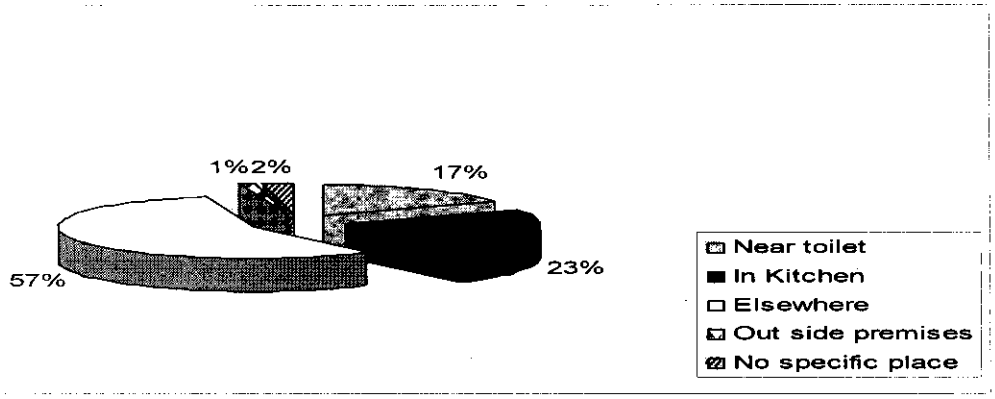

Figure 4.1.30 Distribution of respondents according to location of facility to wash hands

Figure 4.1.30 shows that 17.5% (14) respondents were washing their hands near toilet 22.5% (18) respondents washed their hands near kitchen, 56.3% (45) respondents wash elsewhere 1.3% (1) respondents outside the premises and 2.5% (2) respondents wash their hands having no specific area.

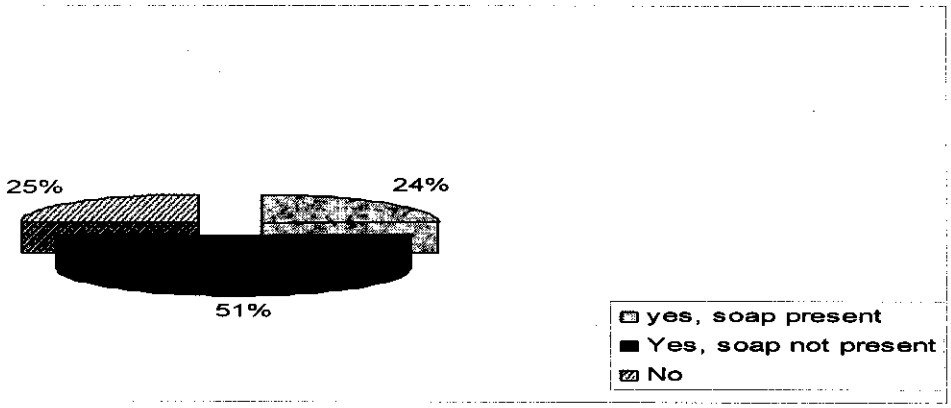

Figure 4.1.31 Distribution of responses according to washing sink

Figure 4.1.31 shows that there were 24% respondents who responded that they had wash sink and soap was also present where as 51.3% responded that they had sink and it was observed that there was no soap to wash hands. Similarly 25% respondents responded that they had no sink and no soap.

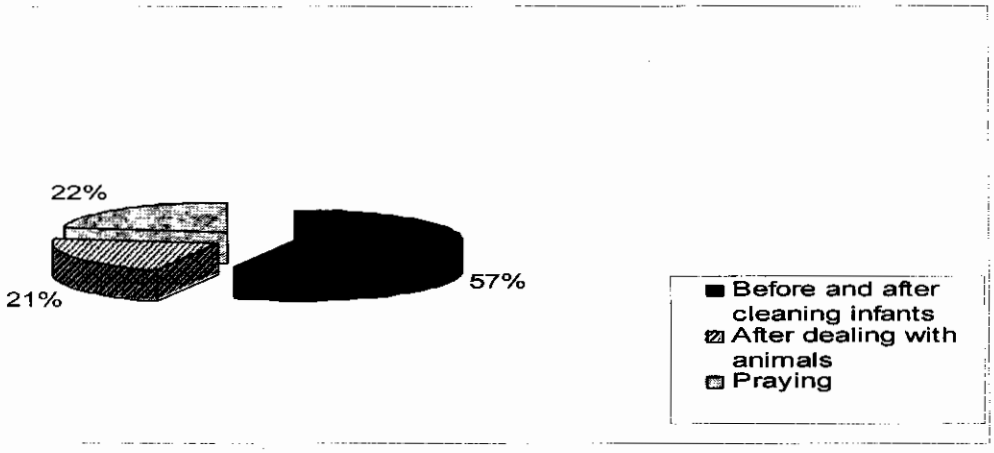

Figure 4.1.32 Distribution of respondents according to the time of washing hands

Figure 4.1.32 shows that 56.3% (45) respondents washed their hands before and after cleaning infants and 21.3% (23) responded that they washed their hands after dealing with animals while 22.5% (18) said that they washed their hands when they offered prayers.

Responses to Diseases

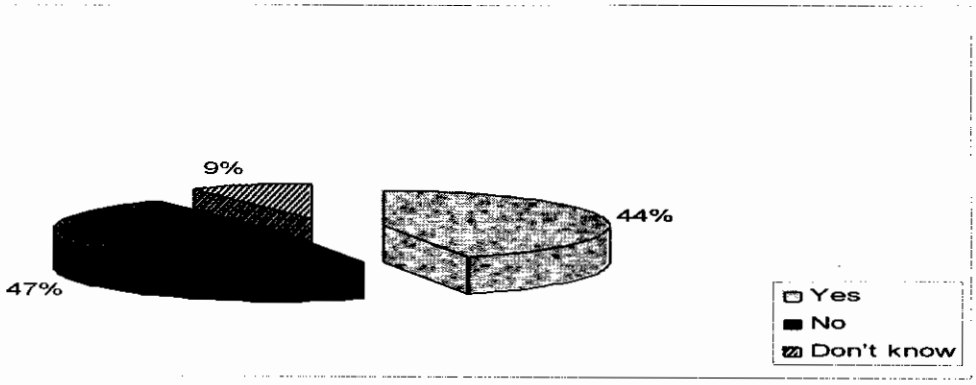

Figure 4.1.33 Distribution of respondents according to sickness.

Figure 4.1.33 shows that 43.8 % (35) respondents responded that they had some one in the household who was sick because of drinking water in the last two weeks. While 47.5 % (38) respondents responded that there was no person who got sick because of drinking water and 8.8% (7) responded that they did not know about this issue.

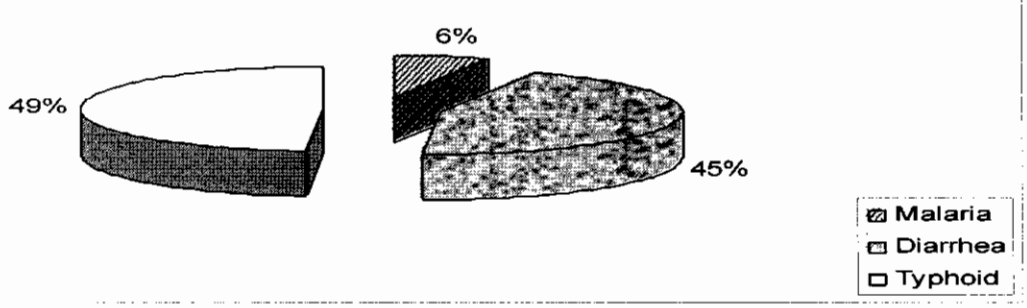

Figure 4.1.34 Distribution of respondents according to diseases in the area.

Figure 4.1.34 shows that 6.3 % (5) respondents heard about malaria in their area in last two weeks and 45% (36) respondents responded that they heard about diarrhea while 48.8% (39) respondents said that they observed typhoid in last two weeks

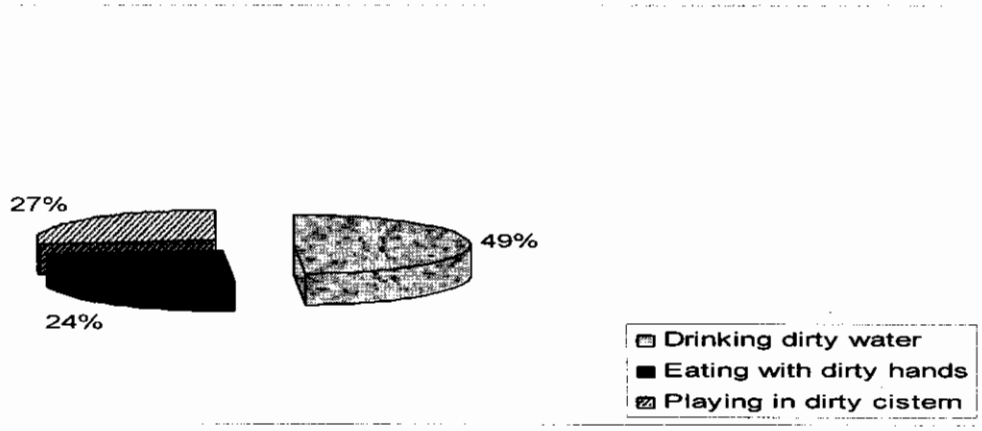

Figure 4.1.35 Distribution of respondents according to the responses to diseases.

Figure 4.1.35 shows that 23.8% (19) respondents responded that these diseases were because of dirty drinking water and 48.8% (39) said that theses diseases were because of eating with dirty hands while 26.3% responded that it was because of plying in dirty cistern and 1.3% (1) said that they did not know about it.

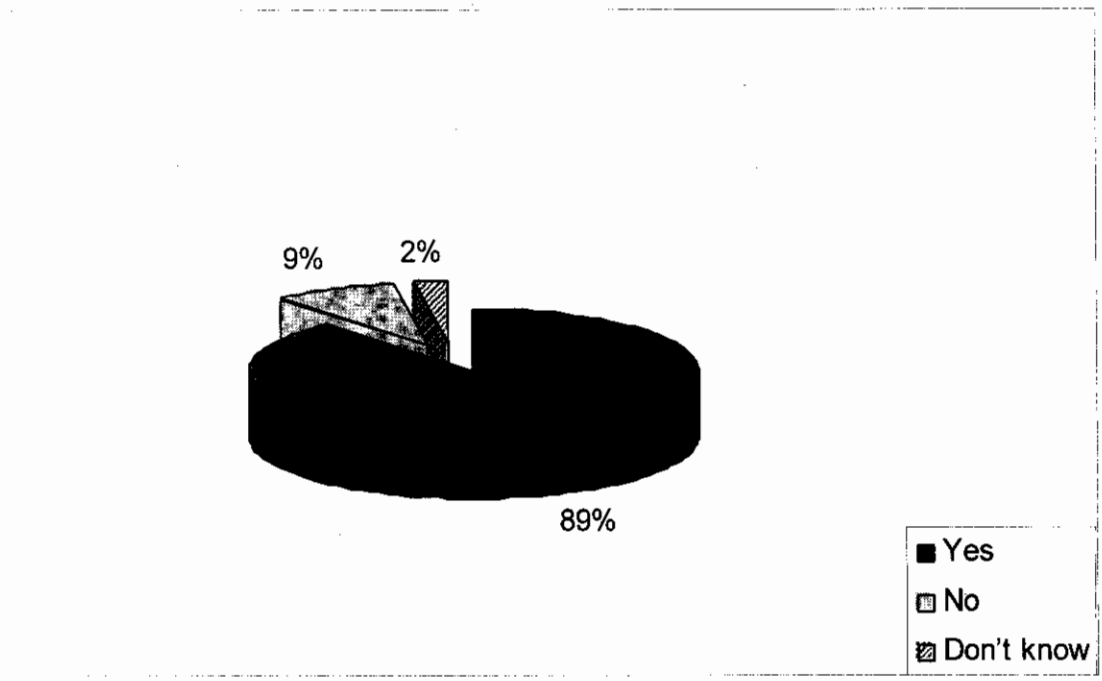

Figure 4.1.36 Distribution of respondents according to the awareness regarding treatment of diseases

Figure 4.1.36 shows that 88.8% (71) respondents knew when the medical treatment was required against diseases. Where as 8.8% (7) responded in no and 2.5% (2) said that they did not know about the issue. Poverty was the main reason; respondents were not able to afford the medical expenditure especially at private health facilities/clinics.

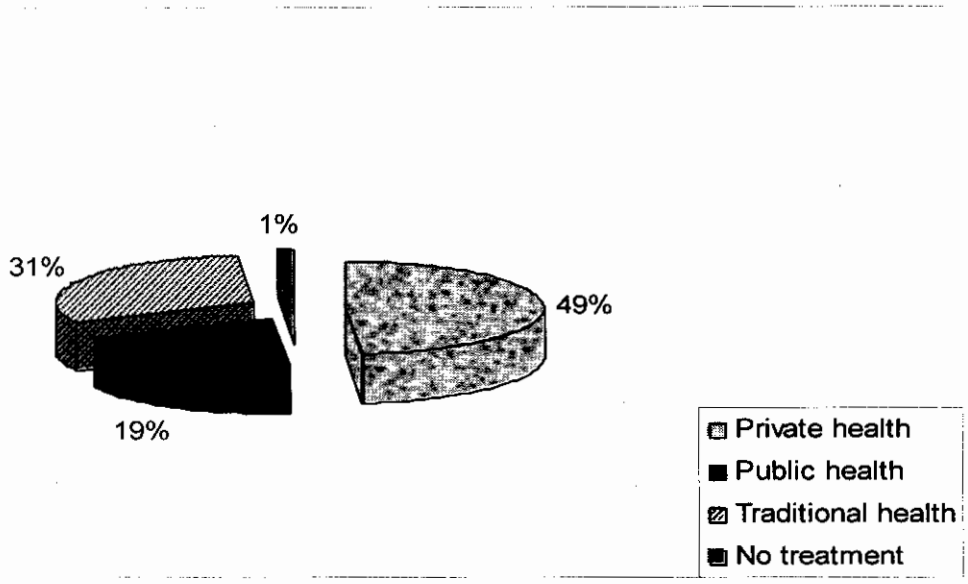

Figure 4.1.37 Distribution of respondents according to treatment method

Figure 4.1.37 shows that 48.8% (39) households responded that said disease could be treated at private health centre and 18.8% (15) households said for public health centre where as 31.3% (25) responded for traditional health facility and 1.3% (1) households responded for no treatment.

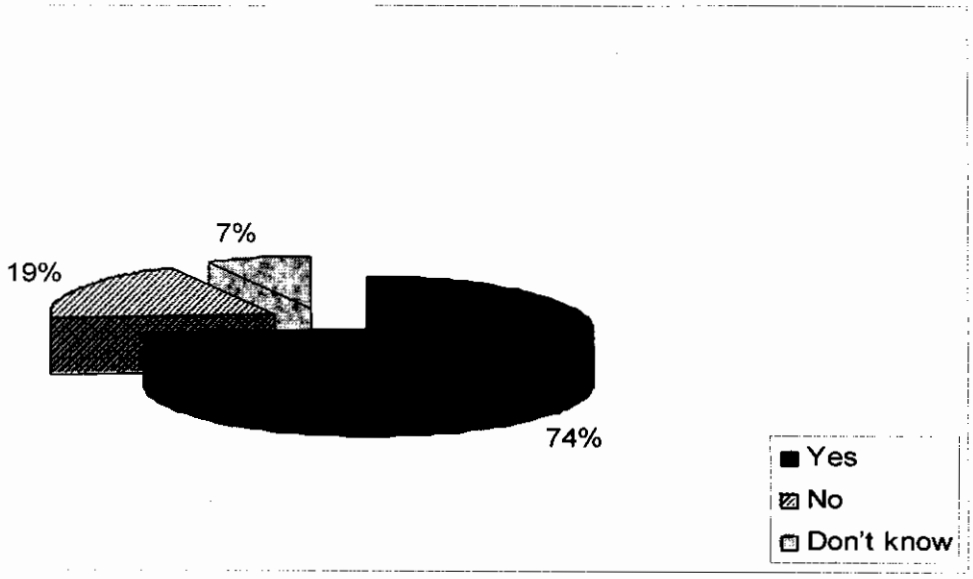

Figure 4.1.38 Distribution of respondents according to their children having diarrhea during last 36 hrs.

Figure 4.1.38 shows that 73.8% (59) respondents responded that their children had diarrhea during last 36 hrs and 18.8% give negative response. Whereas 7.5% (6) households said that they do not know about this issue.

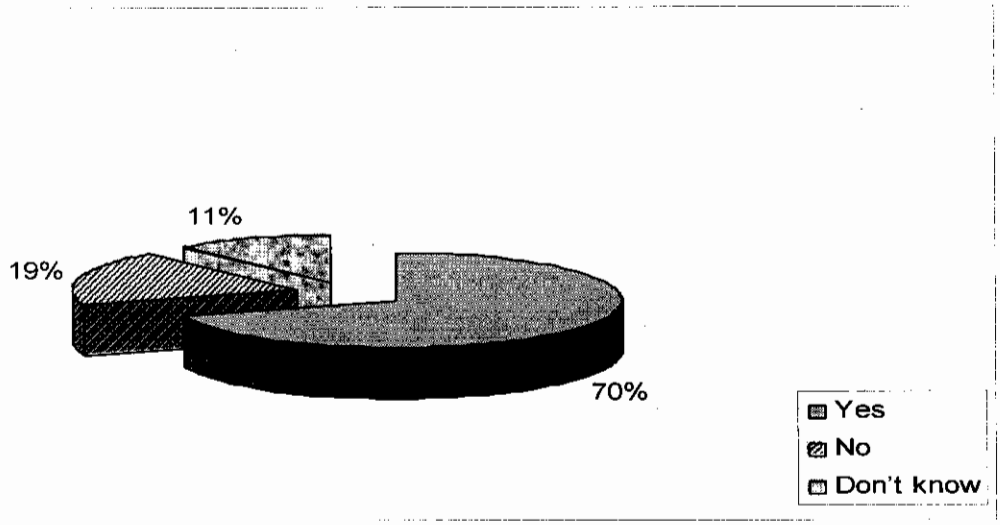

Figure 4.1.39 Distribution of respondents according to their children having diarrhea during last two weeks

Figure 4.1.39 shows that 70% (56) respondents responded that their children had diarrhea during last two weeks and 18.8% (15) responded that they their children had no diarrhea where as11.3% (9) households said that they do not know about this issue.

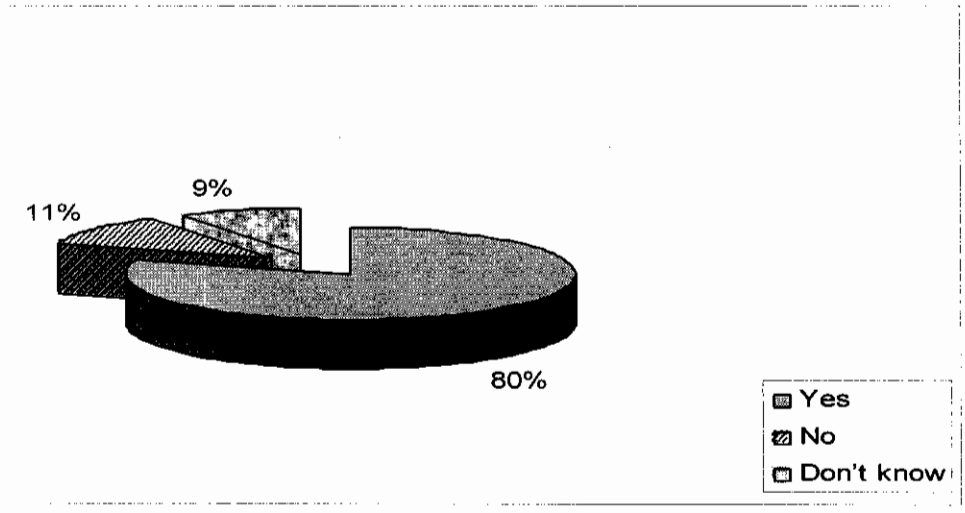

Figure 4.1.40 Distribution of respondents according to treatment of Diarrhea.

Figure 4.1.40 shows that 80% (64) respondents responded that knew that how diarrhea could be prevented and 11.3% (9) respondents responded as no and 8.8% (7) household responded that they did not know about the issue.

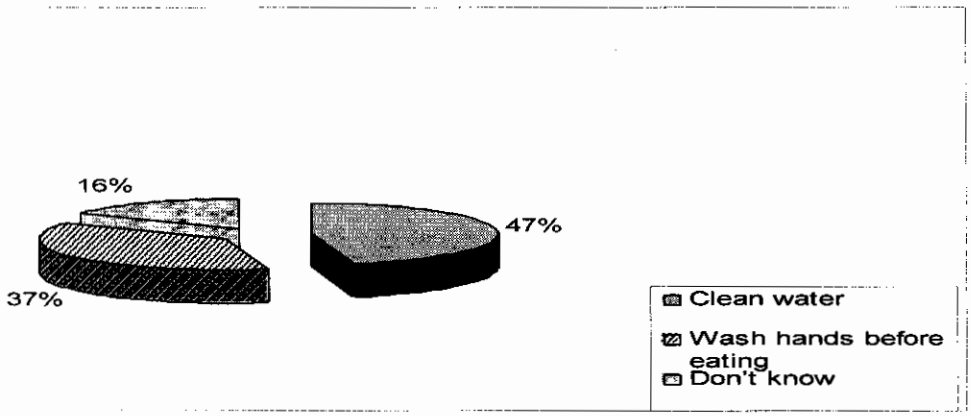

Figure 4.1.41 Distribution of respondents according to preventions adopted.

Figure 4.1.41 shows that 46.3% respondents said that diarrhea could be treated by drinking clean water and 37.5% (30) responded that it could be avoided by washing hands before eating whereas 16.3% (13) households responded that they did not know about it.

Household Expenditure

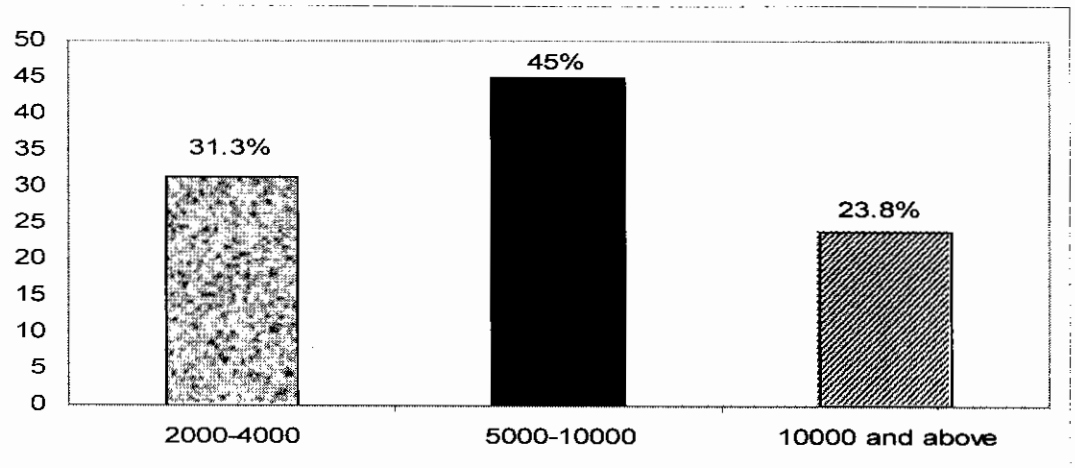

Figure 4.1.42 distribution of respondents according to total expenditure incurred during last 4 weeks

Figure 4.1.42 shows that 31.3 % (25) respondents responded that they spent 2000-4000 in total during the last four week and 45% (36) households responded that they spent Rs 5000-10000 and 23.6% (19) households responded that they spent 10000 and above during last 4 weeks.

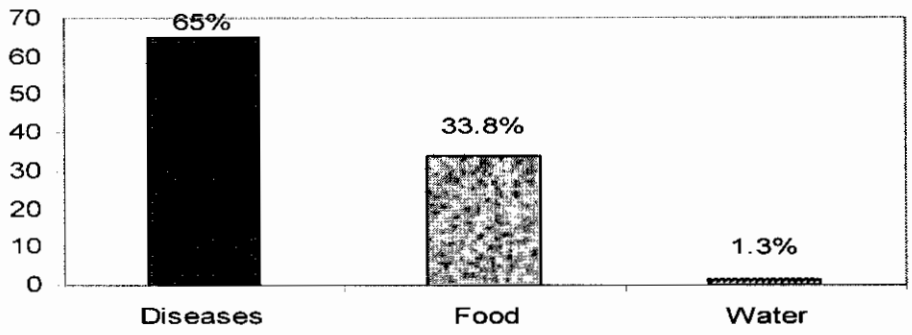

Figure 4.1.43 Distribution of respondents according to their categorical expenditure.

Figure 4.1.43 shows that there were 65 % respondents said that they spent major part of income on treatment of diseases, 33.8% responded that they spent most of their money on food where as 1.3% responded for water as well.

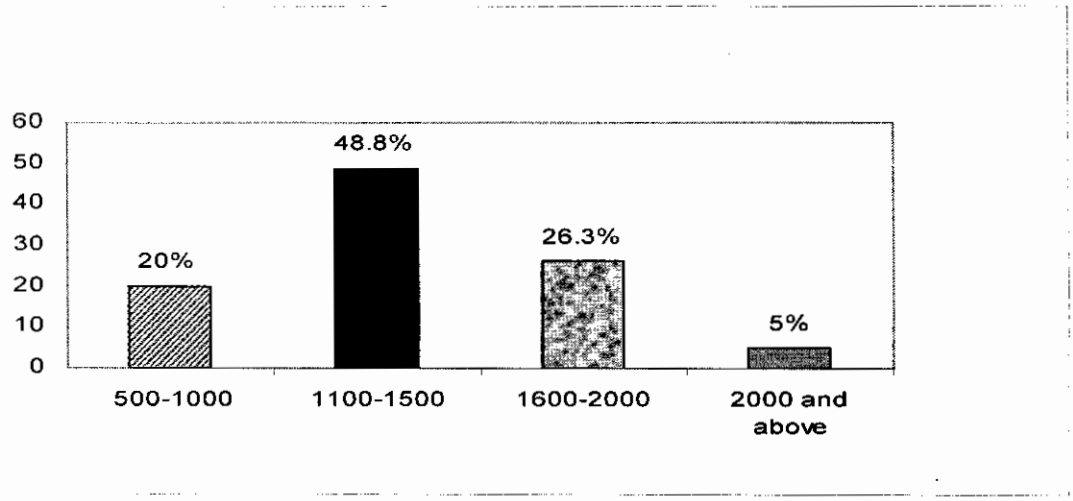

Figure 4.1.44 Distribution of respondents according to total expenditure during last four weeks spent on diseases

Figure 4.1.44 shows that20 % (16) respondents spent Rs. 500-1000 in total during the last four weeks and 48.8 % (39) responded that they spent Rs 1100-1500 and 26.3 % (21) responded that they spent 1600-2000 and 5% (4) responded that they spent worth Rs 2000 and above for treatment of diseases during last 4 weeks.

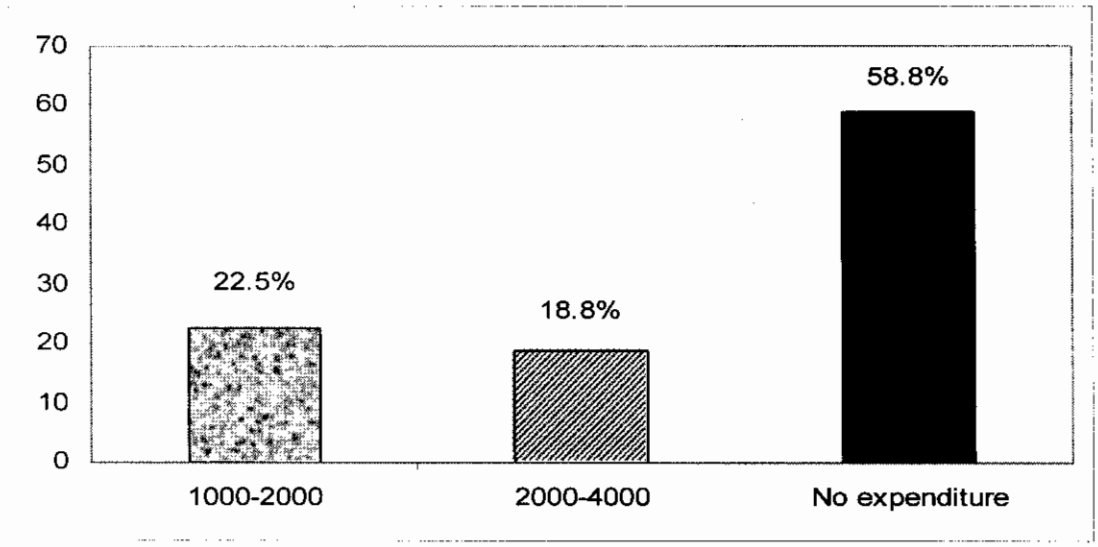

Figure 4.1.45 Distribution of respondents according to expenditure incurred on education.

Figure 4.1.45 shows that 22.55 (18) respondents responded that they spend only Rs 1000-2000 on education per month and 18.8% responded that they spent 2000-4000 while rest of the households said that had no educational expenses.

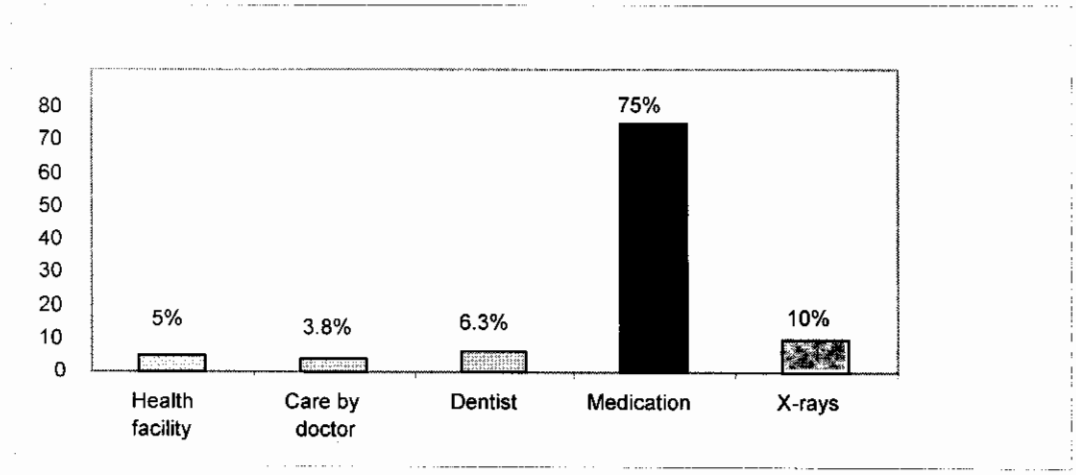

Figure 4.1.46 Distribution of respondents according to medical expenditure

Figure 4.1.46 shows that 5% (4) house holds spent much on health facility in the last 4 weeks and 3.8% (3) households spent on care by doctors while as 6.3% (5) respondents spent on dentist and 75% (60) households on medication and 10% (8) households spent in total on X-ray.

Households Income

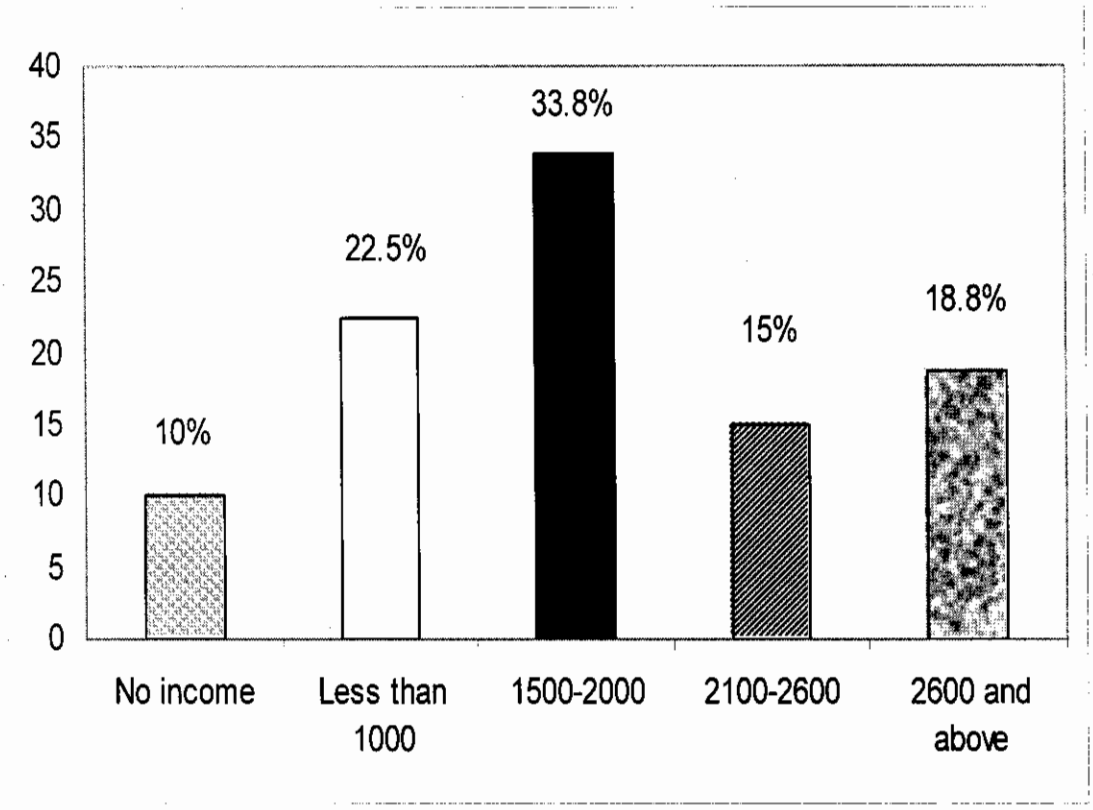

Figure 4.1.47 Distribution of respondents according to per capita income/ month.

Figure 4.1.47 shows that there were 8 respondents (10%) who had no income, they were found sick because of water-borne diseases and 18 respondents were found having total income less than Rs.1000 where as 27 respondents were found to earn Rs.1500-2000, where as 12 respondents (15%) were found earning Rs. 2100-2600 and above Rs.2600 were 15 respondents (18.8%).

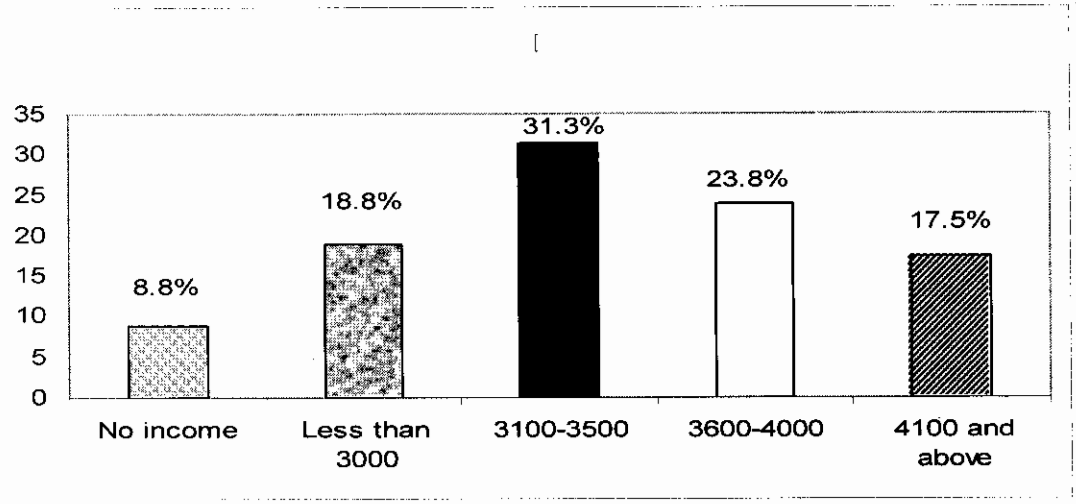

Figure 4.1.48 Distribution of respondents according to the total income.

Figure 4.1.48 shows that there were found 7 respondents (8.8%) who had no income and the respondents who were earning less than 3000 were 15 (18.8) while 25 (31.3%) respondents were found to be earning Rs. 3100-3500. Similarly 19 (23.8%) And 14 (17.5) households were earning worth of Rs 3600-4000 and above 4100, respectively.

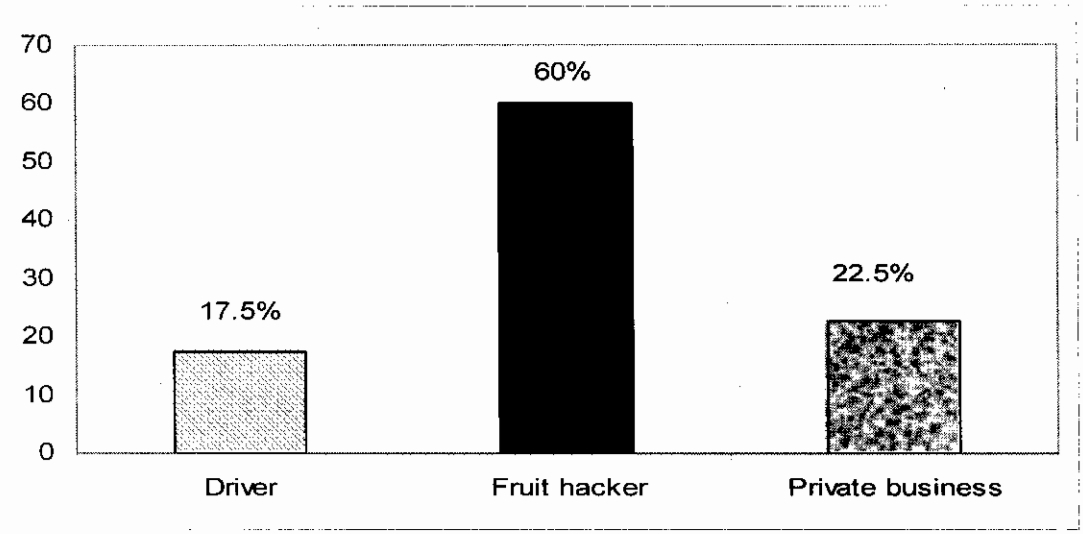

Figure 4.1.49 Distribution of respondents according to source of income

Figure 4.1.49 shows that there were 14 respondents (7.5%) whose occupation was driving while 48 respondents (60%) were engaged in fruit business as fruit hackers to earn for their livelihood. Similarly 18 respondents (22.5%) were doing other business.

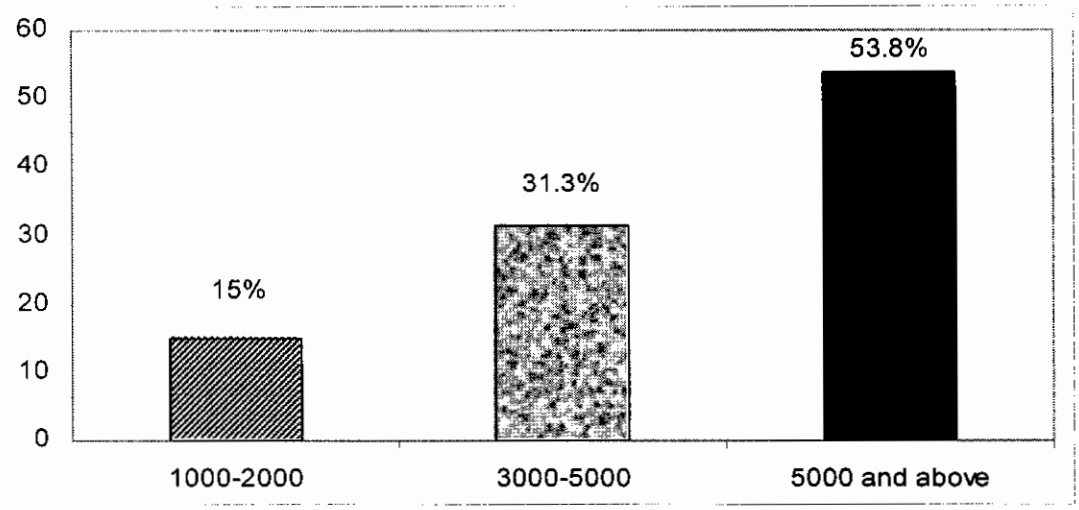

Figure 4.1.50 Distribution of respondents according to expenditure incurred during a month period.

Figure 4.1.50 shows that 12 respondents (15%) responded that they spent Rs.1000-2000 during the last week and 25 respondents (31.3%) spent Rs.3000-5000 where as there were 43 respondents (53.8%) who said that they spent more than 5000 during the last four week.

Solid Waste Management

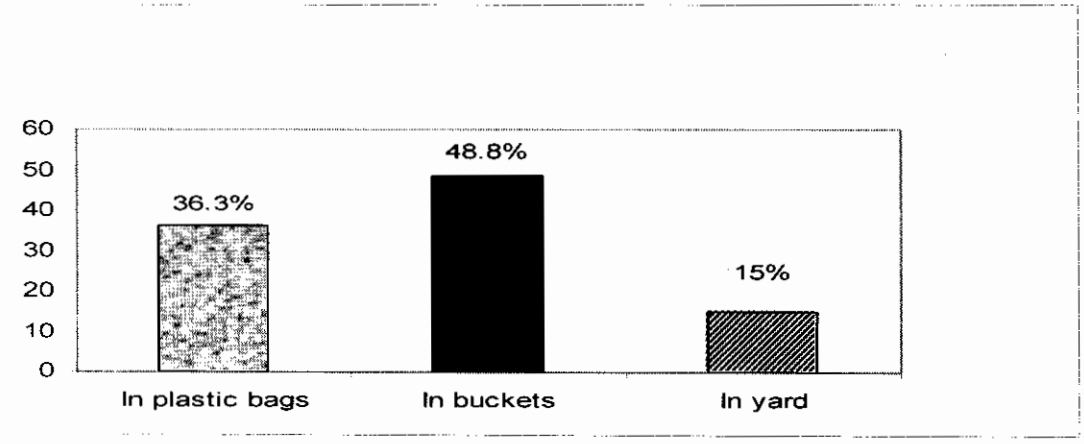

Figure 4.1.51 Distribution of respondents according to the waste management

Figure 4.1.51 shows that 36.3 % (20) respondents collect waste in plastic bags and 48.8% (39) respondents to collect waste in buckets where as 15% (12) respondents in the yard.

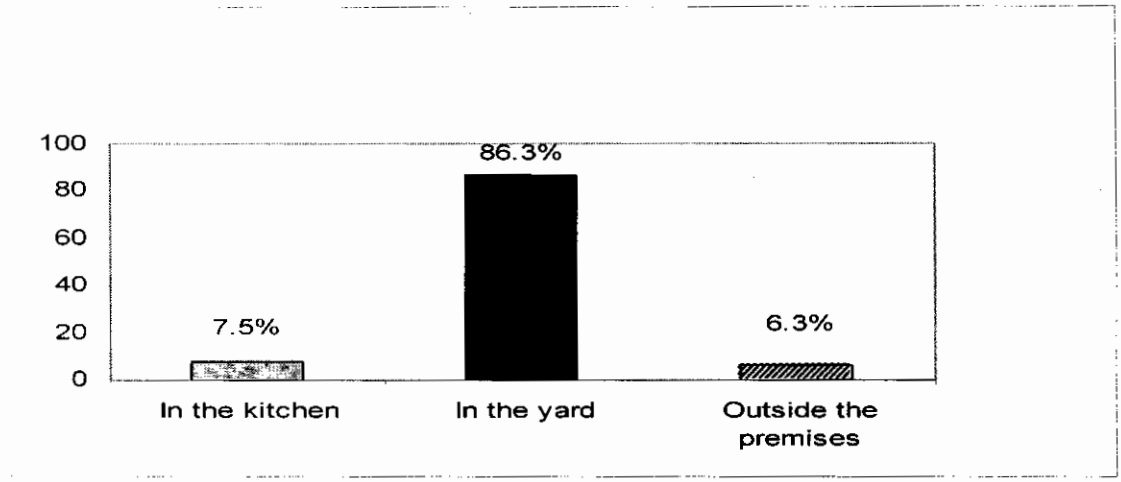

Figure 4.1.52 Distribution of respondents according to the garbage placement in the house

Figure 4.1.52 shows that 7.7 % (6) respondents placed garbage in the kitchen and 86.3% (69) collected in the yard while 6.3% (5) respondents placed garbage outside the premises.

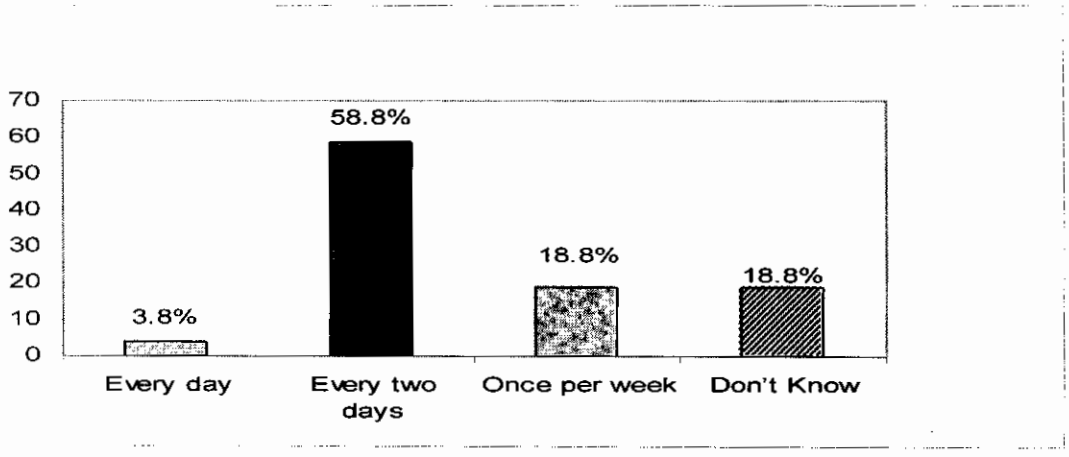

Figure 4.1.53 Distribution of respondents according to waste disposal frequency

Figure 4.1.53 shows that 3.8% (3) respondents got rid of waste every day and 58.8% (47) threw off the waste every two days where as 18.8% (15) respondents disposed off waste once per week and 18.8% (15) respondents lack of awareness regarding the issue.

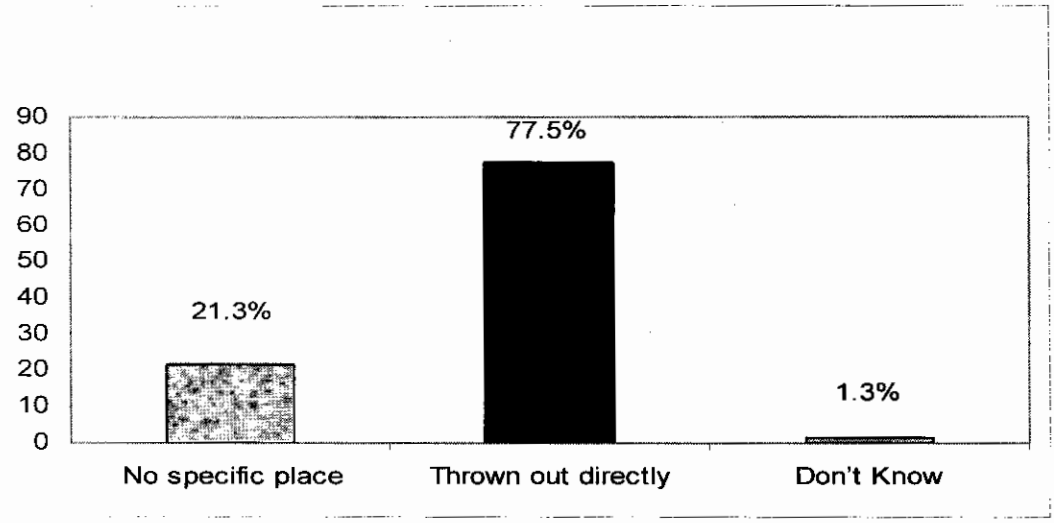

Figure 4.1.54 Distribution of respondents according to the garbage collection.

Figure 4.1.54 shows that 21.3% (17) respondents collected the garbage having no curb bins in the area and 77.5 % (62) respondents threw it out directly in open field while 1.3% (1) respondents responded that they were unaware of the issue.

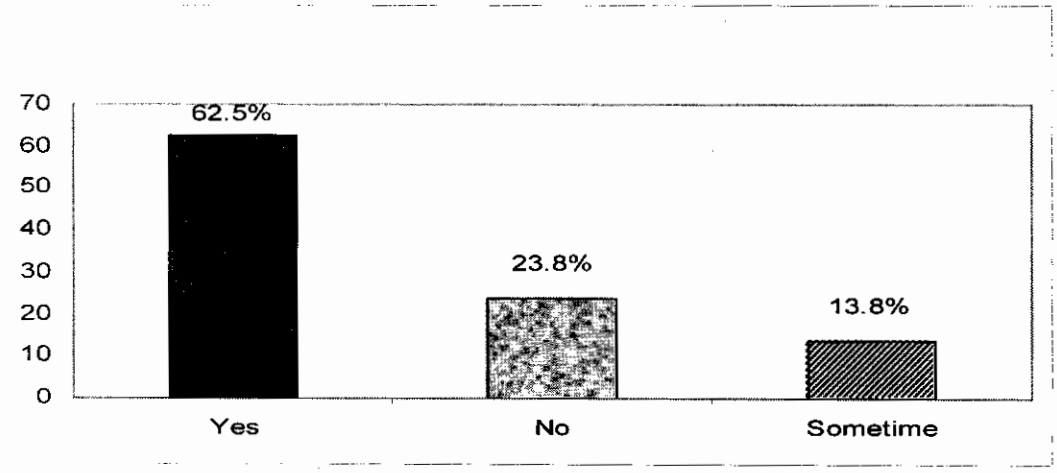

Figure 4.1.55 Distribution of respondents according to waste disposal

Figure 4.1.55 shows that 62.5% (50) respondents said that their community was getting rid of garbage and 23.8% (19) respondents said that they were not disposing off garbage while 13.8% (11) respondents responded that they were disposing off garbage sometime.

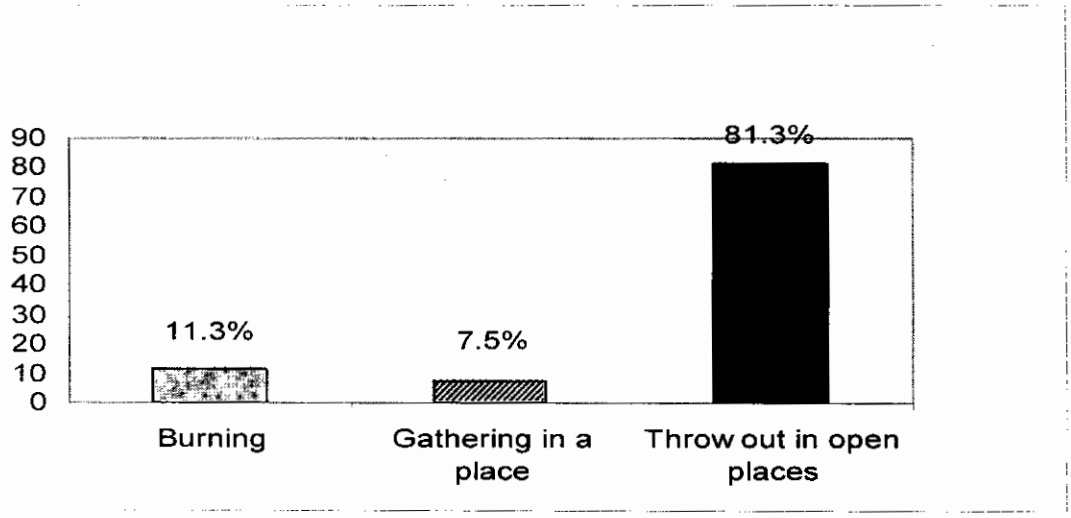

Figure 4.1.56 Distribution of respondents according to the method of disposing off waste.

Figure 4.1.56 shows that 11.3% (9) respondents burnt the garbage and 7.5% (6) households responded that they collect the garbage at one place where as 81.3% answered that they threw out the garbage in open space.

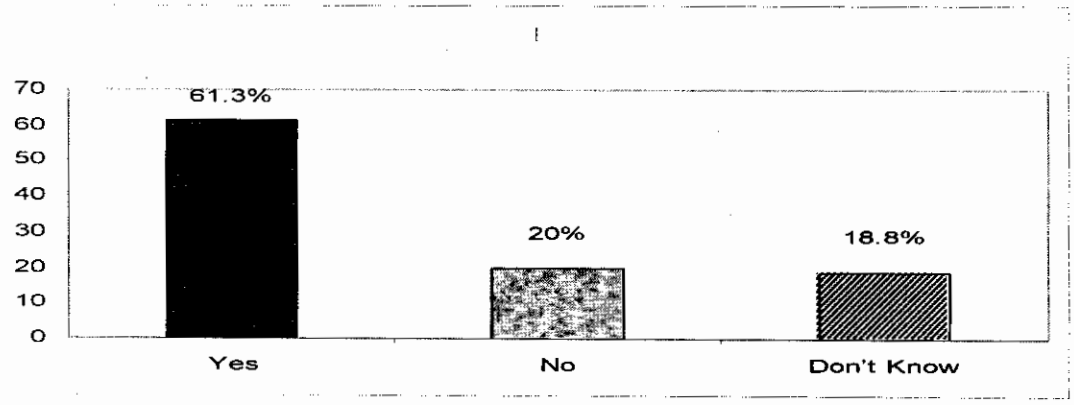

Figure 4.1.57 Distribution of respondents according to the awareness about garbage and diseases.

Figure 4.1.57 shows that 61.3 % (52) respondents believed that garbage caused diseases and 23.8 % (19) respondents responded that garbage is not a cause of diseases where as 11.3% (9) respondents responded that they were not aware of the issue.

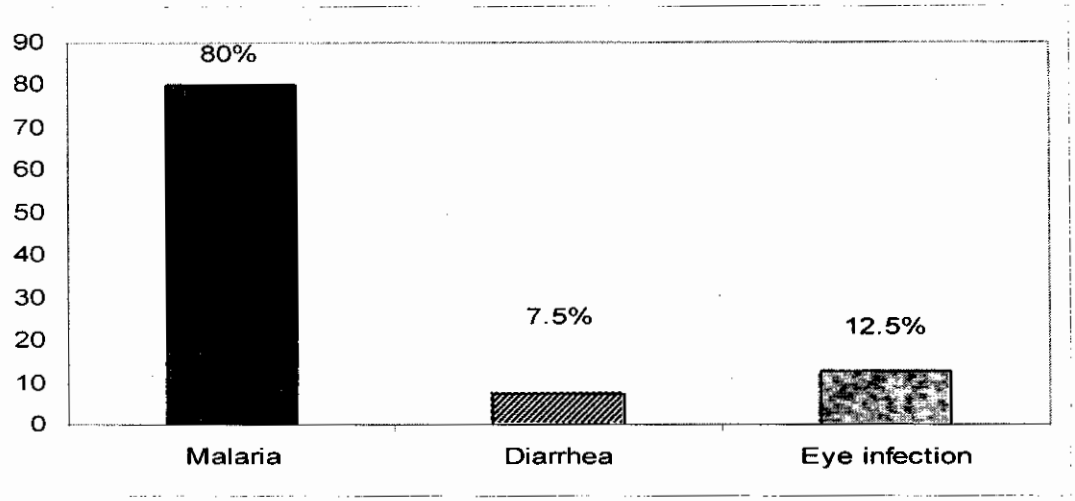

Figure 4.1.58 Distribution of respondents according to diseases caused by poor or no waste disposal.

Figure 4.1.58 shows that 80% (64) respondents responded that garbage can spreads disease like malaria and 7.5% (6) respondents responded that it may cause diarrhea where as 12.5% (10) respondents responded that it may carry eye infection.

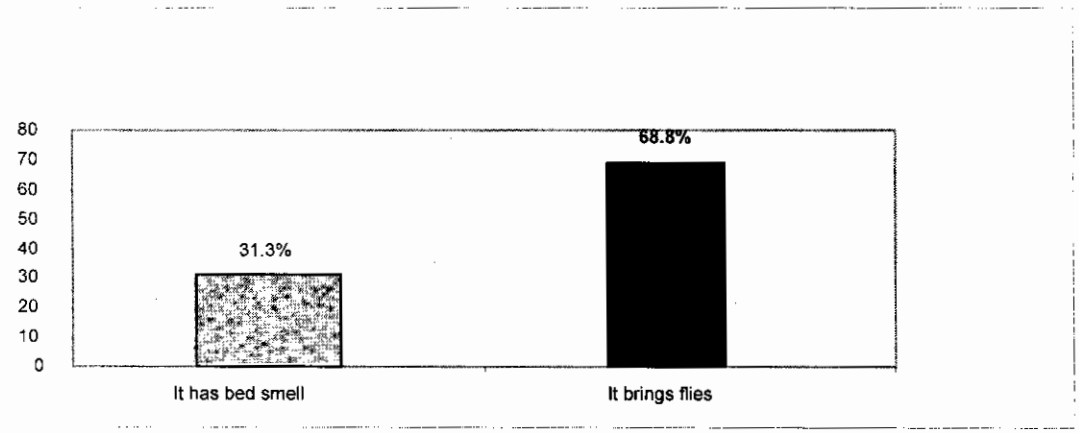

Figure 4.1.59 Distribution of respondents according to problems created by the garbage

Figure 4.1.59 shows that 31.3% (25) respondents said that garbage brings bad smell and 68.8 % (54) respondents responded that it brings flies.

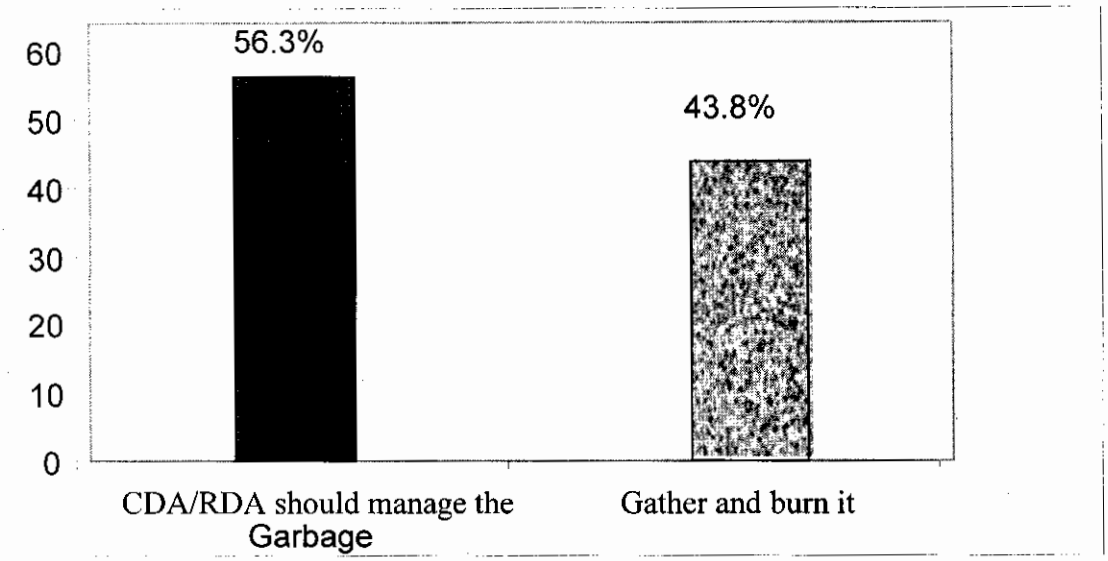

Figure 4.1.60 Distribution of respondents according to the waste management responsibility.

Figure 4.1.60 shows that 56.3% (45) respondents said that garbage should be managed and disposed off by the CDA/RDA whereas 43.8% suggested that garbage should be collected gathered at one place and should be burnt.

Total percentage of diseases in study area sector I-11/1 Islamabad

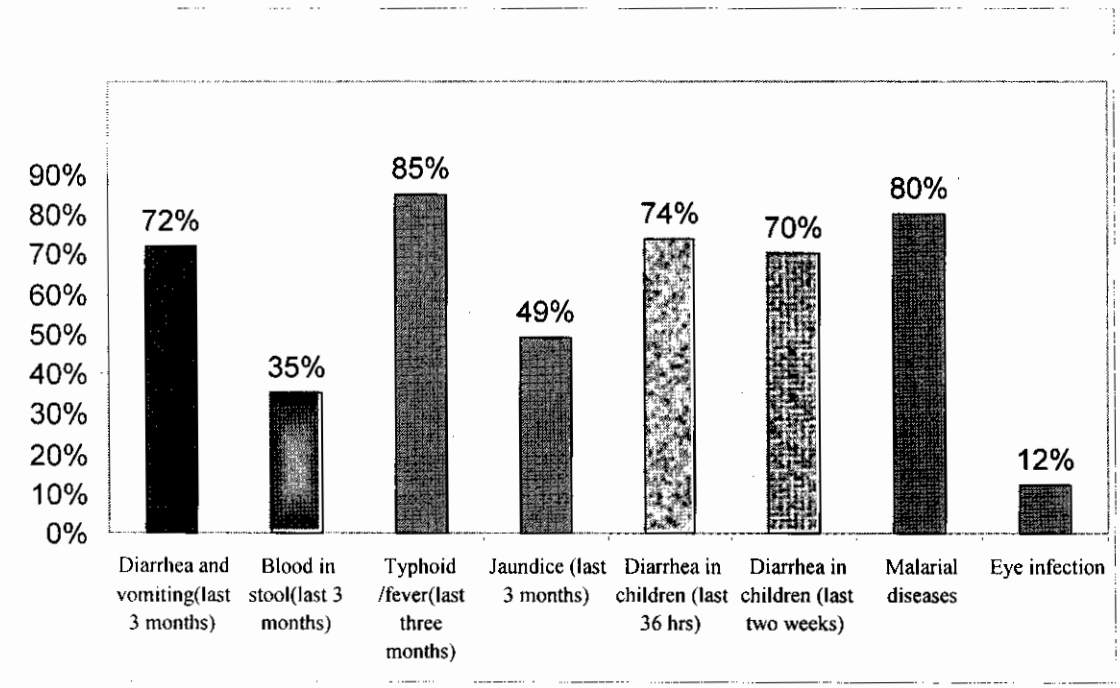

Figure 4.1.61 percentage of respondents who responded for different diseases.

Figure4.1.61 shows that there were 72% respondents who replied that they suffered from diarrhea during last three month. Other 35% responded that they had blood in stool during last three month. Whereas, 85% responded for typhoid which was greater percentage as compared to other diseases. Similarly 49 % responded that they had jaundice and 74% responded that their children suffered from during last 36 hours and 70% responded that their children had diarrhea with in last two weeks. Eighty percent (80%) respondents responded that they had malaria due to garbage and 12% responded for eye infection diseases. The results showed that total 40% of household's income was spent on health on different disease as mentioned above, so we calculated the total share of the income spent over Diarrhea, Typhoid, Jaundice, blood in stool, eye infection and malaria in study area. As 40% of the income was spent on health so the total percentage of income spent on different types of diseases is as follows:

The percentage of Typhoid was observed 40/85x100=34% where 34% of 109850= 109850/100x34 = (Rs, 37349) were spent on Typhoid. Similarly the percentage of Diarrhea was observed 40/72x100=28% 28% of 109850=109850/100x28= (Rs, 30758) were spent on diarrhea in a month. The percentage share of income for jaundice and typhoid was also calculated. The percentage of Jaundice was=40/50x100=20% where 20% of 109850= 109850/100x20 = (Rs, 21970) and the percentage of malaria was=40/80x100=32% where 32% of 109850= 109850/100 x 32 = (Rs, 35152) were spent on jaundice and malaria. The result showed that diseases burden was high in the study area, where prevalence of diarrhea and typhoid was noted more as compared to other diseases, which are associated with them.

4.2 Water Quality Test (Microbiological Analysis) Sources of drinking water in the study area.

Table 4.2.1 Water Source (hand pumps)

Parameter	Hand pump 1			Hand pump 2			Hand pump 3			
Sample #	S1	S2	S3	S1	S2	S3	S1	S2	S3	S4
Total coli forms	70	60	70	60	80	90	60	70	90	80
Fecal coli forms	30	33	34	27	33	34	27	33	34	27
E.Coli	-ve	-ve	+ve	+ve	+ve	-ve	-ve	+ve	-ve	+ve

The first objective of research was to test the quality of drinking water in the study area, where 41 households (51%) were using the hand pump as water sources for drinking purposes. It was found that that only Pump 1 was free of bacterial load containing a single sample having E.Coli, while, pump 2 was found unfit for drinking water having E.Coli. Hand pump 3 was also providing a source of pathogenic E.Coli after a microbiological analysis.

Table 4.2.2 Water Sources (Unprotected Private Wells)

Parameter	Un protected private well-1			Unprotected private well -2		
Sample #	S1	S2	S3	S1	S2	S3
Total coli forms	70	34	540	540	17	900
Fecal coli forms	26	17	540	540	17	900
E.coli	+ve	+ve	+ve	+ve	+ve	+ve

Twenty five (25) households (31.3%) were using unprotected private well for drinking water. It was observed the well was not protected well from pollutants and

the result revealed that all of the samples were found infected with E. Coli causing water-borne diseases.

Table 4.2.3 Water Sources (Piped Water Supply to Surrounding Area)

Parameter	**Pipe Water Supply to Surrounding Area**		
Sample #	**S1**	**S2**	**S3**
Total coli forms	4	8	Nil
Fecal coli forms	2	Nil	Nil
E.coli	-ve	-ve	-ve

Three samples were also collected from the piped water supply near the surrounding area and 14 households (17.5%) responded that they were getting water from this source. The results showed that source was free of E. coli load and is safe for drinking purposes.

Table 4.2.4 Randomly Collected Water Samples from Households of Study Area

Parameter	**H_1**	**H_2**	**H_3**	**H_4**	**H_5**	**H_6**	**H_7**	**H_8**	**H_9**	**H_{10}**
Total coli forms	65	8	Nil	19	17	Nil	08	06	09	72
Fecal coli forms	30	6	Nil	10	08	Nil	Nil	04	Nil	32
E.Coli	+ve	+ve	-ve	+ve	+ve	-ve	-ve	+ve	-ve	+ve

Similarly, 10 samples of drinking water were randomly collected from the study area. It was found that six, out of ten households were using the water having E. coli a major source causing diarrhea, typhoid and jaundice. The same work was also done

by Van Derslice and Briscoe (1993) showing that mean Coli form level were considerably higher in house holds water containers than in original source of water.

Table 4.2.5 Total number of samples and total bacteriological contamination

Samples Codes	No. Samples	Total Coli form, (%)	Fecal Coli form, (%)	E.Coli, (%)
Hand Pump	10.00	100.00	100.00	50.00
Well	06.00	100.00	100.00	100.00
Home	10.00	80.00	50.00	60.00
Water Supply	03.00	66.66	33.33	00.00
Grand Total=	**29.00**	**93.10**	**75.86**	**62.06**

Figure 4.2.5 (a) Total number of samples and total bacteriological contamination

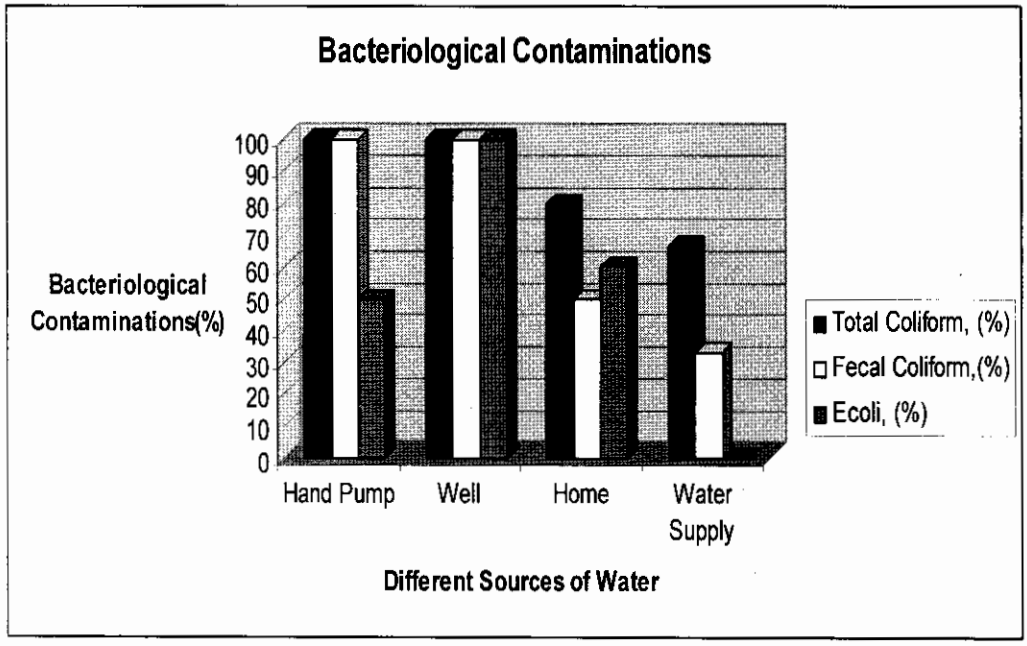

Figure 4.2.5 (a) Total number of samples and total bacteriological contamination

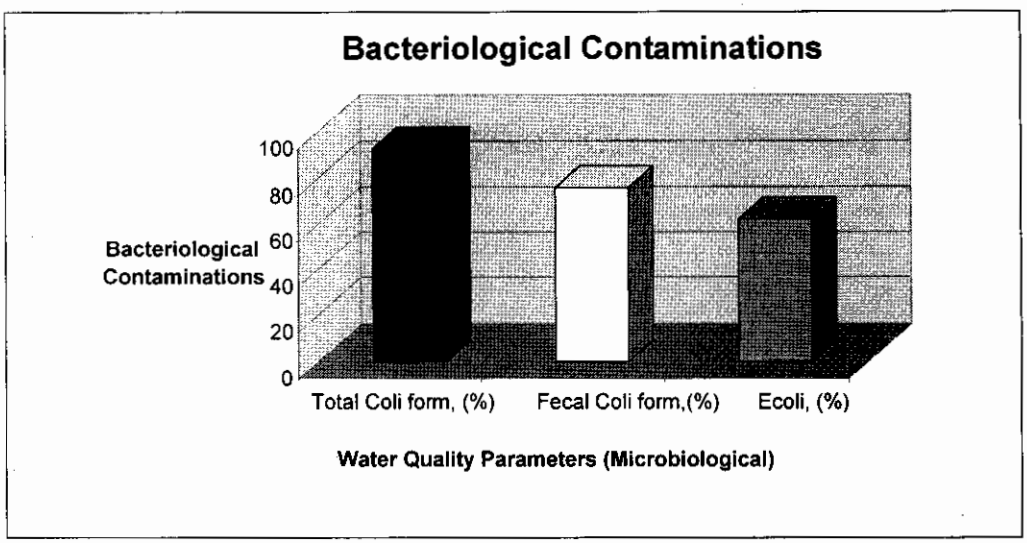

Figure 4.2.5 (b) Total number of samples and total bacteriological contamination

4.3 Association between two criteria of classification.

4.3.1 Determinants of acute diarrhea and typhoid

The most important questions related to diseases were analyzed to work out the association of the attributes to bring the test up to the mark. To bring these results a test hypothesis was stated Ho (Null hypothesis), the two variables of classification are independent. Whereas H1 (Alternate hypothesis), the two variables of classification are not independent, and i.e. they are associated. The level of significance (alpha value) was decided as 0.05.

Table 4.3.1.1 Association between drinking water sources and diarrhea

Observed table (expected table) Chi-Sq = 10.642 DF = 2, P-Value = 0.005

Diarrhea	Hand pump	Un protected private well	Piped water supply to surrounding areas.	Total Households
yes	17(24.09)	20(14.69)	10(8.23)	47
No	24(16.91)	05(10.31)	04(5.78)	33
Total	**41**	**25**	**14**	**80**

Since the calculated value of chi square fell in the critical region, we therefore rejected our null hypothesis of independence and concluded that the data provides evidence of statistical association between two criteria of classification, the sources used for drinking water in the study area were three (3) hand pumps, two (2) unprotected private wells and a source of piped water supply in the surrounding area. Forty one households were using hand pump. Seventeen out of 47 had responded that they had diarrhea and vomiting ,where as twenty (20) respondents were found infected with diarrhea who were using unprotected private well as a source drink water and 10 respondents responded for diarrhea who were getting water from piped water supply in the surrounding area. The quality of water in the study area was not up to the mark for drinking purposes. People were badly infected with diarrhea and a large number of children were prey to diarrhea as shown in the table below. The same work on diseases was done by (Murray and Lopez 1996).

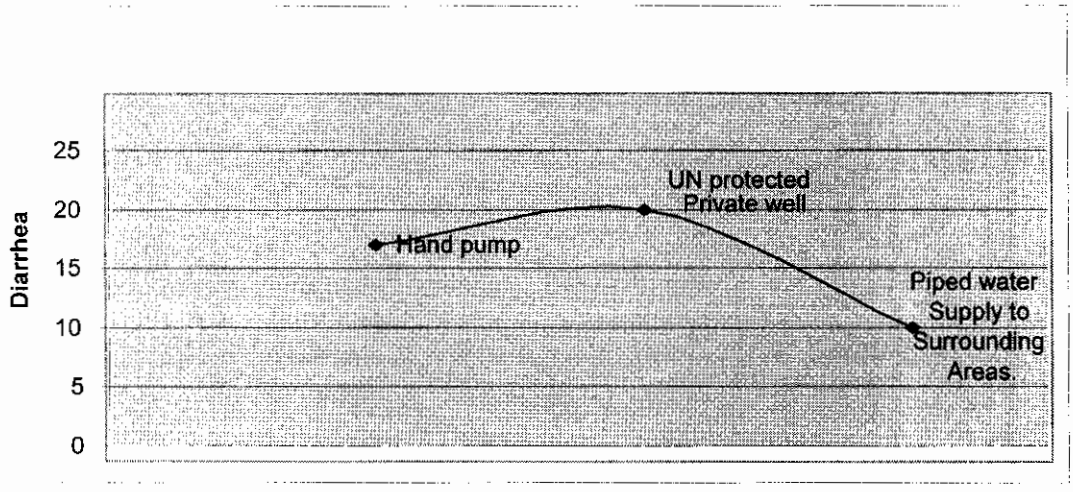

Figure 4.3.1.1. Association between drinking water sources and diarrhea

Table 4.3.1.2 Association between water resources and typhoid/fever

Observed table (expected table) Chi-Sq = 15.352 DF = 2, P-Value = 0.000

Typhoid	Hand pump	Un protected private well	Piped water supply to surrounding areas.	Total
Yes	18(25.63)	23(15.63)	9(8.75)	50
No	23(15.38)	2(9.38)	5(5.25)	30
Total	**41**	**25**	**14**	**80**

Since the calculated value of chi square fell in the critical region, we therefore rejected the null hypothesis of independence and concluded that the data provides evidence of statistical association between two criteria of classification. The association was checked between the typhoid and drinking water source. It was found that 18 respondents responded positively for typhoid suffering for more than three days during last three month where as drinking water from hand pumps and 20 respondents responded for typhoid who were using water from unprotected private well, whereas, ten respondents had diarrhea taking water from piped water supply. People had no access to clean water and status of water was also affected by poor in target area owning to unhygienic storage and handling. The other studies also showed that in Pakistan typhoid fever and other salmonella infections are endemic, particularly among the poor and house residing in slum areas with poor sanitation and inadequate clean water supply (Karamat et al; 1991; Qureshi et al; 2001).

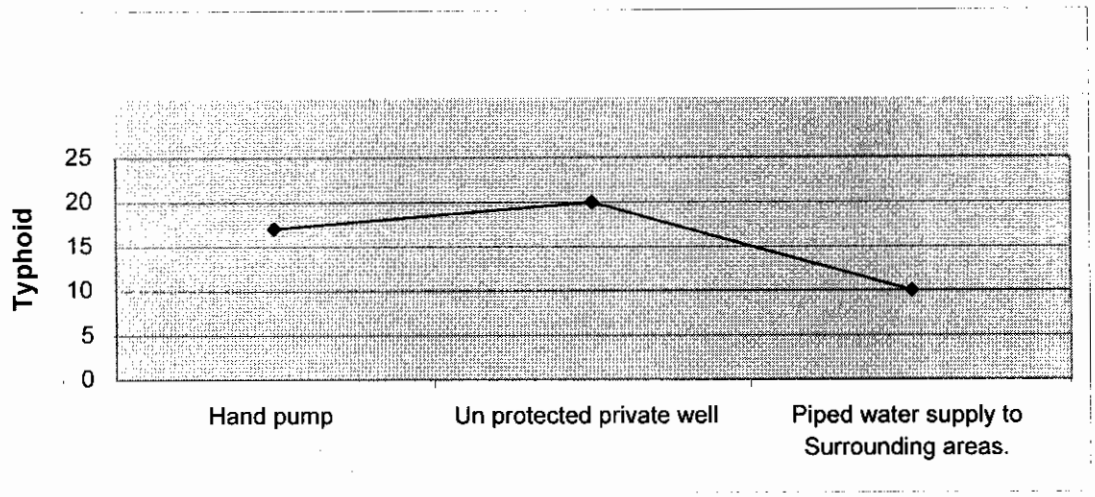

Figure 4.3.1.2Association between water resources and typhoid/fever

Table 4.3.1.3 Association between drinking water sources and jaundice
Observed table (expected table) Chi-Sq = 1.220 DF = 2, P-Value = 0.543

Jaundice	Hand pump	Un protected private well	Piped water supply to surrounding areas.	Total
yes	17(26.14)	18(15.94)	9(8.93)	51
No	24(14.86)	7(9.06)	5(5.08)	29
Total	**41**	**25**	**14**	**80**

Since the calculated value of chi square did not fall in the critical region we were unable to reject the null hypothesis and may conclude that the data provides evidence of statistical independence between two criteria of classification. The results show that water may not the major reason for the spread of jaundice in this case. There could be some other reasons of getting jaundice like blood transfusion, reuse of disposed syringes etc. However, it may because of high fever in some cases because; some of water-borne diseases are associated with one another.

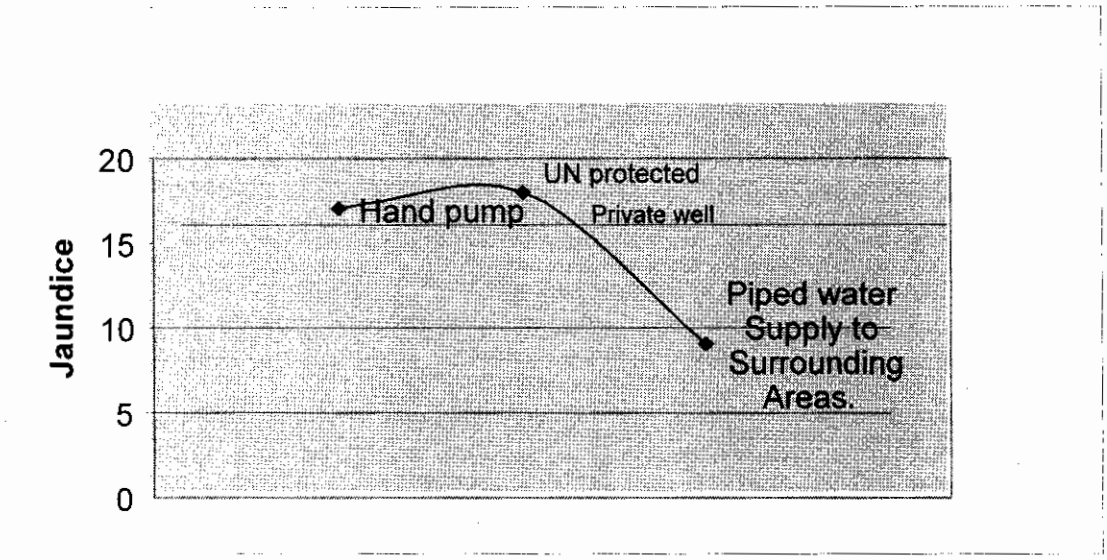

Figure 4.3.1.3. Association between drinking water sources and Jaundice

Table 4.3.1.4 Association between drinking water sources and typhoid

Observed table (expected table) `Chi-Sq = 24.940 DF = 2, P-Value = 0.000`

Typhoid	Hand pump	Un protected private well	Piped water supply to surrounding areas.	Total Household
yes	12(21.01)	23(12.81)	6(7.18)	41
No	29(19.99)	2(12.19)	8(6.83)	39
Total	**41**	**25**	**14**	**80**

Since the calculated value of chi square fell in the critical region we, therefore, rejected the null hypothesis of independence and concluded that the data provides evidence of statistical association between two criteria of classification. When question was asked about diarrhea in children during last 36 hours, 12 respondents responded for taking water from hand pump and 23 responded in the same way who were drinking contaminated/muddy water from unprotected private well, while 6 respondents responded for water supply for causing diarrhea in children.

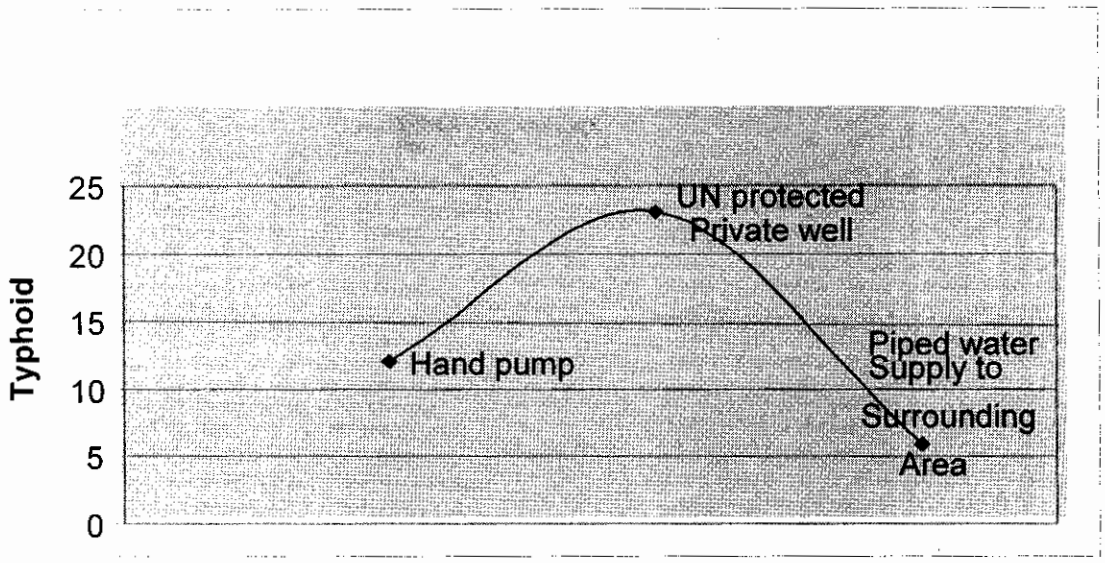

Figure. 4.3.1.4 Association between drinking water sources and Typhoid.

Table 4.3.1.5 Association between storage of water and diseases

Observed table (expected table) Chi-Sq = 6.154 DF = 1, P-Value = 0.013

Diarrhea	Stored water at home	No storage	Total
yes	49(45.5)	3(6.50)	52
No	21(24.50)	7(3.50)	28
Total	**70**	**10**	**80**

Since the calculated value of chi square fell in the critical region, we therefore rejected the null hypothesis of independence and concluded that the data provide evidence of statistical association between two criteria of classification. The association shows that diarrhea may also be caused because of the water stored at house, resulting in contamination occurred. Seventy respondents were found who stored water at houses and 49 of them responded that they had diarrhea for last thirty days, while three respondents were also found with diarrhea and they were not storing water at houses. People were fetching water from a long distance taking a time of 60-

90 minutes, so they preferred to store water at houses and this storage remained for many days. The other studies also shows that no proper storage containers were used to store water and contamination risk was not negligible as (Murray and Lopez, 1996) and water stored within the home where it may become contaminated (Gundry et al. 2004), although arguably this is a matter of water quality management and domestic hygiene

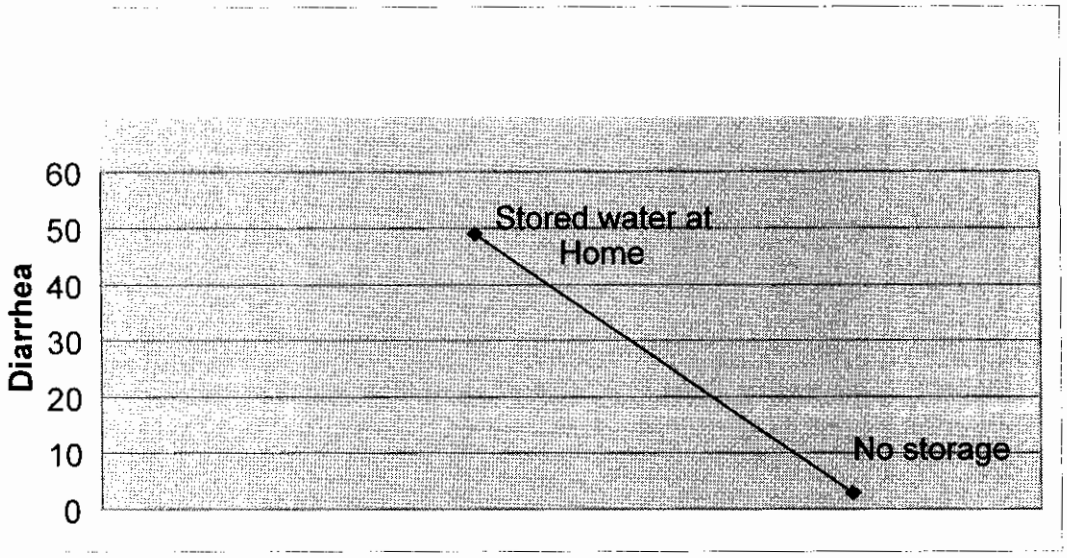

Figure. 4.3.1.5 Association between storage of water and diseases

Table 4.3.1.6 Association between water treatment and diarrhea

Observed table (expected table) Chi-Sq = 10.021 DF = 2, P-Value = 0.007

Diarrhea.	**Treatment(boil)**	**NO treatment**	**Do not know**	**Total Households**
yes	4(9.40)	31(25.85)	12(11.75)	47
No	12(6.60)	13(18.15)	8(8.25)	33
Total	**16**	**44**	**20**	**80**

Since the calculated value of chi square fell in the critical region we therefore rejected the null hypothesis of independence and concluded that the data provides evidence of statistical association between two criteria of classification. As for as treatment is concerned, 16 respondents responded that they were treating the water, i.e. they used to boil water, four (4) respondents responded for diarrhea and 44 respondents were found who were not treating the water, 31 among the respondents were found affected with diarrhea. Similarly 20 respondents responded that they did not know about the issue. Twelve (12) respondents responded that they had diarrhea for last four weeks.

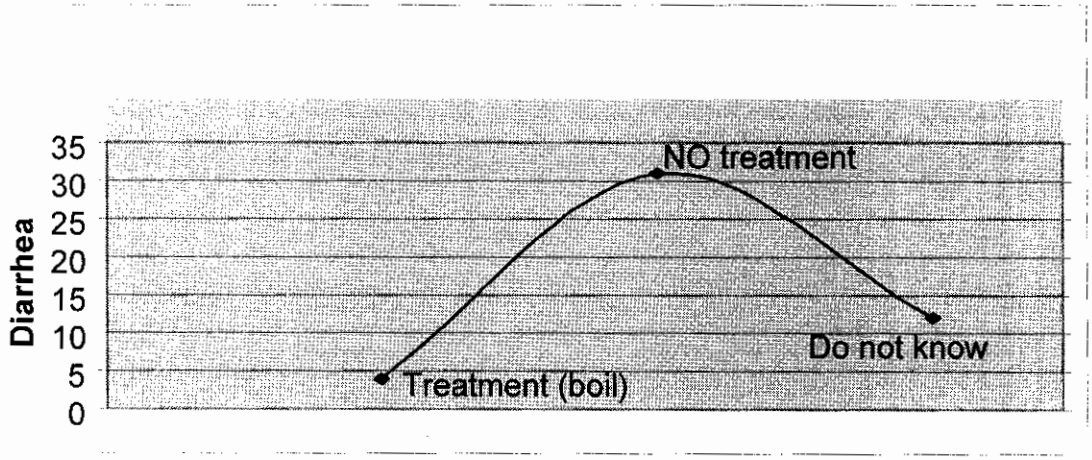

Figure. 4.3.1.6 Association between water treatment and diarrhea

Table 4.3.1.7 Association between water treatment method and typhoid

Observed table (expected table) Chi-Sq = 19.777 DF = 2, P-Value = 0.000

Typhoid	Treatment(boil)	No treatment	Do not know	Total Households
Yes	6(11.40	40(31.35)	11(14.25)	57
No	10(4.60)	4(12.65)	9(5.75)	23
Total	**16**	**44**	**20**	**80**

Since the calculated value of chi square fell in the critical region we therefore rejected the null hypothesis of independence and concluded that the data provides evidence of statistical association between two criteria of classification. Similarly the respondents who were treating water were 16 in number, among them 6 respondents bearing typhoid and 44 respondents not treating water among them 40 were found having typhoid, while 20 respondents responded that they did not know about the treatment of water. Along with them, eleven among them were infected with typhoid. The study proved that water born diseases can be checked if the people of study area treat water by boiling or use any other sound method.

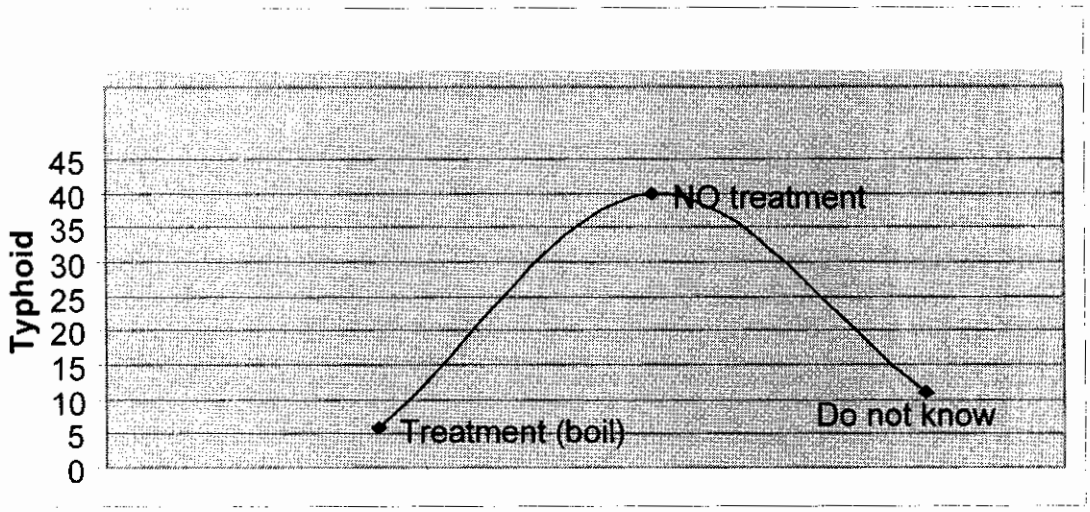

Figure. 4.3.1.7 Association between water treatment method and typhoid

Table 4.3.1.8 Association between toilet facilities and fever

Observed table (expected table) Chi-Sq = 9.456 DF = 2, P-Value = 0.009

Fever	Flush to septic tank	Pit latrine	Bucket latrine	Total Household
yes	28(21.28)	9(13.23)	9(11.50)	46
No	09(15.73)	14(9.78)	11(8.50)	34
Total	**37**	**23**	**20**	**80**

Since the calculated value of chi square fell in the critical region we therefore rejected the null hypothesis of independence and concluded that the data provides evidence of statistical association between two criteria of classification. Sanitation, also, was the main problem of the area. Households sanitary condition was very bad, as the result shows that 46 respondents were found infected with fever, where as, 28 households out of 37 were infected with fever having flush to septic tank facility and 9 out of 23 were infected who were using pit latrines, whereas 9 out of 20 respondents were infected with high fever using bucket latrine. All of the facilities were very closer inside a house which is a high health risk and people were not used to wash their hands after using the toilet. WHO and UNICE, 2000; Mintz et al, 2001) also examined that inadequate sanitation services affected more than 2.4 billion people across the globe.

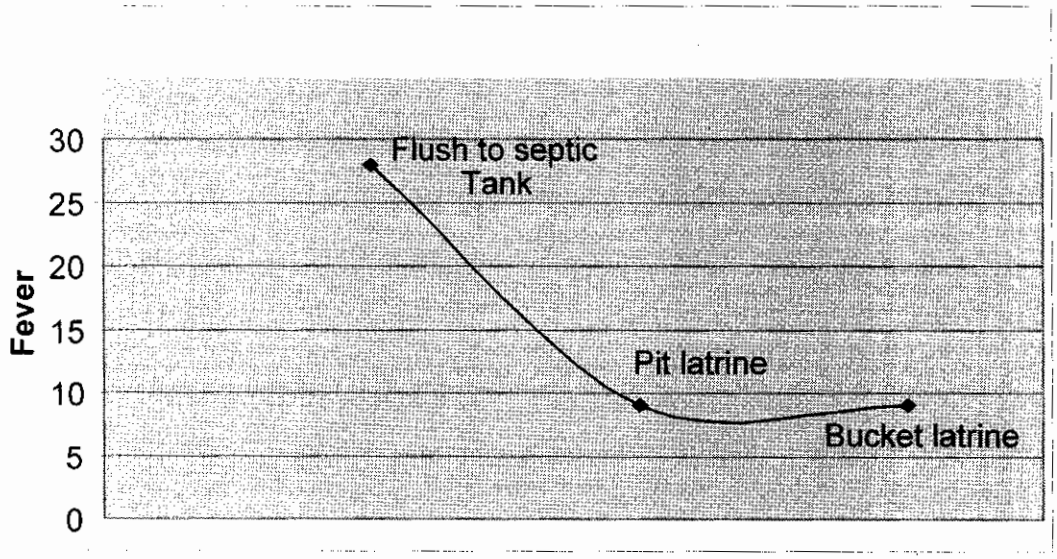

Figure. 4.3.1.8 Association between toilet facilities and typhoid fever

Table 4.3.1.9 Association between cleansing facilities after defecation and diarrhea

Observed table (expected table) Chi-Sq = 1.764 DF = 2, P-Value = 0.414

Diarrhea	water	soil	Do not know	Total Households
Yes	18 (17.81)	29(27.08)	10(12.11)	57
No	07(7.19)	09(10.93)	07(4.89)	23
Total	**25**	**38**	**17**	**80**

Since the calculated value of chi square fell in the critical region, we therefore rejected our null hypothesis of independence and concluded that the data provides evidence of statistical association between two criteria of classification. Diarrhea is water and food borne. It is necessary to use clean water for drinking and use good sanitation facilities. Twenty five households responded that they were using water after defecation and out of them 18 were found who had diarrhea and vomiting for four weeks. Similarly respondents who were using soil after defecation were 38, among 29 were found infected with diarrhea and 10, were found with diarrhea who did not respond.

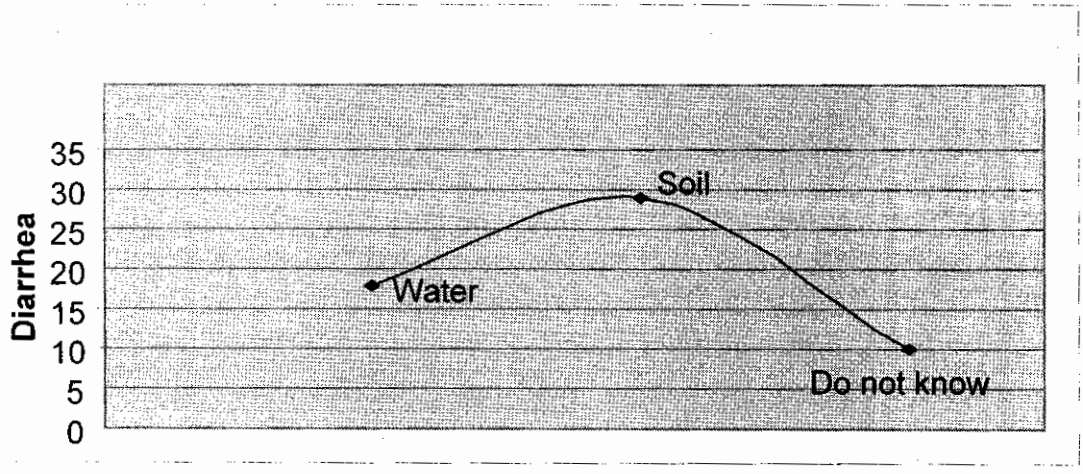

Figure. 4.3.1.9 Association between cleansing facilities after defecation and diarrhea

Table 4.3.1.10 Association between sink with soap, no soap and no sink and diarrhea

Observed table (expected table) Chi-Sq = 13.783 DF = 2, P-Value = 0.001

Diarrhea	Yes, soap present	Yes, soap not present	No sink	Total Households
Yes	09(14.73)	37(31.78)	16(15.50)	62
No	10(4.28)	04(9.23)	04(4.50)	18
Total	**19**	**41**	**20**	**80**

Since the calculated value of chi square fell in the critical region we therefore rejected our null hypothesis of independence and concluded that the data provides evidence of statistical association between two criteria of classification. Nineteen respondents were found who had sink and soap facility. Out of 19 respondents were found to have diarrhea and 41 respondents were found who had sink but no soap was present, among them 37 respondents were found who had diarrhea and 20 respondents were found who had no sink .Out of them 16 were found who had diarrhea.

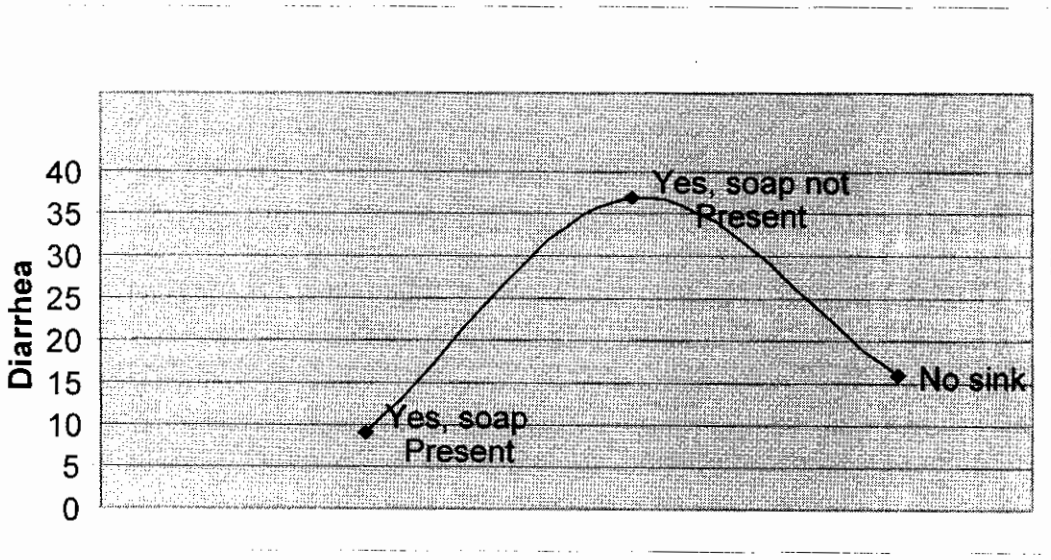

Figure. 4.3.1.10 Association between sink with soap, no soap and no sink and diarrhea

Table 4.3.1.11 Association between eating habits and typhoid

Observed table (expected table) Chi-Sq = 14.726 DF = 2, P-Value = 0.001

Disease	Drinking dirty water	Eating with dirty hand	Playing in dirty cistern	Total Households
Typhoid .yes	31(27.79)	7(13.54)	19(15.68)	57
No	08(11.21)	12(5.46)	03(6.33)	23
Total	**39**	**19**	**22**	**80**

Since the calculated value of chi square fell in the critical region we, therefore rejected our null hypothesis of independence and concluded that the data provides evidence of statistical association between two criteria of classification. Water washed and water-borne diseases are caused by poor water quality and bad sanitation. The results show that 39 respondents responded that typhoid is because of drinking contaminated drinking water, among them 31 were found with typhoid. Similarly 39 respondents responded that typhoid is because of eating with dirty hands and 7 respondents among them were found having typhoid. Twenty two respondents responded that typhoid is because of playing in dirty cistern and 19 respondents among them were found infected with diarrhea. The results show that good facilities reduce extent of diseases to a very high degree. Sanitation is very important to cease the disease, specially the toilet facilities. Other studies also shows that Curtis and Cairncross (2003) conducted a systematic review and meta-analysis of the impact of hand washing with soap on diarrhoea morbidity

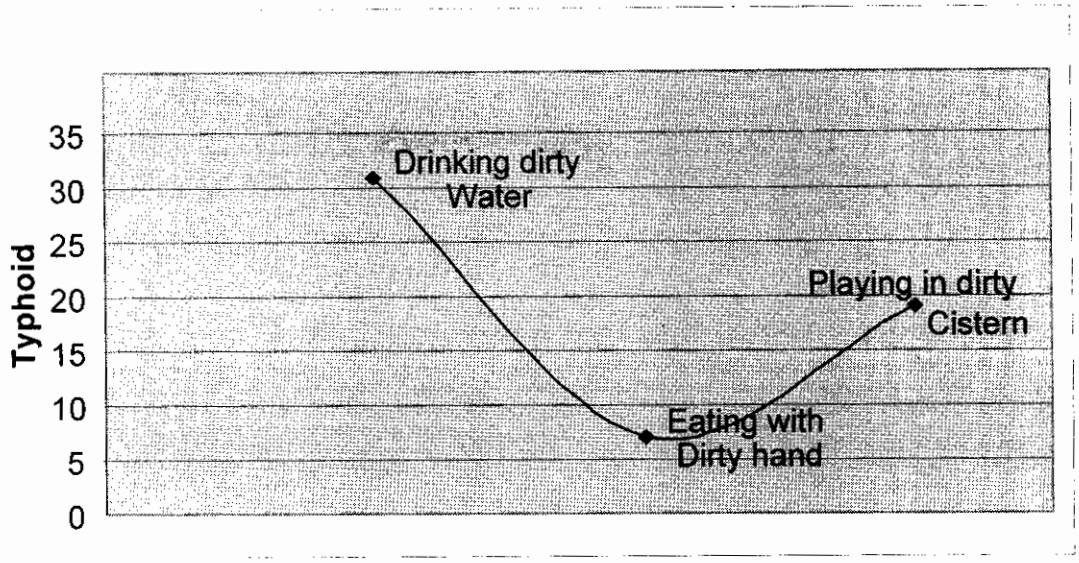

Figure. 4.3.1.11 Association between eating habits and typhoid

Table 4.3.1.12 Association between income and diseases (typhoid)

Observed table (expected table) `Chi-Sq = 12.445 DF = 4, P-Value = 0.014`

Typhoid	No income	Rs, <2000	2100-3000	Rs, 3100>4000	Rs, 4100 and above	Total
yes	5(4.11)	8(8.81)	21(14.69)	7(11.16)	6(8.23)	49
No	2(2.89)	7(6.19)	4(10.31)	12(7.84)	8(5.78)	31
Total	**7**	**15**	**25**	**19**	**14**	**80**

Since the calculated value of chi square fell in the critical region, we therefore rejected our null hypothesis of independence and concluded that the data provides evidence of statistical association between two criteria of classification (income and diseases). The results reveal that 7 respondents responded that they had no income source. Out of these 7 respondents 5 were found to have diarrhea and vomiting. Fifteen (15) respondents responded that their income was less than Rs. 2000/month and 8, out of 15 respondents were found to have diarrhea. Respondents who were earning Rs. 2100-3000 were 25 in number, among 25 respondents, 21 were having

diarrhea. The respondents who were earning 3100-4000/month were 19 in numbers among them 7 were suffering from diarrhea. Respondents who was earning worth of Rs 4100 and above were 14 households among them 6 responded that their children had diarrhea during last two weeks. The results show that the sick persons were earning less as compared to the persons who were earning more and they were healthy and less susceptible to diarrhea and other diseases.

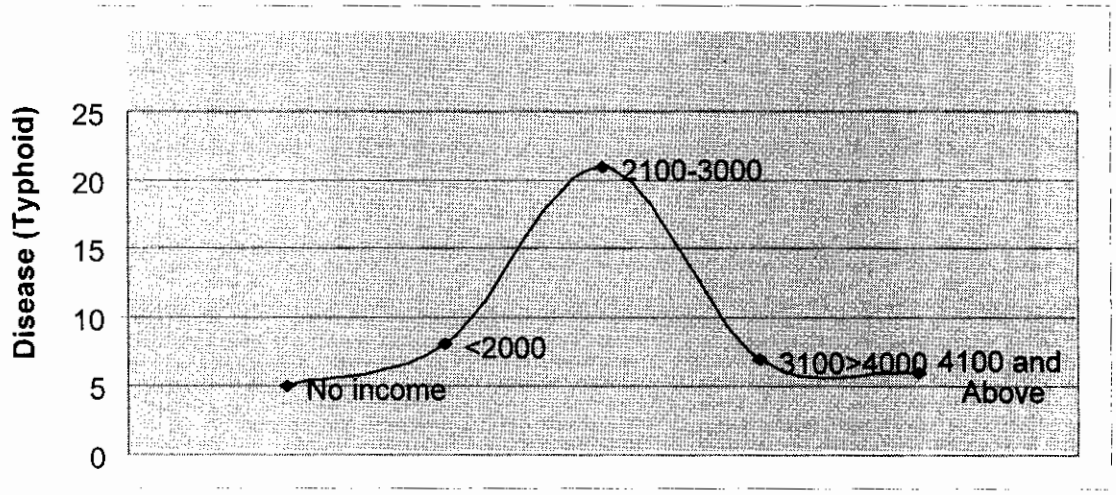

Figure 4.3.1.12 Association between income and diseases (typhoid)

Table 4.3.1.13 Total share of household income spent over health

Total share of income spent over health (diseases)	Household income less than Rs, 3000	Household income Rs, 3100-3500	Household income Rs, 3600-4000	Households income Rs, 4100 and above	Total Households
500-1000	8	9	3	5	25
1100-1500	5	8	4	4	21
1600-2000	4	9	3	5	21
2000 and above	2	4	3	4	13
Total	**19**	**30**	**13**	**18**	**80**

Average share of income spent over health(diseases)	Average household income Rs, 2500	Average households income Rs, 3300	Average households income Rs, 3600	Average households income Rs, 4200	Total Households
750	8	9	3	5	25
1300	5	8	4	4	21
1800	4	9	3	5	21
2000	2	4	3	4	13
Total	**19**	**30**	**13**	**18**	**80**

Total income earned by 80 household = Rs. 268900

Total share of income spent on health (diseases) by 80 households = Rs. 109850

To calculate the total %age share of income spent on health we applied the formula for calculation as shown below.

Percentage share of income spent on health = total share of income spent over health/total income of households.

$$109850/268900 \times 100$$

$$= \mathbf{40.85\%}$$

The results show that total income of households was ranging from 2000-5000(earnings of all members of the households) while they were spending major share of income on food. It was calculated that 40 % of the total share of income was spent on health, which is undoubtedly a very high figure. Poor water quality and lack of proper sanitation facilities are major reasons for prevalence of diseases. The households were earning less were affected more by the diseases as compare to the households with relatively higher income. Sometime they even spent more than they were earning because of prolonged period of diseases. So it was observed that people spent more on health after the food they required. The study shows that the people, who were earning less than Rs. 3000 per month, were spending 500-2000 on health

and diseases whereas the people earning Rs, 3100-3500, were 30 in number spending Rs. 500-2000 in one month. Similarly households who were spending Rs 41000 and above were 18 in number and were spending Rs 500-2000 on health.

The results show that the total income of eighty households per month was almost Rs, 268900. Whereas total share spent by 80 households on health was Rs, 109850 and the calculated percentage showed that **40.85%** of the total household income was spent on diseases and health.

4.4 Poverty and Income

The result shows that 40% of total income of the squatter settlement was spent on health and health care facilities. A large number of respondents were found redundant /unemployed because of diseases they had. So the diseases keep out the people to earn and to do jobs. The main reason of prevalence of diseases was found to be drinking of contaminated water that caused water-borne disease, beside inadequate sanitation facilities. Forty percent of income spent on health shows that the problem is very serious and needs to be addressed on top priority basis. The other studies also show that poverty and lack of education are the causes of poor sanitation condition. For these reason environment is polluted dangerously. Centre for Urban Studies (CUS), The Urban Poor in Bangladesh, Phase 1, vol. 1, Centre for Urban Studies, Dhaka, 1990.

4.5 CONCLUSIONS/DISCUSSIONS

The current study exhibits the miserable living conditions of the squatter settlements in I-11/1 sector of Islamabad. The study covers a wide range of social, economic and environmental issues.

So far as water quality tests are concerned, 29 samples were analyzed and it was found that 93%, 75% and 60 % of total coli forms, fecal coli forms and E.Coli, respectively were a source to contaminate the quality of water. Typhoid fever and Diarrhea were identified as the major results of contaminated water and poor sanitation facilities. This was because of poor attention of government to the issue and lack of proper medical facilities in the squatter settlement. Fourty percent (40%) of the total income was found to be spent on health by the squatter settlement which further exacerbates the extent of poverty.

Sanitation facilities were awful, insufficient and poorly managed by households themselves and were not hygienically useful for health and environment. Poorly managed toilet, wash sink, open defecation, water treatment and waste management seemed to make squatter settlers more vulnerable to diseases and other related calamities.

The percentage total share of income spent on health was noted to be 34% on typhoid, 28% on diarrhea, 20% on jaundice and 32% on malaria, which clearly showed high burden of diseases because of poor water quality and sanitation.

The study area had no proper schooling system to educate the children and mostly children under age of five were found infected with diarrhea and were kept out of school.

It was found that sanitation as well as clean, safe water is very important for health, but the study area lacked such facilities, had no safe drinking water and sanitation facilities. Pit and bucket latrines were common and mostly households were defecating in open fields which were creating health hazardous, especially in children.

Many respondents were found infected with eye infections that mostly occurred due to bad sanitation, even people were not washing their hands after defecation, were using soil. There was no treatment of water, toilets were mostly located inside the houses, shared toilet facility and placement of garbage inside the houses had made their lives more vulnerable to diseases.

Poorly managed, illegal settlement and lack of political voice act as a restriction towards the provision of basic civil facilities to these squatter settlers. Water sources are few in the area and the sources are very close to each other. People covered a long distance to fetch the water. Mostly households were using unprotected well for drinking purpose only because of easy access. On the other hand sick persons were not able to fetch the water from a long distance.

4.6 RECOMMENDATIONS

Poor water quality and sanitation were found to be major factors in squatter settlement of I-11/1 sector of Islamabad for generating water-borne diseases. So far as water quality tests are concerned 29 samples were analyzed and it was found that 93%, 75% and 60% of total coliforms, fecal coliforms and E.Coli were present, respectively. They were the sources to contaminate the quality of water.

1. To avoid water contamination it is recommended that inhabitants must be given awareness regarding cost effective methods of water treatment. e.g. Boiling. People were unaware of water-borne diseases, so NGO's should play a role to raise awareness among people of this settlement.

2. There was only one primary school near squatter settlement for both boys and girls with inadequate facilities and lack of well qualified teachers. It is recommended that one primary school each for boys and girls must be established which will definitely be a important step for creating awareness among people to understand the meanings of quality of life.

3. It was found that quality of water was not satisfactory, leaking and loss of drinking water was observed (improper maintenance). Wells were found open. So it is recommended that government should provide hygienically safe source

of water (e.g. water filtration plant or at least a tube well). A single plant can fulfill the requirements of this settlement.

4. There is a piped water supply of CDA passing by the squatter settlement, so CDA should provide water from this line to the households and the pipe line water was found comparatively safe for drinking purposes when a water quality test was conducted.
5. Water storage tanks can also be constructed to store drinking water at different places within squatter area and clean water from piped water supply can be stored easily, so CDA should take the responsibility in this regard.

6. As far as sanitation is concerned, it was found that whole of the settlement was using pit latrines and bucket latrines which was a health risk. The only solution is that, government should provide flush to septic tanks latrines for proper disposal of sewerage and NGOS should play their role to raise awareness regarding eating habits, like washing of hands before eating and after defecation that will change the attitudes of the people about health.

7. The "Kacha" (muddy) houses, unpaved streets were found more risky, especially on rainy season that cause smell and mud to produce more diseases as serve as breeding places for disease vectors. So there arises a need of a reasonable sewage system either done on the behalf of community or government provided that it seems to be very difficult for squatter settlers to have paved streets and hence good quality sewage system.

8. At certain times CDA took the action and abolished the houses owning to the illegal status, so squatter settlers should be given property rights or alternate place to reside where people will have a sense of belonging and ownership and over all result would be better hygienic / environmental condition, keeping in view the point that the said squatter settlement falls in the of planned sector I-11/1 and it seems difficult for squatter settlers to have property rights in future.

9. It was observed that there was no hospital or dispensary in or in the vicinity of squatter settlement. People were being treated at private health facilities, where they spent much more on health. It is recommended that government should provide health facilities at least a dispensary in or near the settlement. The health risk was also because of the visiting dispensers, who were not adequately qualified, so the area should be provided with a free dispensary with qualified medical professionals.

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APPENDIX

Frequency Tables

Respondent Socio-Demographic Characteristics

4.1.1.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	31-40	20	25.0	25.0	25.0
	41-60	42	52.5	52.5	77.5
	61 and above	18	22.5	22.5	100.0
	Total	80	100.0	100.0	

4.1.2.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	30-40	3	3.8	3.8	3.8
	41-50kg	4	5.0	5.0	8.8
	51-60kg	47	58.8	58.8	67.5
	60k and above	26	32.5	32.5	100.0
	Total	80	100.0	100.0	

4.1.3.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Single	3	3.8	3.8	3.8
	Married	61	76.3	76.3	80.0
	Widow	16	20.0	20.0	100.0
	Total	80	100.0	100.0	

4.1.4.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1-5	15	18.8	18.8	18.8
	6-10	61	76.3	76.3	95.0
	11-15	4	5.0	5.0	100.0
	Total	80	100.0	100.0	

4.1.5.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	64	80.0	80.0	80.0
	Female	16	20.0	20.0	100.0
	Total	80	100.0	100.0	

4.1.6.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Pushtu	67	83.8	83.8	83.8
	Punjabi	13	16.3	16.3	100.0
	Total	80	100.0	100.0	

4.1.7.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No formal education	29	36.3	36.3	36.3
	Less than primary school	47	58.8	58.8	95.0
	Secondary school completed	4	5.0	5.0	100.0
	Total	80	100.0	100.0	

4.1.8.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Govt. Employ	3	3.8	3.8	3.8
	Self employ/private	58	72.5	72.5	76.3
	Not working	19	23.8	23.8	100.0
	Total	80	100.0	100.0	

Water Supply and Use

4.1.9

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	hand pump/boring	41	51.3	51.3	51.3
	unprotected well	25	31.3	31.3	82.5
	piped water supply to surrounding area	14	17.5	17.5	100.0
	Total	80	100.0	100.0	

4.1.10

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	hand pump/boring	36	45.0	45.0	45.0
	unprotected private well	26	32.5	32.5	77.5
	piped water supply to surrounding area	18	22.5	22.5	100.0
	Total	80	100.0	100.0	

4.1.11

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Once	5	6.3	6.3	6.3
	Twice	9	11.3	11.3	17.5
	Thrice	53	66.3	66.3	83.8
	Four time	13	16.3	16.3	100.0
	Total	80	100.0	100.0	

4.1.12

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1-30min	15	18.8	18.8	18.8
	31-60min	61	76.3	76.3	95.0
	61-90mins	4	5.0	5.0	100.0
	Total	80	100.0	100.0	

4.1.13

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Bucket/Pots	28	35.0	35.0	35.0
	Plastic container 10 lit/20 lit	52	65.0	65.0	100.0
	Total	80	100.0	100.0	

4.1.14

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	70	87.5	87.5	87.5
	No	10	12.5	12.5.	100.0
	Total	80	100.0	100.0	

4.1.15

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	One	3	3.8	3.8	3.8
	Two	13	16.3	16.3	20.0
	Three	57	71.3	71.3	91.3
	Four	7	8.8	8.8	100.0
	Total	80	100.0	100.0	

4.1.16

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Bucket	36	45.0	45.0	45.0
	Piped container	2	2.5	2.5	47.5
	Barrel	2	2.5	2.5	50.0
	Narrow cap/plastic bottles	40	50.0	50.0	100.0
	Total	80	100.0	100.0	

4.1.17

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	10	12.5	12.5	12.5
	No	70	87.5	87.5	100.0
	Total	80	100.0	100.0	

4.1.18

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Boil	16	20.0	20.0	20.0
	No treatment	44	55.0	55.0	75.0
	Don't know	20	25.0	25.0	100.0
	Total	80	100.0	100.0	

4.1.19

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yesterday	7	8.8	8.8	8.8
	No treatment	73	91.3	91.3	100.0
	Total	80	100.0	100.0	

4.1.20

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	58	72.5	72.5	72.5
	No	19	23.8	23.8	96.3
	i don't know	3	3.8	3.8	100.0
	Total	80	100.0	100.0	

4.1.21

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1-10	61	76.3	76.3	76.3
	11-20	17	21.3	21.3	97.5
	41and above	2	2.5	2.5	100.0
	Total	80	100.0	100.0	

4.1.22

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	28	35.0	35.0	35.0
	No	52	65.0	65.0	100.0
	Total	80	100.0	100.0	

4.1.23

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	68	85.0	85.0	85.0
	No	9	11.3	11.3	96.3
	Don't know	3	3.8	3.8	100.0
	Total	80	100.0	100.0	

4.1.24

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	35	43.8	43.8	43.8
	No	26	32.5	32.5	76.3
	I don't know	19	23.8	23.8	100.0
	Total	80	100.0	100.0	

Sanitation Facilities

4.1.25

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	In living quarter	54	67.5	67.5	67.5
	In building but outside the quarter	5	6.3	6.3	73.8
	Open field	21	26.3	26.3	100.0
	Total	80	100.0	100.0	

4.1.26

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Poor flush latrine/pit latrine	37	46.3	46.3	46.3
	Bucket latrine	23	28.8	28.8	75.0
		20	25.0	25.0	100.0
	Total	80	100.0	100.0	

4.1.27

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	67	83.8	83.8	83.8
	Yes	13	16.3	16.3	100.0
	Total	80	100.0	100.0	

4.1.28

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Flush to septic system	1	1.3	2.5	1.3
	Latrine for manually removed	79	98.7	98.7	100.0
Total		80	100.0	100.0	

4.1.29

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Water	25	31.3	31.3	31.3
	Other/soil	38	47.5	47.5	78.8
	Don't know	17	21.3	21.3	100.0
	Total	80	100.0	100.0	

4.1.30

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Near toilet	14	17.5	17.5	17.5
	Kitchen	18	22.5	22.5	40.0
	Elsewhere	45	56.3	56.3	96.3
	Out side premises	1	1.3	1.3	97.5
	No specific place	2	2.5	2.5	100.0
	Total	80	100.0	100.0	

4.1.31

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes.soap present	19	23.8	23.8	23.8
	yes.soap not present	41	51.3	51.3	75.0
	no	20	25.0	25.0	100.0
	Total	80	100.0	100.0	

4.1.32

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Before and after cleaning infants	45	56.3	56.3	56.3
	After dealing with animals	17	21.3	21.3	77.5
	Praying	18	22.5	22.5	100.0
	Total	80	100.0	100.0	

Prevalence of Acute Diarrhea, Jaundice & Typhoid

4.1.33

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	35	43.8	43.8	43.8
	No	38	47.5	47.5	91.3
	Don't know	7	8.8	8.8	100.0
	Total	80	100.0	100.0	

4.1.34

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Malaria	5	6.3	6.3	6.3
	Diarrhea	36	45.0	45.0	51.3
	Typhoid	39	48.8	48.8	100.0
	Total	80	100.0	100.0	

4.1.35

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Drinking Dirty Water	39	48.8	48.8	48.8
	Eating With Dirty Hand	19	23.8	23.8	72.5
	Playing In Dirty Cistern	22	27.5	27.5	100.0
		80	100.0	100.0	

4.1.36

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	71	88.8	88.8	88.8
	No	7	8.8	8.8	97.5
	Don't know	2	2.5	2.5	100.0
	Total	80	100.0	100.0	

4.1.37

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Private health	39	48.8	48.8	48.8
	Public health	15	18.8	18.8	67.5
	Traditional health	25	31.3	31.3	98.8
	No treatment	1	1.3	1.3	100.0
	Total	80	100.0	100.0	

4.1.38

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	59	73.8	73.8	73.8
	No	15	18.8	18.8	92.5
	Don't know	6	7.5	7.5	100.0
	Total	80	100.0	100.0	

4.1.39

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	56	70.0	70.0	70.0
	No	15	18.8	18.8	88.8
	Don't know	9	11.3	11.3	100.0
	Total	80	100.0	100.0	

4.1.40

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	64	80.0	80.0	80.0
	No	9	11.3	11.3	91.3
	Don't know	7	8.8	8.8	100.0
	Total	80	100.0	100.0	

4.1.41

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Clean water	37	46.3	46.3	46.3
	Wash hands before eating	30	37.5	37.5	83.8
	Don't know	13	16.3	16.3	100.0
	Total	80	100.0	100.0	

Household Expenditure

4.1.42

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2000-4000	25	31.3	31.3	31.3
	5000-10000	36	45.0	45.0	76.3
	10000 and above	19	23.8	23.8	100.0
	Total	80	100.0	100.0	

4.1.43

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Diseases	52	65.0	65.0	65.0
	Food	27	33.8	33.8	98.8
	Water	1	1.3	1.3	100.0
	Total	80	100.0	100.0	

4.1.44

Valid	500-1000	16	20.0	20.0	20.0
	1100-1500	39	48.8	48.8	68.8
	1600-2000	21	26.3	26.3	95.0
	2000 and above	4	5.0	5.0	100.0
	Total	80	100.0	100.0	

4.1.45

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1000-2000	18	22.5	22.5	22.5
	2000-4000	15	18.8	18.8	41.3
	no expenditure	47	58.8	58.8	100.0
	Total	80	100.0	100.0	

4.1.46

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Health facility	4	5.0	5.0	5.0
	Care b doctor	3	3.8	3.8	8.8
	Dentist	5	6.3	6.3	15.0
	Medication	60	75.0	75.0	90.0
	X-rays	8	10.0	10.0	100.0
	Total	80	100.0	100.0	

Household Income

4.1.47

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no income	8	10.0	10.0	10.0
	less than 1000	18	22.5	22.5	32.5
	1500-2000	27	33.8	33.8	66.3
	2100-2600	12	15.0	15.0	81.3
	2600 and above	15	18.8	18.8	100.0
	Total	80	100.0	100.0	

4.1.48

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no income	7	8.8	8.8	8.8
	less than 3000	15	18.8	18.8	27.5
	3100-3500	25	31.3	31.3	58.8
	3600-4000	19	23.8	23.8	82.5
	4100 and above	14	17.5	17.5	100.0
	Total	80	100.0	100.0	

4.1.49

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Driver	14	17.5	17.5	17.5
	Fruit hacker	48	60.0	60.0	77.5
	Private business	18	22.5	22.5	100.0
	Total	80	100.0	100.0	

4.1.50

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1000-2000	12	15.0	15.0	15.0
	3000-500	25	31.3	31.3	46.3
	5000 and above	43	53.8	53.8	100.0
	Total	80	100.0	100.0	

Solid Waste Management

4.1.51

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	In plastic bags	29	36.3	36.3	36.3
	In buckets	39	48.8	48.8	85.0
	In yard	12	15.0	15.0	100.0
	Total	80	100.0	100.0	

4.1.52

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	In the kitchen	6	7.5	7.5	7.5
	In the yard	69	86.3	86.3	93.8
	Outside the premises	5	6.3	6.3	100.0
	Total	80	100.0	100.0	

4.1.53

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Every day	3	3.8	3.8	3.8
	Every two days	47	58.8	58.8	62.5
	Once per week	15	18.8	18.8	81.3
	Don't Know	15	18.8	18.8	100.0
	Total	80	100.0	100.0	

4.1.54

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No specific place	17	21.3	21.3	21.3
	Thrown out directly	62	77.5	77.5	98.8
	Don't know	1	1.3	1.3	100.0
	Total	80	100.0	100.0	

4.1.55

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	50	62.5	62.5	62.5
	No	19	23.8	23.8	86.3
	Sometime	11	13.8	13.8	100.0
	Total	80	100.0	100.0	

4.1.56

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Burning	9	11.3	11.3	11.3
	Gathering in a place	6	7.5	7.5	18.8
	Throw out in open places	65	81.3	81.3	100.0
	Total	80	100.0	100.0	

4.1.57

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	49	61.3	61.3	61.3
	no	16	20.0	20.0	81.3
	dk	15	18.8	18.8	100.0
	Total	80	100.0	100.0	

4.1.58

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Malaria	64	80.0	80.0	80.0
	Diarrhea	6	7.5	7.5	87.5
	Eye infection	10	12.5	12.5	100.0
	Total	80	100.0	100.0	

4.1.59

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	it has bed smell	25	31.3	31.3	31.3
	it brings flies	55	68.8	68.8	100.0
	Total	80	100.0	100.0	

4.1.60

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Cda/rda should manage the garbage	45	56.3	56.3	56.3
	Gather and burn it	35	43.8	43.8	100.0
	Total	80	100.0	100.0	