FACTORS RELATED TO THE OCCURRENCE OF DIARRHEAL DISEASE AMONG UNDER-FIVE CHILDREN IN LALITPUR DISTRICT OF NEPAL

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ABSTRACT

A cross-sectional descriptive study was conducted to identify the factors (socio-demographic, behavioral, child, environmental and sanitation) related to the occurrence of diarrheal disease in under-five pre-school children in the Lalitpur district of Nepal. Data of 179 caretakers of the under-five children were collected from two urban schools, during the winter season (Jan-Feb, 2010) where the incidence of diarrhea was high. Data were collected by structured questionnaire and face to face interviews in both schools.

Caretakers were mostly female (78.77%), and 72.63% were mothers. 46.93% had secondary education or higher, and 39.11% were of low family income. More than half had a fair level of knowledge. 49.16% had good diarrhea practice, and 88% believed that first teeth emergence can cause diarrhea. Most of their children were 37- 48 months old. 82.68% had normal birth weight, and 46.93% had exclusive breastfeeding.

Most caretakers reported no diarrhea in their children in the month prior to the day of the interview, 20.67% reported one episode, and only 0.56% reported two episodes. 86.84% had watery type of diarrhea. Diarrhea occurred more often in children of ≥ 30 years old female caretakers with primary education and having poor practice on diarrhea. Diarrhea also occurred more often in children with low birth weight and not exclusively breastfed. However, there was no statistically significant association. Two variables were statistically significant associated with the occurrence of diarrheal disease: clean drinking water storage system (O.R.= 2.53, p-value= 0.020) and preventing contamination of food and water by not having blocked drainage near or around the house, (O.R = 2.12, p-value =0.045).

Clean storage of drinking water and not having blocked drainage should be encouraged. A good sewerage system may be expected to have a long term impact in the prevention of diarrhea.

KEY WORDS : DIARRHEA/ UNDER-FIVE CHILDREN /CARETAKERS HYGIENE/ ENVIRONMENT/ SANITATION

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LIST OF ABBREVIATIONS

AIDS	:	Acquired Immuno-deficiency Syndrome
AIHD	:	Asean Institute for Health Development
ARI	:	Acute Respiratory Infection
BCG	:	Bacillus Calmette Guerin
CDR	:	Central Development Region
CB	:	Community Based
DPT	:	Diphtheria Pertusis Tetanus
ECF	:	Extra Cellular Fluid
EDR	:	Eastern Development Region
EPI	:	Expanded Program on Immunization
FCHV	:	Female Community Health Volunteer
FWDR	:	Far Western Development Region
Hep B	:	Hepatitis B
HIV	:	Human Immuno-deficiency Virus
ICF	:	Intra Cellular Fluid
IMCI	:	Integrated Management of Childhood Illness
MICS	:	Multiple Indicator Cluster Survey
MoHP	:	Ministry of Health and Population
MWDR	:	Mid-Western Development Region
NDHS	:	Demographic and Health Survey, Nepal
NID	:	National Immunization Day
ORS	:	Oral Rehydration Solution
Q.D.	:	Quartile Deviation
S.D.	:	Standard Deviation
UNICEF	:	United Nations International Children's Emergency Fund
VDC	:	Village Development committee
WHO	:	World Health Organization

CHAPTER I
INTRODUCTION

1.1 Rationale and justification of the study

1.1.1 Prevalence of diarrhea among children globally and in Nepal

Diarrhea is one of the major killer diseases of under-five children. The mortality rate for children under-five years suffering from acute diarrhea has fallen from 4.5 million deaths annually in 1979 to 1.6 million deaths in 2002 but continues to be highest among the children of developing countries (1). Out of the 10.6 million deaths of under-five year old children, 70 % were due to: pneumonia (19%), diarrhea (18%), malaria (8%), neonatal pneumonia or sepsis (10%), preterm delivery (10%) and asphyxia at birth (8%). Seven out of 10 deaths in underdeveloped countries are caused by pneumonia, diarrhea, measles, and malaria and under nutrition. Of the 6.6 million deaths among children aged 28 days to 5 yrs; 1.7 million (26%) are caused by diarrhea and 1 million (61%) are due to the presence of under nutrition (2).

Diarrheal diseases are related to more than 4 billion episodes per year and more than 3 million deaths seen in 80% of the under-five children in 1995. Diarrhea is a leading cause of childhood mortality and an important cause of malnutrition in developing countries. On average, children below 3 years of age experience three episodes of diarrhea each year. About 50% of deaths are due to acute watery stools, 35% are due to persistent diarrhea, and 15% are due to dysentery (3).

In developing countries 88% of diarrheal diseases are due to unsafe water supplies, inadequate sanitation and/or poor hygiene. By improving water supplies, diarrhea morbidity can be reduced by 6% to 25% when severe outcomes were included. Similarly, improved sanitation can reduce diarrhea morbidity by 32%.

Hygienic intervention by health education and the promotion of hand washing can reduce diarrhea cases by up to 45%. By improving drinking water quality, diarrhea morbidity can be reduced by between 35 to 39 % (4).

In Nepal, dehydration caused by severe diarrhea is a major cause of morbidity and mortality in under-five children. The causative agent of diarrhea is mostly related to contaminated water and unhygienic practices in food preparation and disposal of excreta. Prevalence of acute diarrhea in 2006 was 12 % and 2 % had bloody diarrhea, most commonly observed in the age group of 6-11 months and 12-23 months. The prevalence decreased from 28% in 1996 to 20 % in 2001. Episodes of diarrhea 3.3 per child per year in 1994 (14). Diarrhea subject to seasonal variations and peaks in summer (May to July) and winter (December to February). However, the above data were taken at the same time in previous years, so there it should not be affected by the seasonal difference (5, 54).

1.1.2 Prevention and Case Management of Acute Diarrhea

Diarrhea is defined as the passage of liquid or watery stools more than three times in a day (6). Diarrhea is the third most common cause of death in 12-59 months age group children. Death is due to severe dehydration leading to loss of fluids and electrolytes resulting in shock. Since children do not usually suffer from only one disease most of the time, a holistic approach in managing sick children, a new strategy by WHO, called Integrated Management of Childhood Illness (IMCI) was implemented in Nepal in 1997. In this strategy, 70% of the under-five children illness is covered which are Pneumonia, Diarrhea, Measles, Malaria and Malnutrition. The IMCI strategy includes three main components:

- Improvement of the case management skills of health workers
- Improvement of the overall health system
- Improvement of family and community health care practices
- Management of acute diarrhea is a part of the IMCI strategy and follows the following steps during management:
  - Assess the young infant/child
  - Classify the illness

- Identify treatment
- Treat the young infant/ child
- Counsel the mother and
- Provide follow up care

Diarrhea is of three types as defined by WHO in "Improving the child health" book. IMCI: an integrated approach, on diarrhea with multy-faceted approach, explains that with proper management of diarrhea it can save about 1.8 million lives per year.

Table 1.1 Three main Types of Diarrhea

Type of diarrhea	**% of all cases of childhood diarrhea**	**% of all childhood deaths due to diarrhea**	**% of deaths preventable by standard case management**
Acute watery	80	50	100
Dysentery	10	15	80
Persistent	10	35	80
Total	100	100	90

Source: Improving the child health: WHO

Categorizing types of diarrhea enables health workers to provide effective management of the problem. Health workers are trained to recognize the three main types:

1**. Acute watery diarrhea** is the most common form and the most easily treated. It may cause dehydration which can usually be avoided by giving extra fluids and food with a little extra salt. Oral rehydration salt solution, which has revolutionized the treatment of diarrhea, since the late 1970s, can safely correct dehydration without the need for intravenous therapy in all but the most severe cases.

2. **Dysentery** is diagnosed by the presence of blood in the stool and is treated with antibiotics.

3. **Persistent diarrhea** is defined as an episode that lasts for more than 14 days. It is a major cause of malnutrition but it can usually be treated by dietary management, supplements of vitamins and minerals, and the treatment of co-existing infections (7).

Management of diarrhea in accordance with WHO/IMCI guidelines includes:

- Watery diarrhea requires replacement of fluids and electrolytes, regardless based fluids. Severely dehydrated patients may need IV fluids like Ringer Lactate solution.
- By increasing the home based fluids and ORS just after starting, diarrhea can be successfully treated at home
- Feeding should be continued during diarrhea and it should be continued for a week more with extra food after the diarrhea stops.
- Drug should not be used routinely except in case of Shigella Dysentery and suspected cases of Cholera

1.1.3 Management of Diarrhea at Home by Mother or Caretaker

This includes:

- Give extra fluid as much as he/she likes
- Continue feeding (frequent breastfeeding to the baby)
- Recognize danger signs (Fever, repeated vomiting, not able to breast feed and bloody stool) and
- Take to health facility if not getting better (8, 6)

This IMCI strategy had been implemented in 92 countries by December 2006 (9).

The first step for managing an outbreak of acute diarrhea was developed by WHO which refers to two types of emergencies which may arise from acute diarrhea:

Cholera	=	Acute watery Diarrhea
Shigella Dysentery	=	Acute bloody Diarrhea

Both are transmitted by contaminated water, unsafe food, dirty hands, and vomit or stools of sick people. Other causes of diarrhea may produce severe illness for the patient, but will not produce outbreaks which represent an immediate threat to the community (10).

Report addressed by UNICEF and WHO on October 14, 2009

Despite the existence of inexpensive and efficient means of treatment, diarrhea kills more children than AIDS, malaria and measles combined, according to a report , titled "Diarrhea: Why Children Are Still Dying and What Can Be Done," includes information on the causes of diarrhea, data on access to means of prevention and treatment, and a seven-point plan to reduce diarrhea deaths.

"In the developing world, 24,000 children under the age of five die every day from preventable causes like diarrhea contracted from unclean water. Some 88 percent of diarrheal deaths worldwide are attributable to unsafe water, inadequate sanitation and poor hygiene. As of 2006, an estimated 2.5 billion people around the world were not using adequate sanitation facilities, and about 1 in 4 people in developing countries practiced open defecation.

Access to clean water and good hygiene practices are extremely effective in preventing childhood diarrhea. Hand washing with soap has been shown to reduce the incidence of diarrheal disease by over 40 %, making it one of the most cost-effective interventions for reducing child deaths caused by this neglected killer.

The overall health and nutrition of children is also critical to their susceptibility to diarrhea and the damage it can cause. Undernourished children are at higher risk of suffering more frequent, severe and prolonged episodes of diarrhea, and repeated bouts of diarrhea also place children at greater risk of worsening nutritional status. The seven–point plan to save the lives of children stricken by diarrhea includes two treatment and five prevention elements.

The two treatment elements are:

1. Fluid replacement to prevent dehydration
2. Zinc treatments, which decrease the severity and duration of the attack

The five prevention elements are:

1. Immunization against rotavirus and measles
2. Early and exclusive breastfeeding and vitamin A supplementation
3. Hand washing with soap
4. Improved water supply quantity and quality
5. Promoting community-wide sanitation (11)

Table 1.2 Ten Leading Diseases, Total New Visits as a Percentage of Total Population by Development Region, Nepal (1999-2000)

Sr. No	Diseases	National Total	EDR	CDR	WDR	MWDR	FWDR
1.	Skin Diseases	5.39	3.60	5.26	6.08	4.56	4.97
2.	Diarrhoeal Diseases	3.12	2.87	2.68	3.54	3.62	3.70
3.	Intestinal worms	2.85	3.04	2.55	3.43	2.59	2.36
4.	Acute Respiratory Infection	2.68	2.63	2.11	3.44	2.89	2.97
5.	Gastritis	1.79	1.64	1.43	2.39	1.95	1.96
6.	Pyrexia of Unknown Origin	1.86	1.07	1.47	1.99	1.79	2.51
7.	Ear Infection	1.30	1.26	1.39	1.23	1.24	1.30
8.	Chronic bronchitis	0.93	0.81	0.77	1.18	1.12	1.03
9.	Anaemia	0.86	0.72	0.93	0.93	0.80	0.94
10.	Abdominal pain	0.86	0.73	0.75	0.95	1.10	1.08

Source : NDHS 2006

Table 1.2 showing Diarrhea as the second most common diseases among top ten diseases and EDR, CDR, WDR, and FDR are the names of the developmental regions. In Nepal, during diarrhea only 27 % of parents take the child to the health provider, give Oral Rehydration Solution (ORS) to 29%, 41 % give increased fluids during diarrhea and 34% do not receive the treatment especially in cases of poor and

less educated mothers. Diarrhea mortality is the third most important cause of death (13 %) in 12-59 months age group and 5 % in under-five as a whole(5).

Even after having standard management of diarrhea through community based integrated management of childhood illness (CB-IMCI) program in the district, it is clear that the multiple factors are working to cause diarrhea. These includes, how diarrhea is managed at home by mothers or caretakers, not recognizing its seriousness in time and not taking children to a health provider in time, not giving enough attention on environment, sanitation and hygiene. Diarrhea is the second most common cause of morbidity and third most common cause of mortality among children aged 12-59 months in Nepal. This has led the researcher to think about other aspects which require further research to address the factors which hampers the effective management of diarrhea in under-five children in Nepal, so that its prevalence could be reduced (12).

1.2 Research Questions

What factors affect the occurrence of diarrheal disease among children under-five years of age in schools in the Lalitpur District of Nepal?

1.3 Research Objective

1.3.1 General objective

To identify the factors related to the occurrence of diarrheal disease among pre-school children in under-five years of age.

1.3.2 Specific objectives

1.3.2.1. To describe the socio-demographic factors of caretakers relating to the occurrence of diarrheal disease among under-five children.

1.3.2.2. To identify behavioural factors of caretakers about knowledge, attitudes and practice relating to the occurrence of diarrheal disease among under-five children.

1.3.2.3. To identify any association between the factors as child, social support, use of services and environment and sanitation related to the occurrence of diarrheal disease among under-five children.

1.4 Conceptual framework

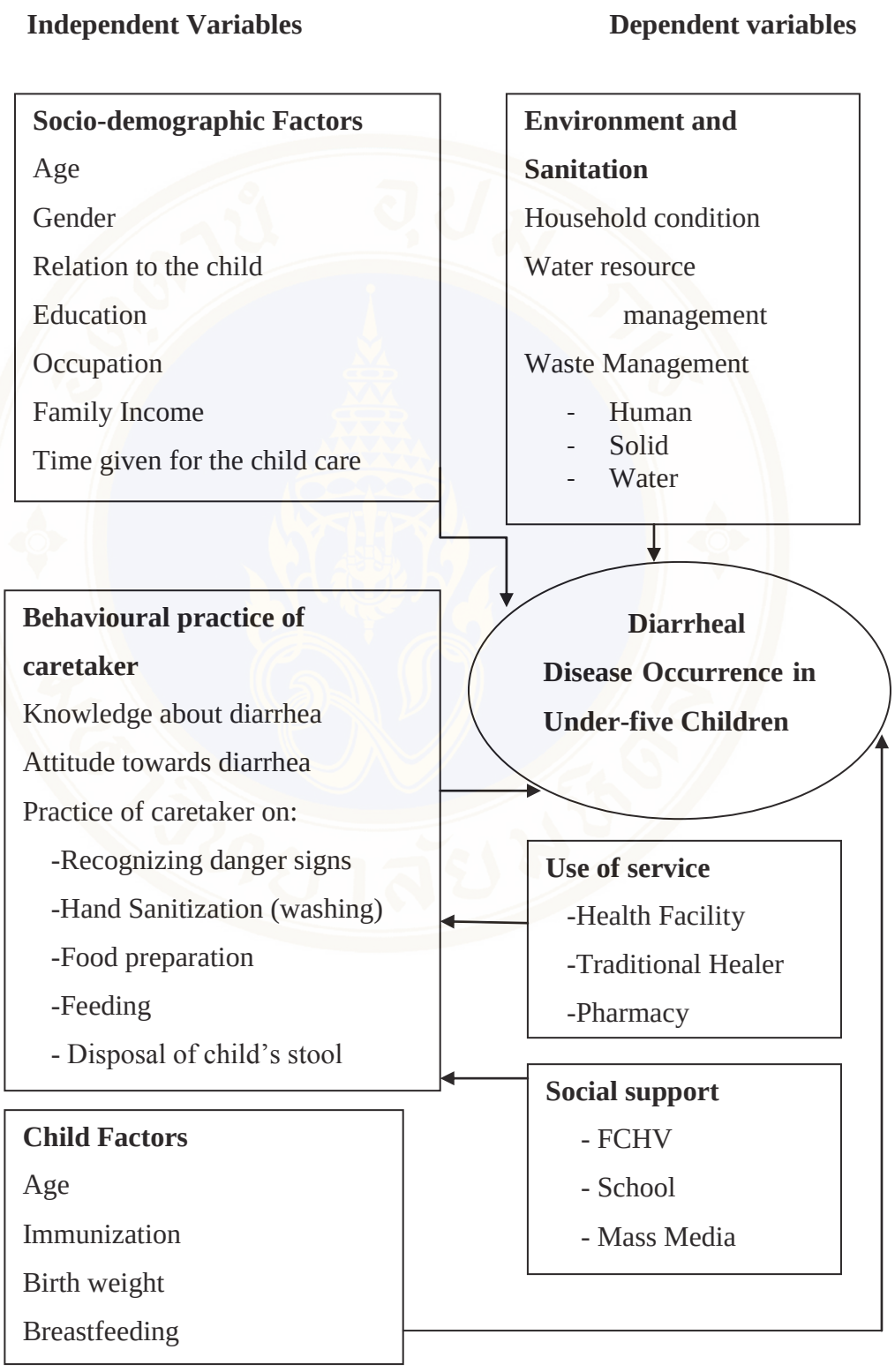

Figure 1.1 Conceptual Frame Work

1.5 Operational definition

1.5.1 Dependent Variables

Diarrheal disease occurrence in under-five children: It refers to the under-five children who were sick with diarrhea at least once, as stated by the respondents within the month previously to the day of the interview.

Diarrhea is assumed in the following conditions:

1) Three or more loose or watery stools in 24 Hours
2) Diarrhea associated with blood in stool
3) Diarrhea associated with fever

In this study diarrhea may present as acute diarrhea (viral, also includes cholera) lasting for hours to days, bacillary dysentery with blood in stool, and chronic or persistent diarrhea which may last for 14 days or more.

The percentage of children with diarrhea was calculated as the number of children with diarrhea as told by the respondents at any time during the month previous to the day of the interview divided by the number of children participating in the study.

Data on episodes of diarrhea will be collected during the study and it refers to the attacks of diarrhea lasting for two days in one attack as stated by the respondent in the month previous to the day of the interview.

1.5.2 Independent Variables

Factors referred to all independent variables

1.5.2.1 Socio-demographic factors of caretaker

It means a mother's or caretaker's age, educational level, occupation, family income, relationship to the child and time given for child care in 24 hrs.

Age : Age is complete 18 years age of the mother or caretaker on the day of the interview

Relationship: It refers to the relationship of the child to the caretakers which is categorized into two groups

Group 1 Mother

Group 2 Others eg.: grandparent, father, aunt or uncle etc

Education: Education received by the mother via the National Education system is divided into four groups: Primary level (Grade 1-6), Secondary level (7-10), Higher secondary level (10+2), and Bachelor and above

Occupation: Refers to the job or work done which generates income to sustain daily needs of the family. This is divided into four groups:

1. Housewife or unemployed - Works at home by looking after the children and others
2. Service worker - works for the public or private sector to earn
3. Self employed - conducts his/her own business
4. Agriculture - Work as a farmer
5. Others

Family Income: This means the total income earned by all family members per month and is categorized into three groups

1. US $ 100-150 (Nep.Rs.7-10,000)
2. US $ 150-250 (Nep Rs.10,000-15,000)
3. US $ 250 above (>Nep Rs.15,000)

Time given for child care:

Time spent by the caretaker with the child categorized into three groups

1. Less than 8 hrs per day
2. 8-16 hrs per day and
3. More than 16 hrs per day

1.5.2.2 Behavioural Practice of caretaker:

Caretaker is taken as the mother, father, uncle, aunt, grandparents or anyone else who takes care of a child.

Knowledge: Refers to the knowledge regarding causes of diarrhea, and its prevention and management when a child becomes sick with diarrhea. It is divided into three groups

Group 1	Poor
Group 2	Fair
Group 3	Good

Attitude: Refers to the thinking and belief of the caretakers regarding diarrhea prevention and management at home. It is classified into two groups

Group 1	Positive attitude
Group 2	Negative attitude

Practice: The routine practice done by a caretaker regarding the child like hand washing (after defecating, before feeding etc) during food preparation, feeding, disposal of child's stool and recognizing danger signs. It is classified into three groups

Group 1	Poor
Group 2	Moderate
Group 3	Good

1.5.2.3 Child factor

Age: The child should be under 5 yrs on the day of interview (4 yrs 11 months and 29 days)

Immunization: In accordance with the Expanded Program on Immunization (EPI) program of Nepal, Measles vaccination is given to all children below 1 yr and above 9

months of age. The children will be categorized into two groups

Group 1 Received

Group 2 Not received

Birth weight: Weight taken at birth normally within one hr of birth. It is classified into two groups

Group 1 Normal birth weight (2,500 gms or more)

Group 2 Low birth weight (< 2500 gms)

Breastfeeding: Exclusive breastfeeding is defined as baby taking mother's milk for six months without water or fruit juice or formula milk, except vitamins, minerals and medications (13). It is grouped into two

Group 1 Exclusively breastfed

Group 2 Not exclusively breastfed

1.5.2.4 Social support

FCHV: Female Community Health Volunteer (FCHV) in Nepal work in the community and distribute ORS and advice about the prevention and management of diarrhea at an early stage. Service received is grouped into two

Group 1 Received

Group 2 Not received

School: During school hours whether a child receives the treatment if diarrhea occurs, divided into two groups

Group 1 Received

Group 2 Not received

Mass Media: Knowledge regarding diarrhea received from Mass Media like Radio/Television/ News papers/ Posters. It is grouped into two

Group 1 Received

Group 2 Not received

1.5.2.5 Use of service

Health Facility: It refers to a public place where health worker manages sick people coming to get the care (preventive / curative). After having

diarrhea caretaker might be taking to the facility for the management, divided into two groups

Group 1 Attend

Group 2 Not attend

Traditional Healer: Many believe in traditional healer's who give psychological treatment by sprinkling water and throw a few raw rice granules into one corner of the room, a child is taken to a traditional healer is divided into two groups

Group 1 Attend

Group 2 Not attend

Pharmacy: They go to a pharmacy take a pharmacist's advice about managing diarrhea, divided into two groups

Group 1 Attend

Group 2 Not attend

1.5.2.6 Environment and Sanitation

Household condition: This is considered in terms of the insect breeding places around the house and animal raising or livestock in or near the house. It is further divided into two groups as hygienic and unhygienic

Area surrounding the house - Hygienic (absence of insect breeding place)

- Unhygienic (presence of insect breeding place)

Animal raising or livestock -Hygienic (yes)

-Unhygienic (No)

Water resources: Water resources for drinking and other purposes are divided again into two groups as hygienic and unhygienic

Drinking water

Hygienic: from deep well, tube well, filtered or boiled water

Unhygienic: from shallow well or rain water

Water for other use

Hygienic: from deep well, tap water, tube well

Unhygienic: from shallow well or rain water

Waste disposal:

Human - Use and condition of the latrine is taken as Hygienic and Unhygienic

- Use of latrine by Family members

Hygienic - All family members use the latrine

Unhygienic - Every member do not use the latrine

- Condition of the latrine

Hygienic - Clean having no unpleasant odor with good ventilation

Unhygienic - Not clean having unpleasant odor

Solid- Solid waste or garbage collection present and maintained, or not

Garbage collection

Hygienic - Garbage collection maintained on regular basis

Unhygienic - No collection or not maintained

Water - Presence or absence of drainage system and its functioning condition

- Drainage

Hygienic - Presence of drainage

Unhygienic - Absence of drainage

- Drainage condition

Hygienic - Waste flowing freely and no foul smell

Unhygienic - Waste not flowing freely with foul smell

1.6 Usefulness of the study

The findings of this study will assist the District Health Office, Lalitpur, and the Child Health Division, Nepal, to understand the factors related to the prevention of diarrhea and the barriers to controlling diarrheal disease in the community. Programs like simple hand washing can give an useful information for policy makers, program managers, decision makers and private practioners and make a practical contribution to the reduction of diarrhea mortality and morbidity in children under-five years of age in Nepal.

1.7 Limitation of the study

This study was conducted in Nepal, as we have high child mortality and prevalence of diarrhea in under-five children. It was carried out in an urban area and by socioeconomic status index, where the wealth quintile as shown by residence and regions, an overwhelming majority of the population residing in urban areas is from the richest quintile. The cause of Malnutrition is multi-factorial and diarrhea could be one of the causes of malnutrition or vice versa. With regard to the feeding practices of the children, it has been found that male children, children in urban areas, children with mothers with some secondary or higher education, and children in the highest wealth quintile are more likely to be fed according to the Infant and Young Child Feeding (IYCF) recommendations from Nepal than other children. While studying the nutrition status of children, it has been found that children of mothers with higher education levels and those living in households in the highest wealth quintile are least likely to be under weight (NDHS 2006). Considering all the above facts, researcher did not try to determine the association with malnutrition.

This study was carried out in a short period of time during winter season in pre-primary schools located in an urban area of Kathmandu Valley. The incidence of diarrhea in Nepal has two peaks the winter season (December to February), has mostly viral diarrhea, and during the summer (June to August), has mostly bacterial diarrhea.

Because, therefore, the incidence of diarrhea is seasonal, its findings cannot be generalized to the whole year. The observation of environment and sanitation conditions were completed from information provided by the caretakers and the severity of diarrhea were not observed or assessed in this study. Further study, therefore, in the community may be desirable to overcome these limitations.

1.8 Hypothesis

There is an association between the socio-demographic factors, behavioural practices, child factors, environmental sanitation, and occurrence of diarrhea in under-five children.

CHAPTER II
LITERATURE REVIEW

2.1 Theoretical Model

Natural History of Disease

Human disease results from a complex interaction between a host (person), an agent (cause of the disease) and the environment. The term natural history of the disease signifies the way in which a disease evolves overtime from the earliest stage of its pre-pathogenesis phase (subclinical) to its termination as recovery, or disability or death, in the absence of prevention or treatment. Each disease has its own unique natural history, which is not necessarily the same in all individuals.

The causative factors of disease can be classified as Agent, Host and Environment and, according to the diagram it is the product of an interaction between the human host, an infectious or other type of agent, and the environment that promotes exposure.

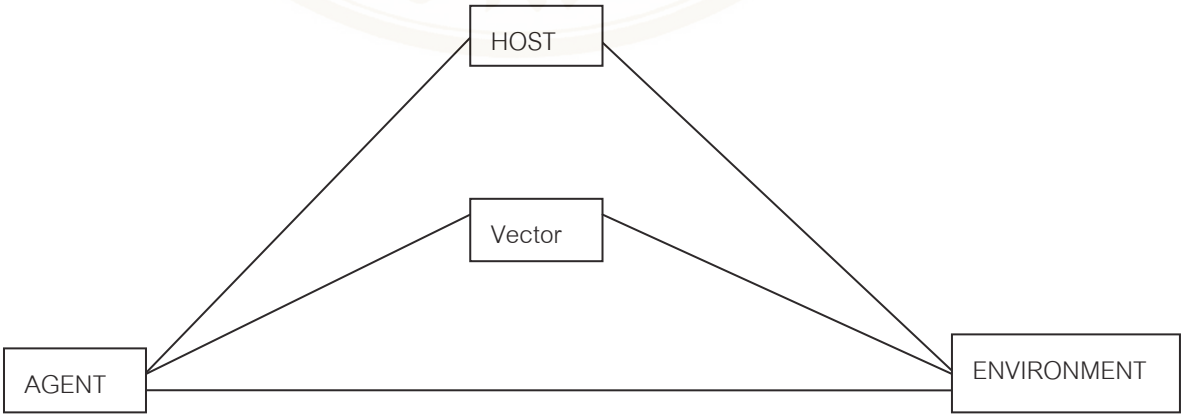

Figure 2.1 The Epidemiological Triad of a Disease

The disease “agent” is defined as a substance living or non-living or a force, the excessive presence or relative lack of which may initiate a disease process. A disease may have a single agent, a number of independent alternative agents or two or more factors whose combined presence is essential for the development of the disease. The agent can be biological, nutrient, chemical, mechanical, absence or insufficiency or excess of a factor necessary for health and social agents.

Human host factor (Intrinsic) is referred to as “Soil” and the disease agent as “Seed”. In some situations the host factors play a major role in determining the outcome of an individual’s exposure to infection (eg. Tuberculosis)

Environmental factor (Extrinsic) - The study of the disease is really the study of man and his environment. Millions of people are affected by preventable diseases originating in the environment in which they live. The macro-environment is defined as external to the individual human host, living and non-living, and with which he is in constant interaction which includes man’s external surroundings such as air, water, food and housing etc. The environment can be physical, biological and psychosocial which can all be inter-related (14, 15).

This study will use the concept of the epidemiologic triad of disease model, an integrated approach which explains diarrheal disease occurrence as a product of the interaction between the human host, infectious or other types of agent and the environment that promotes the exposure. Agents are behavioural factors as: knowledge, attitude and practice regarding diarrheal diseases, especially drinking safe water, eating safe food, sanitary disposal of faeces and washing hands appropriately. Host susceptibility, in this study the child, is determined by a variety of factors including age, gender, birth weight, immunization and breastfeeding status. Environment in this study refers to all external conditions which influence those factors as mentioned above in under-five children. Enabling environment factors include: good housing conditions, accessibility to good water resources, and good management of human, solid and water waste.

2.2 Information about Diarrhea

2.2.1 Definition

It is the passing of liquid or watery stools, more than three times in a 24 hours period (WHO 1998) although recent changes in consistency of the stool is more important than the frequency. Mother can explain well about the changes in the consistency of stool in under-five children.

There are three types of Diarrhea

Acute diarrhea- Watery stools lasting for few days like in cholera or viral diarrhea. It will be associated with vomiting and fever more common below 1 yr in rota virus diarrhea and profuse watery loose stools with vomiting in Cholera with severe dehydration observed in a short time.

Chronic or Persistent diarrhea- Watery stools lasting for 14 days or more, like in infectious origin or transient enzyme deficiency stage or other rare disorder like inflammatory bowel disease or irritable bowel syndrome

Dysentery - Characterized by the presence of blood or pus in the stool and associated with abdominal cramps and fever and passing stools frequently in small amount with tenesmus (intestinal spasm)

2.2.2 Symptoms

Symptoms of diarrhea are because of the dehydration due to loss of water and electrolytes from the body. WHO IMCI strategy describes the three types and advises how each type should be managed as mentioned below;

No dehydration - Not enough signs to classify as some or severe dehydration. Plenty of home fluids given, danger signs explained and asked to go to health facility if symptoms increases, passes blood in stool, not able to feed or fever develops and followed in 5 days. Treat as Plan A of the chart (supplied in the health facility and given in the participant's module).

Some Dehydration- Restless and irritable with sunken eyes and skin pinch goes back slowly. Two of those signs will suffice to signify some dehydration. ORS is given

within 4 hrs as calculated amount in 75ml / kg then reassessed (Plan B) and repeated if still persists otherwise treat as Plan A

Severe dehydration- Lethargy or unconsciousness with sunken eyes and skin pinch goes back very slowly. Two of those signs will be labelled as severe dehydration. Intra- venous (IV) fluids with antibiotics (suspecting infective serious causes) are given and referred urgently to the hospital, as IMCI strategy works at the Health facility or OPD level of the hospital (6).

2.2.3 Physiological basis of dehydration

About 60% of a child's body weight contains fluid in two compartments known as extracellular fluid (ECF) and intracellular fluid (ICF). The ECF includes circulating blood, interstitial fluid and secretions. Diarrheal losses initially come from the ECF so the replacement fluid should be of similar composition like sodium and low potassium. As ECF losses increase blood volume is reduced, the pulse becomes thready, blood pressure falls and the different signs described above starts appearing. Diarrheal stools in children contain large amounts of potassium and leads to distension of the abdomen especially in malnourished children.

Diarrhea can lead to either death or malnutrition if not managed properly in time. Dehydration is the most common cause of death from diarrhea and a significant number of deaths occur as a result of malnutrition. So this generates a vicious cycle of "Diarrhea - Malnutrition" leading to Death.

Darrhea ↔ Malnutrition

2.2.4 Causative Agent

The causative agent can be found in acute diarrhea in 70-80 % of cases in a sophisticated laboratory now. Rota virus and E.Coli (Enterotoxigenic) causes diarrhea among children in 50% of the total cases in India. Cholera 5-10%, ETEC enterotoxin producing causes 20% and shigella and salmonella are isolated in 3-7 % of childhood diarrheas (6).

A prospective epidemiological and clinical study of acute diarrhea in children under 5 years old was done at King Mongkut Prachomklao Hospital, Phetchaburi, Thailand. Out of 105 cases of acute diarrhea patients admitted to the Pediatric ward 76% of them were in the younger age group (> 1 month-2 years old) while 23.8 % were in the older age group (2-5 years old). Causative pathogens were identified in 64 patients (61%). Younger patients had a higher percentage of identifiable pathogens (66.7%) than older patients (44.4%). Rotavirus was the most common pathogen isolated (17.2%). The other common pathogens identified were Eschericia coli (14.1%), Campylobacter jejuni (14.1%), Shigella (12.5%), Entamoeba histolytica (7.8%) and Salmonella (3.1%). Mixed infections were reported in 31.3 per cent of these patients. Clinical presentations and stool characteristics were difficult to distinguish from most of the pathogens. However, Rotavirus was highly suspected if a younger child presented with fever, watery to loose stool with the predominant symptom of vomiting. Mucous, mucous-bloody stool gave a clue to the diagnosis of Shigella and Entamoeba histolytica (16).

2.3 Risk factors associated with diarrhea

2.3.1 Socio-demographic factors

In Jordan, maternal age but not paternal age, was significantly correlated with acute diarrhea morbidity. Acute diarrhea was more likely to occur among children of younger mothers, less than 25 yrs, perhaps because of their inexperience with child care. Paternal age may have been less important, because fathers are less likely to be involved in child care (17).

A study of diarrhea preventive behaviour of mothers with children aged 2-5 yrs old at Sao Mai School Cau Giay District, Vietnam, showed a strong relationship between socio-demographic factors and maternal diarrhea preventive behaviour. 75% mothers over 40 years of age, 63.6 % mothers with Bachelor’s degree, mother with a family income ranging from US $ 300-499, and mothers with one child in the family had good preventive behaviour (18).

Study on the factors associated with incidence of diarrheal disease in under-five children in Khon Kaen province, Thailand, showed an association between household income and the incidence of diarrhea but no significant association between education and occupation (19). Another study demonstrated an association between household income, occupation and diarrheal disease occurrence among under-five children, but no association between education of caretaker and diarrhea (20).

In a study of screening for faecal contamination in primary schools in Crete, Greece parental education and faecal contamination of children's hands were correlated. Faecal streptococci were found on 52.9% of children's hands and on 16.7% of other surfaces of the school. Children, who had parents with the higher education level (>12 yrs) had the lowest percentage (48.8%) of faecal contamination on their hands (21).

2.3.2 Behavioural practice of caretakers

Cognitive learning results from awareness and produces knowledge. An increase in knowledge doesn't always cause behavioural or organizational change, but positive associations between changes in these variables (knowledge, awareness, behaviour) have been found in many studies of educational research. A threshold of knowledge may need to be met for some action to occur, such as recognizing a symptom as abnormal before seeking a medical check up. However after that amount of knowledge is attained, additional information will not necessarily promote additional behaviour change. Specific knowledge requirements for a person or members of a particular demographic group to carry out an intended behaviour can often be identified through simple logic. Cognitive learning also accumulates as experience, which produces beliefs, which combine over time to produce values, which in turn produce attitudes. Before people act, they need to know why they should act, what actions are needed, when or under what circumstances, how to do it and where. For example some essential informational components of diarrhea education include:

1. How to recognize diarrhea symptoms and their severity
2. When to give ORS and how to prepare ORS

3. What foods and medicines should be avoided, and what complications can occur
4. How to prevent a recurrence of diarrhea and stay healthy

The figure below explains the development of predisposing factors and shows the interaction of experience with learning in natural human history and with beliefs, values, attitudes and behaviour in personal histories (22).

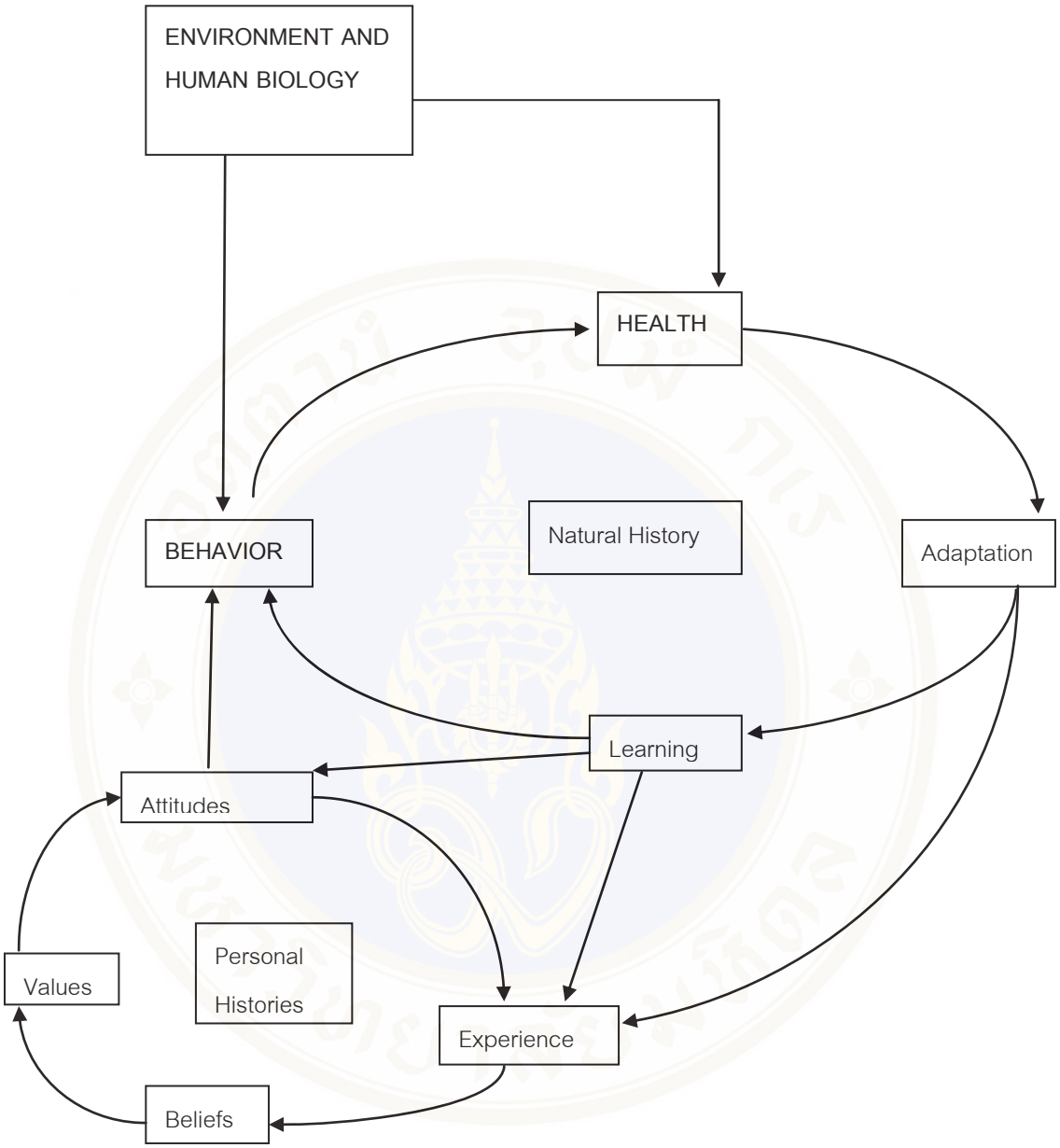

Figure 2.2 Interaction of experience with learning in natural human and personal histories

Sources : Adapted from "Community and Population Health, by L.W.Green and J.M.Ottoson,1999, New York

The behavioural practice of a caretaker in a study explaining a social marketing approach used both qualitative and quantitative methods to develop a hygiene behaviour intervention in rural north–east of Thailand (Khon Kaen Province).

Behaviours were preselected from a previous study and the intervention was designed to promote hand washing, especially before feeding a baby, cooking, eating and after defecation or cleaning a baby's bottom, and dish washing immediately after eating. A bacteriological indicator (enumerating faecal streptococci using a finger impression technique) was developed to measure changes in hand washing behaviour and observation (spot checks) of dirty dishes to indicate dish washing practice. There was a significant improvement in both behaviours and a significant reduction in diarrheal disease (39%) found as a result of the intervention (23).

A review article explains that, improving domestic hygienic practices is potentially one of the most effective means of reducing the global burden of diarrheal diseases in children. If hygiene promotion is to succeed, only those few hygiene practices needs to be identified and targeted which are the major source of risk in any setting. Hence **safe stool disposal,** a primary barrier to transmission, may be more important than hand washing before eating. So it is reviewed for the epidemiological evidence of the primary and secondary barrier behaviour and suggests giving more attention to the previous one.

Diarrheal diseases are responsible for over a quarter of the deaths of children in the world today (WHO 1996). Most of the 3.3 million deaths each year (Bern et al 1992) take place in developing countries, and are entirely preventable because most frequently transmission occurs in the domestic domain where a child lives and it can be prevented by changes in domestic hygiene behaviour. The figure below explains that the simplest option for a pathogen is to emit infective material into the environment in faeces in the hope that it will be ingested by a new human host (Figure 4). Examples of Enteric pathogens for which man is the principal reservoir, and whose transmissions mostly originate from human faeces are Entamoeba histolytica and viruses such as rotavirus, adenovirus and astroviruses. While viruses cannot multiply in the environment and may rapidly lose viability in warm conditions but some may have a chances to reach a new host.

a) Human to human via the environment

Figure 2.3 Transmission of disease from human to human via the environment

b) Human to human multiplying in the environment

Figure 2.4 Transmission of disease human to human multiplying in environment

Unlike viruses, some bacteria can multiply in the environment especially when nutrients and warmth are available like the food which has been kept at ambient temperature (Rowland 1985)

c) Human to animal to human via the environment

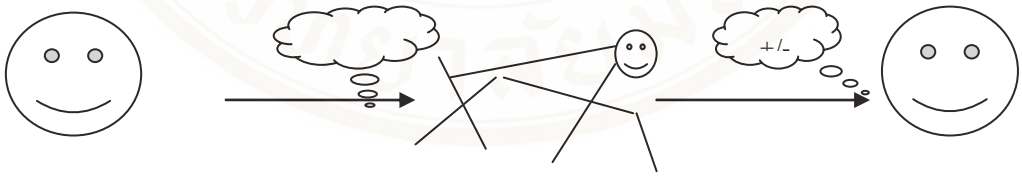

Figure 2.5 Transmission of disease human to animal to human via environment

d) Animal to human via the environment

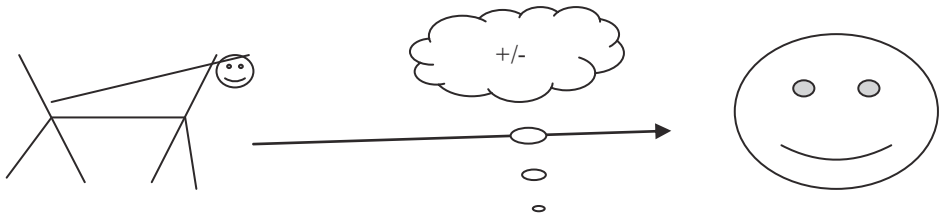

Figure 2.6 Transmission of disease from animal to human via environment

So most of the pathogens have to pass through the environment. The F-diagram of Wagner and Lanoix (1958) in figure 8 shows the routes that fecal pathogens take through the environment to reach a new host.

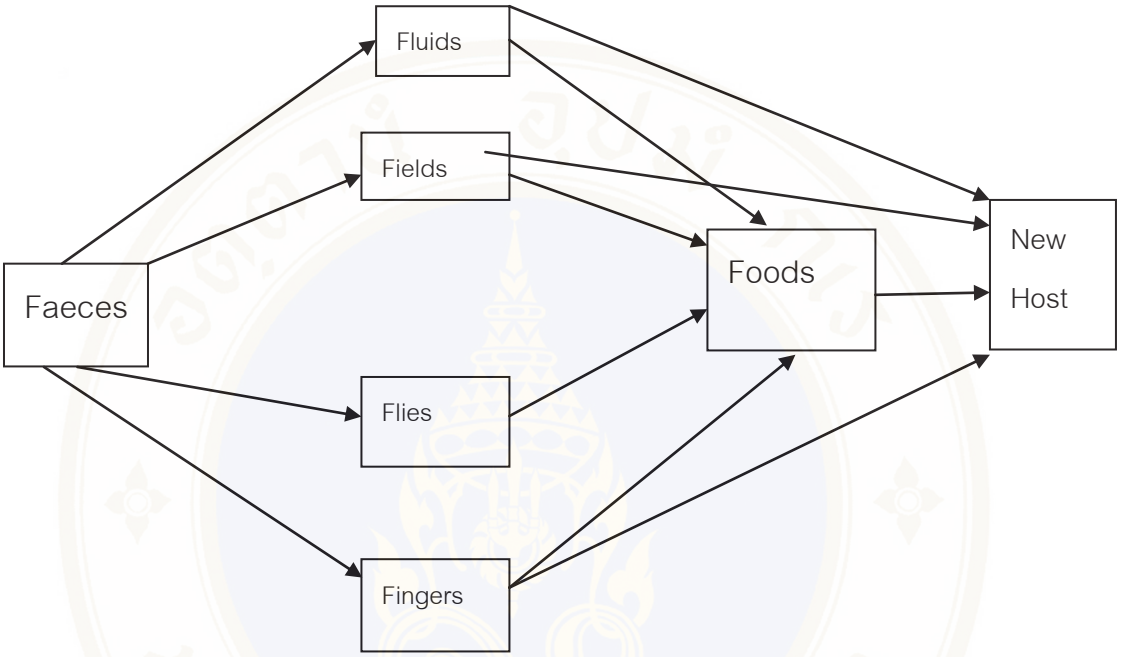

Figure 2.7 F-Diagram of Wagner and Lanoix (1958)

Once excreted, most of the pathogen progeny usually die but some may get into fingers, into food or fluids, and some of these may reach new hosts. Flies landing on excreta can carry pathogens to foods or surfaces that are used for food preparation or eating. All of the transmission routes shown in the F-diagram can be blocked by changes in the domestic hygiene practice called a **Primary barrier**. So the F-diagram shows food as possible link in the chain of transmission of diarrheal pathogens from stool to new host. Potential intervention to break this chain includes the **Secondary barrier** , like hand washing before food preparation and handling, safe food storage, avoidance of contaminated foods, adequate cooking and reheating, cleaning kitchens, surfaces and utensils, and hand-washing before eating, and feeding children. It has been proved that simple hand washing can reduce the incidence of diarrhea by 89 % (Wilson et al, 1991, Indonesia). In conclusion it mentions that the human stool should be regarded as public enemy number one (24).

In a study of the impact of fly control on childhood diarrhea in Pakistan, it was found that during the fly seasons (March-June) of both 1995 and 1996, the use of insecticides practically eliminated the fly population in the treated villages. The incidence of diarrhea was lowered by 23 % in the sprayed villages compared with the unsprayed villages in both 1995 (mean episodes per child 6.3 vs 7.1) and in 1996 (4.4 vs 6.5). At other times, there was no evidence of difference in diarrhea morbity between sprayed and unsprayed villages (25).

In another study, the place of residence had an influence on the behavior and practice of mothers. The study compared the sick role behavior of mothers living inside and outside the municipality of Ubon, Ratchathani , Thiland, when their under-five children suffered from diarrhea. Results showed that mothers who lived inside the municipality area had a higher level of knowledge of perceived benefits, perceived barriers, treatment and care seeking behaviour and disease spreading preventive behaviour than those mothers living outside the municipality. The difference in occupation, knowledge and perceived barrier showed significant difference in maternal sick role (26).

In a study to investigate the contribution of poor case management and care-seeking behaviour to childhood deaths from acute respiratory infections (ARI) and diarrheal diseases in Mexico, late care seeking and /or poor case management contributed to 68% of deaths. The estimated care seeking alone was 32%, of case management alone 17% and both combined was 18% deaths. In 35% of all deaths the delay appeared to be due to lack of recognition of the severity of the disease. In 15% of deaths, mother recognized the severity of the disease but did not go to see the doctor because of other factors (27). Similarly, in Bolivia, almost 70% of mothers with sick infants sought attention outside the home but only 43% recognized the severity of the disease, and only one –third of the children seen by formal health services received appropriate care (28).

Despite progress in reducing morbidity and mortality through the use of oral rehydration salts (ORS) over the last 20 yrs, it is estimated that every year around

2.5 million under-five children die as a result of diarrheal diseases (Kosek, Ben and Guerrant, 2003; Murray and Lopez, 1997; UNICEF, 1991) (29). The introduction of oral rehydration therapy by WHO in 1971 has greatly simplified the treatment of cholera and acute diarrheal diseases. The aim of oral fluid is to prevent dehydration and reduce mortality. It is based on the observation that glucose given orally enhances the intestinal absorption of salt and water and is capable of correcting the electrolyte and water deficit in the body (13).

After long research, WHO and UNICEF have focused on reducing the osmolarity of ORS solution to avoid possible adverse effects of hypertonicity on net fluid absorption. Studies of this approach show that decreasing the sodium concentration of ORS solution to 75 meq/l, the glucose concentration to 75 mmol/l and the total osmolarity to 245 mosm/l improved the efficacy of ORS regimen for children with acute non-cholera diarrhea (30). Use of ORS in Nepal has increased from 26% in 1996 to 29% in 2006 but still is very less as compare to the diarrhea mortality and mortality (5).

A study of hand washing behaviour found that, four out of five women have used soap for any purpose and two third of them had used it to wash their hands. Hand washing is more common among the more educated and wealthier women. Thus 94% of women with secondary level school and 88% of wealthiest women washed their hands with soap compared to 48 % with no education and 38 % of poor women. Frequency of hand washing is also highest among educated and rich women. A study in Southern Nepal showed that Birth attendant and maternal hand washing with soap and water were associated with significant lower rates of neonatal mortality. The overall mortality rate of enrolled infant was 32.1/1000 live births. Birth attendants washed their hands prior to delivery for 59.2% of live births, whereas only 14.8% of mothers reported hand washing with soap and water or antiseptic prior to handling the baby. Neonatal mortality was significantly lower among infants whose birth attendant and / or mother washed their hands with soap with water or antiseptic. Newborns whose birth attendant washed their hands had 25% lower risk of death compared with

who did not wash. Infants whose mothers washed their hands prior to handling had 60% lower risk of death compared to mother who did not wash (31).

2.3.3 Child Factors

A study of rural children of Khon Kaen province of Thailand, revealed a significant difference of age group in diarrheal diseases occurrence. Diarrhea was more common in the 6-12 months and 12- 24 months age groups (32). Similarly, in Nepal the incidence of diarrhea was relatively more common in 6-11 months and 12-23 months age groups, presumably because babies are usually weaned off breast milk around that age and start consuming complimentary food. (NDHS 2006) It has also been found that diarrheal deaths most commonly occur in Mexican children in under 1 year of age residing in rural areas (33).

A study of the association of low birth weight with acute childhood diarrhea in an urban settlement of Papua New Guinea, demonstrated a significant association between low birth weight and diarrhea in children of less than 3 years of age (34).

Immunization for the prevention of communicable diseases like BCG, diphtheria, tetanus and Pertusis, oral polio are given together along with hepatitis B and completed along with measles vaccine within a year's duration. In Nepal overall 83 % of children aged 12-23 months were fully immunized and specifically BCG 93 %, DPT- 3 89%, Polio- 3 91 %, Measles 85 % were immunized (NDHS 2006). Here measles vaccine is especially considered because of its direct relation with morbidity and mortality of diarrhea.

Normally children with measles die because of complications like diarrhea, pneumonia and malnutrition. Effective prevention and treatment of measles could save 700,000 lives per year. Despite the major impact made on this disease by successful immunization programmes, 2000 deaths of young children still occur every day from measles often in association with diarrhea and pneumonia (35).

53% of children in Nepal are exclusively breastfed whereas in Thailand, the Multiple Indicator Cluster Survey (MICS) of women and children during 2005-2006 showed only 5% were exclusively breastfed (36). Infants under 2 months of age who are not breastfed are 25 times are more likely to die of diarrhea than infants exclusively breastfed. Continued breastfeeding during diarrhea reduces dehydration, severity, duration and nutritional consequences of diarrhea. Evidence shows that early initiation of breastfeeding can prevent 22% of all deaths among babies below one month in developing countries (37). It has been found that breastfeeding has a protective effect and provides specific protective elements including antibodies, lymphocytes and macrophage. Breastfed infants have shown sustained weight gain and improvement in growth at least during the first months of life thereby reducing the risk of severe diarrhea and death (38).

A study of risk factors in acute diarrhea mortality showed that out of 336 cases, 36.36 % were caused by acute diarrhea, of these 63.63 % were artificially fed and 36.36% were breast and artificially fed, and 7 cases died from the artificial feeding ones. Artificial feeding is a risk and increases mortality and morbidity in children (39). A study of the role of breastfeeding on the prevention of infant mortality found that any breastfeeding is associated with more than two–fold protection against infant mortality compared with no breastfeeding in the first year of life in developing countries (40). Further it has been found that infants who are not breast fed in first six months of life have a six –fold greater risk of mortality due to diarrhea and that 6-11 months age group had a 2 fold greater risk of mortality due to acute diarrhea (41).

In developing countries, children under three years old experience on average three episodes of diarrhea every year (3). Similarly in an evaluation of diarrheal diseases and acute respiratory infections control programmes in Delhi slum, found 1.69 episodes of diarrhea per child per year (55) and in a comparative study of incidence of diarrhea among children in two different environmental situations in Calcutta found 1.6 and 1.4 episodes of diarrhea per child per year respectively. Malnourished children and partially breastfed children had more episodes of diarrhea than the normal children (56).

2.3.4 Social support

This factor is indirectly associated to the prevention and management of diarrhea in under-five children as practiced by the caretaker. There are approximately 48,000 FCHVs working at the community level of the health system, the lowest level in Nepal. They cover about 300-1500 people in each ward which is the lowest unit of the Village Development Committee (9 wards in each VDC).Their main job is counseling and providing an immunization service at the out-reach clinics. They also supply family planning devices, Vitamin A with wormicidal drug distribution, ORS packets for diarrhea, and take part in National Immunization days (NIDs). They are very popular for their service in the community and before going to a health facility (government health clinic where preventive and curative services are provided) most of the sick people take advice from them especially in rural areas.

Most schools have a small clinic with a nurse and give first aid to the students when there is an emergency. They also provide ORS when there is diarrhea, and severe cases are referred to the nearest health facility.

Access to information through the media is essential to increasing people's knowledge and awareness of events occurring around them which may affect their perceptions and behavior. Mass media like radio is very popular at the community level, especially in remote areas. In those places where there is transportation and electricity, there is also television, newspapers and most of the health facilities have programs like prevention of disease and promotion of health like in diarrhea, ARI, HIV/AIDS and Family planning. In 1990 a slogan (delivered by radio) about "salt sugar solution" became very popular and people still use it although ORS packets are available everywhere.

Exposure to media was assessed in Nepal, by asking respondents whether they listened to a radio, watched television, or read a newspaper or magazine at least once a week. Media exposure is relatively high with men than women. 60.5% listen to the radio at least once a week, 38% watch television by even once a week, but only 10.3% read newspapers once a week. 30% of the population did not use any media at

least once a week (5). Getting health information from the mass media can improve the practice on management of diarrhea. In one study, it was found that mothers who received more information about management of acute diarrhea, were better at managing their children (42). Similarly, another study by Tomoko Hiruta in rural Ratchabury province, Thailand, found that most of the mothers got information about prevention of diarrhea from the mass media (93.50%) and from health personnel (91.34%) (43). In order to see how much the mothers or caretakers relied on mass media as a source of health information, it was found that 19.8% of them used as common source of information and it was perceived that those mothers took the child early for health care also (44).

2.3.5 Use of Service

This factor is also indirectly associated with the occurrence and early management of diarrhea as practiced by the caretaker. Care seeking behaviour is less in rural areas where people have lower education and are poorer. The situation is aggravated in Nepal by the geographical terrain of Nepal especially in regions where transport facilities are limited. People may have to walk carrying a sick person for a few days, sometimes only to find that the health service provider is absent. So in rural areas normally they go to the traditional healers, if there is a pharmacy nearby then take advice from him, which is also done even in urban areas. So now, at community level, training by the health authority regarding diarrhaea ARI, always involves traditional healers and the pharmacists. If the health facility is close then they go to take the service but it all depends on their belief in the health worker's behaviour and attitude to serve in the community.

In Nepal, only 27% of the under-five children with diarrhea were taken to a health provider (excludes pharmacy, shop and traditional healer) (NDHS 2006). In Thailand, in 1962, a study on the pattern of health service utilization was conducted and revealed that only 10% of the population coverage was served in disease prevention, health promotion and curative services by the government health units. Similarly in 1980 a cross-sectional study of health-care seeking behavior and cost of health-care services indicated that more than 60% of rural people treated themselves

by self-prescribing drugs from drug stores except for serious illnesses. Very few went to government hospitals or health centers due to lack of transportation and the high cost of services. Private clinics were found to be more popular with the people (34). In a study in and around Bangkok in 1992, in a question about seeking treatment for a child with diarrhea, 54.3 % of mothers agreed to look for medical advice if their child have diarrhea (44).

2.3.6 Environment and Sanitation

Overall child mortality declined significantly in the 1990s, but environmental hazards still persist for at least 3 million children under the age of 5 every year. Such young children make up roughly 10% of the world's population but comprise more than 40% of the population suffering from health problems related to the environment. Due to their size, physiology, and behavior, children are more vulnerable than adults to environmental hazards. Children are more heavily exposed to the toxins in proportion to their body weight and have more years of life ahead of them in which they may suffer long term effects from early exposure (45).

A study exploring the influence of sanitation and environmental factors on diarrheal diseases occurrence in the Samrong District Ubon Rachathani Province had found that the most influential factors associated with diarrhea were: house fly breeding places, waste water drainage and cattle excreta within the perimeter of the house. The moderating influencing factors were: personal hygiene, food sanitation, and water storage and handling practices (46).

A study was undertaken to assess the ability of a water container with a cover and a spout to prevent household contamination of water in a Malawian refugee camp. Water flowing from the source wells had little or no microbial contamination although the water collectors quickly contaminated the water, primarily through the contact with their hands. Analysis of the water sample demonstrated that there was a 69% reduction in the geometric mean of faecal coliform levels in household water and 31% less diarrheal disease in under-five children among the group using the improved bucket. Regression models examining diarrhea among under-five year olds, confirmed

the protective effect of the bucket and found that visible faces in the family latrine and the presence of animals were significantly associated with a higher incidence of diarrhea in children (47).

A case control study carried out to find out the association between several social and environmental variables and the deaths of children due to infectious disease like diarrhea, ARI, measles and others. Significant associations also observed between i) sources of drinking water and deaths due to ARI and diarrhea ii) conditions of latrines and deaths due to diarrheal diseases after controlling for confounding variables. This study confirms the importance of improved water, sanitation and hygiene practices in the child survival program irrespective of breastfeeding, immunization and selected social variables. Water that is free of pathogenic agents at the source may become contaminated with fecal matter in the private domain as it is carried home, stored and used. For example the bacteriological count of fecal coliform present in tube well water at the source was about 11 colony counts /100ml of water but the drinking water storage container contained 175 fecal coliform colony/100ml (48). Indiscriminate defecation near the home or village, was found to be associated with an increased incidence of diarrhea observed as 64 % increase in pathogen positive diarrhea in the families (Stanton and Clemens 1987; Han &Moe 1990), Baltazar and Solon (1989)

In one study done in Kathmandu, Nepal, to see the risk factors for diarrheal diseases among pre-school children and their mothers, found some maternal education is related only to direct care of the child and hygienic practices of the mother. Education was not significantly related to diarrheal incidence but there was association between maternal and paternal education and household income and the behavioral risk variables. All three of the socioeconomic variables were related to dirtiness of the child and whether the child put dirt by putting fingers in his mouth (49).

A city-wide sanitation intervention was started in Salvador, Brazil, in 1997 to improve sewerage coverage from 26% of households to 80%. Its epidemiological

effect in diarrhea morbidity in less than 3 years old children were studied before and after the program. Diarrhea prevalence fell by 21% from 9.2 days per child – year before the intervention to 7.3 days per child-year afterwards. After adjustment for baseline sewerage coverage and potential confounding variables, the estimated overall prevalence reduction was 22% (50).

2.4 Summary

In previous studies, different risk factors of diarrhea in under-five children have been studied. This study, in addition to the factors affecting the prevention of diarrheal disease in under-five children, tries to ascertain the caretakers' knowledge and practice regarding health care seeking behaviour when their children have diarrhea. By knowing about the danger signs of diarrhea, the severity and death due to diarrhea is prevented. Measles immunization status of the child will make it clear that measles complication with diarrhea will be less even if measles occurs. Uses of the service from the different types of service providers make them understand where exactly to go for the early management of diarrhea especially in future episodes. Similarly social support received from the local service providers in the community will give an idea about how far they are taking advantage from the service provided at their nearby place.

CHAPTER III
RESEARCH METHODOLOGY

3.1 Study design

This is a cross-sectional study to identify the factors related to the occurrence of diarrheal disease in pre-school children under the age of 5 years in schools in the Lalitpur District of Nepal.

3.2 Study area and population

Lalitpur district lies in the south-east of the Kathmandu district and it is one of the three districts of the Kathmandu valley (Kathmandu, Lalitpur and Bhaktpur). Its population in 2006 was 4,01,958 with the children under-five years were 40,200.This district has one sub-metropolitan city, 3 constitutional area, 13 Ilaka and 41 VDC (village development committee). The district, being a sub-metropolitan city, it has many places where there are no roads and electricity. This is a Community Based IMCI district (CB-IMCI) and incidence of diarrhea was 524/1000 in 2009 (Source: Brouchre Lalitpur District Health Information).Their Immunization coverage for measles was 91% in the district. This study was carried out using cluster sampling method in two pre-primary schools out of the 13 pre-primary private schools in the Lalitpur District of Nepal, where caretakers or mothers bring their children to attend the school as a play-group class.

3.2.1 Inclusion Criteria

1. Caretakers or mothers aged more than 18 yrs or
2. Mothers having a child below 5 yrs of age and
3. They were willing to participate in the study

3.2.2 Exclusion criteria

1. Children aged 5 yrs and over
2. Mothers not willing to participate in the study
3. Having diarrhea epidemics at the time of study

3.3 Sample Size

$$n = \frac{z^2 p(1-p)}{E^2}$$

n = sample size

Z = standard normal score at 95% of confidence interval = 1.96

E = allowance for error = 0.05

p = It is the prevalence of diarrhea among children under five years old in Nepal in 2006. (5 p167) = 0.12

$$n = \frac{1.96^2 (0.12)(1-0.12)}{0.05^2}$$

n = 162

The researcher increased the sample size by 10% to ensure that sample size was sufficient for the study if any missing or incomplete data occured. Thus, the required sample size was at least 179.

3.4 Sampling Techniques

Two schools were selected from thirteen pre-primary schools by cluster sampling, as all pre-primary schools located in Lalitpur, are in same geographical area, similar environment with same water and sanitation facilities; therefore cluster sampling were employed. Name of the selected schools are:

1. Navjeevan English Secondary School, Bagdole, Lalitpur

2. Adarsha Vidya Mandir Higher Secondary School, Manbhawan, Lalitpur

Mothers or caretakers came to schools to reach or pick up their children in the play group class were interviewed if they met the inclusion criteria and it was continued until the sample size of 179 was achieved.

3.5 Research Instrument

The research instrument was a structured questionnaire in English and which was later translated into the Nepali language. Generally the questions were of closed ended type.

The Questions were divided into six parts:

Part 1 : Socio-demographic factors of caretakers

Seven Questions (Q 1-7) Questions related to **socio-demographic factors** like age, gender, relation to the child, education, occupation, household income and time given for Child care

Part 2 : **Behavioural Practice of Caretaker**

Twenty Questions (Q1-20) regarding **knowledge** of the caretakers meaning "yes" or" No" answers. Similarly regarding **attitudes** of the caretakers to diarrhea there were 10 questions (Q1-10) and all were answered by a different scoring system. Regarding **practice** of caretakers during childhood diarrhea there were sixteen multiple choice questions (Q1-16). Questions regarding knowledge, attitude and practice were related to the recognizing danger signs and their management, breastfeeding, meaning of diarrhea and dehydration, hand washing, food

preparation, feeding, use of ORS and disposal of children's stools. Questions on knowledge and attitude are categorized into diagnosis, causes, prevention and others type based on diarrhea in the result part. So the question numbers in the result do not correlate with the questionnaire.

Part 3 : Child Factors

Seven child factor questions (Q1-7) with answer as "Yes" or "No" related to the Age of the child, diarrhea occurrence, measles immunization status, birth weight , episodes of diarrhea and breastfeeding status

Part 4 : Social Support

Social support includes three questions (Q 1-3) answered " Yes" or " No" about the support received from Female Community Health Volunteer (FCHV), school and mass media during diarrhea.

Part 5 : Use of Service during diarrhea

Use of service by the caretaker had four questionnaires (Q1-4) answers by "Yes" or "No" regarding the use of the service from the health facility or from traditional healers or from nearby pharmacists or medical shops .

Part 6 : Environment and Sanitation

Environment and Sanitation had twelve multiple choice questions (Q1-12) about household condition, and management of water resources, solid waste and water waste. They are labeled as "hygienic" for the correct answer and "unhygienic" for the wrong answer.

Scoring System

Knowledge:

Scoring given for correct answer "Yes" as 1 and not correct "No" as 0. Knowledge was classified into three categories; measured as good (> 80 %), fair (60% - 80%) and poor (< 60%). Total maximum score 20 points, Good (>16), Fair (12-16) and Poor (<12) respectively. Correct answers in "Yes" are: 5, 9, 11, 12, 13, 14, 16, 17, 18, 19 and 20. Respondents who marked "No" to the above questions were Incorrect. Similarly rest of the numbers is correct if the respondents put tick the "No" column and incorrect if they tick the "Yes" column. The range of scores could be 0 to 20. So while categorizing, the knowledge part has six questions about diagnosis of diarrhea like "diarrhea is the passing of watery stools one time in a day with/without vomiting", eight for prevention part like "giving ORS in a child with diarrhea can prevent dehydration", three for causes of diarrhea like "diarrhea is normal for a child's growth and development" and three are for other causes.

Attitude:

Scoring for the statements, Likert's scales of scoring was used like 5, 4, 3, 2, 1 as strongly agree, agree, neutral, disagree and strongly disagree. The scoring was reversed for negative statements. The total scores was categorized into two groups as "positive attitude" (>75^{th} percentiles of the total score) and "negative attitude" (≤ 75^{th} percentiles of the total score). Positive statements were no. 2, 5, 8 and 9. Range of score will be 10 to 50. While categorizing in different headings, it has one question regarding diagnosis like "diarrheal disease can be transmitted not only to the other family members but also to the community as well", two questions for causes of diarrhea like "children who eat uncooked food, and drink unclean water can get diarrhea", six questions for prevention part like "diarrhea in children is not preventable", and one for other parts like "children under-five years of age with diarrhea can die from severe diarrhea, more than the adults".

Practice:

Three items questions (Q3, Q6, and Q10) with choices; every time, often, sometimes and never were scored as 3, 2, 1 and 0 respectively for good practice. One

item (Q8) with the choice; always, sometimes and never were given score of 2, 1 and 0 respectively for good practice. In Q-12, only one point score was given if the respondent gives any of three choices (#3) and Zero score for others, Q 13 was given one point score for (#1, #4) and for Q- 16 one point was given if answers (#1, #2 and #4). Similarly in Q-14, only one point score was given to those respondents with answers any of their choices (#1, and #4). In four questions (#4, #7, #9 and #11) choices no #1 and #2 (washing with water alone and washing with soap and water respectively) was given 0 and 1 point respectively for good practices. Rest of the items had multiple choice questions requiring only one answer and for correct answer, score one point was given. The practice of caretaker was classified into three categories; good (> 80%), moderate (60%-80%) and poor (<60%) of the total maximum score (24 points). So the range of score 0 to 24. While categorizing in different headings, it had five questions for knowledge part like "when are you taking to health provider", nine questions for practice part like 'how often do you practice hand washing" and three for prevention part like "what you do when your child passes stool"

3.6 Validity and reliability

Questionnaires were prepared based on reference books and research articles and revised according to the recommendations of the technical experts on research (51). After getting permission from the ethics committee Mahidol University Institutional Review Board MU-IRB (COA. No. MU-IRB 2009/292.2611), the questionnaire was translated into Nepali language. The questionnaires were pre-tested for reliability by selecting 30 caretakers from Pumori Primary School, Manbhawan, Lalitpur, before starting the actual data collection. Its reliability was measured by using Kuder-Richardson (KR20) for the knowledge part and Cronbach's Alpha for the attitude part .The result of pre-test on KR20 and Cronbach's alpha was unsatisfactory, so with technical expert's approval a few questions in the knowledge and attitude parts were changed or modified. Because of the extreme cold season children were in vacation (January 1-25, 2010) so by considering the situation recalculation of KR20

and Cronbach's Alpha was advised to do after the full data collection by the technical expert, and to start actual collection of data was approved. After that with the full data KR20 of the knowledge part was 0.70 and Cronbach's Alpha of the attitude part was 0.69.

3.7 Data Collection

Courtesy calls were made upon the, Navjeevan English Secondary School, Bagdole, Lalitpur and Adarsha Vidya Mandir Higher Secondary School, Manbhawan, Lalitpur. In both the places the principal and coordinating staff of the school were met separately to briefly explain the activity of data collection, caretakers of under-five children were informed about the activity by the respective school and a date was agreed to commence the data collection to suit the convenience of the school and caretakers. Four staffs were recruited to collect the data. They were trained for half a day and they were told about the purpose of data collection, how to do it, what to do if problems arose, and they also were requested to be very polite to the mothers or caretakers while answering the questionnaires. Data collection was started after giving "Participant's information sheet" and taking the "Written consent" from each caretaker, which was returned to the interviewer after completing the interview. So the data were collected by trained interviewers via face-to- face interviews by using a structured questionnaire. Interview times were arranged according to the convenience of the mothers/caretakers and school, and it took about 15-20 minutes for one set of questionnaire to complete.

3.8 Statistical Analysis

The collected questionnaires were checked for completeness and mistakes every day, and all the data were entered by using the EpiData 3.0 program. Each item was coded and checked for consistency of coding in all the questionnaire forms by

using a coding table. Then again checked and edited consistency of data in all variables and data analysis started by using the Minitab software program.

Three types of analysis were used:

Part I

Univariate Analysis – It was used to describe the frequency distribution, median, mean and standard deviation, maximum and minimum values of each independent and dependent variable.

Part II

Bivariate Analysis, Correlation Analysis was used to determine a relationship between two quantitative variables. Chi-square test was used to determine an association between the two qualitative variables.

Part III

Multivariate Analysis – The association between the independent variables and occurrence of diarrhea in under-five children of the study were determined by multiple logistic regressions.

CHAPTER IV
RESEARCH RESULTS

This cross sectional study was conducted to describe the preventive factors relating to the occurrence of diarrheal diseases in under-five children of Lalitpur district of Kathmandu, Nepal. A sample of 179 caretakers of under-five children was selected, of which 70 were from the Adarsha Vidya Mandir Higher Secondary School, Manbhawan, Lalitpur, and 109 were from the Navjeevan English Secondary School, Bagdole, Lalitpur. Face to face interviews were carried out for data collection by four personnel specially trained for this study. Interviews went smoothly without any problem in both schools. The analysis was conducted and the results are presented in seven parts.

4.1 Socio-demographic characteristics of caretakers

4.2 Behavioural practice of caretakers

- 4.2.1 Knowledge of diarrhea in under-five children
- 4.2.2 Attitude towards diarrhea in under-five children
- 4.2.3 Practice regarding diarrhea in under-five children

4.3 Child factors and the occurrence of diarrhea

4.4 Environmental and sanitation factors related to diarrhea in under-five children

4.5 Social support and use of service during diarrhea

4.6 Relationship between the occurrence of diarrhea and the study factors

- 4.6.1 Relationship between socio-demographic factors and diarrhea occurrences
- 4.6.2 Relationship between knowledge of caretakers and diarrhea occurrences
- 4.6.3 Relationship between attitude of caretakers and diarrhea occurrence
- 4.6.4 Relationship between practices of caretakers and diarrhea occurrencs

4.6.5 Relationship between child factors and diarrhea occurrence

4.6.6 Relationship between environmental and sanitation factors and diarrhea occurrence

4.6.7 Relation between all predictors and diarrheal disease occurrence

4.7 Relationship between social support, use of service and caretaker's behaviour

4.1 Socio-demographic characteristics of caretakers

The socio-demographic characteristics of caretakers included their age, gender, relation to the child, education, occupation, family income and time given during daytime for the child care. A majority (55.31%) of the caretakers were of over 30 yrs of age. The median age was 30 with quartile deviation (QD) as 5 with minimum age of 20 yrs and maximum of 61 yrs.

As shown in Table 4.1, a majority (78.77%) of the caretakers were female. Most (72.63%) of them were mothers accompanying their children to school. Most (46.93%) of the respondents were secondary and higher secondary school educated, a few had not attended the school and majority had only primary education (36.31%). Only (16.76%) completed Bachelor level and above.

Most (45.81%) of the respondents earned their living by agriculture and looking after the houses and children as house- wives. Those who worked in private or government offices as service worker were quite in higher side (40.22%) compared to the self employed (13.97%). Larger number (39.11%) belonged to the low income group, middle and high income group at each level represents less than one third.

Table 4.1 Number and percentage of respondents classified by socio – demographic factors (n=179)

Socio-demographic factors	Number	Percentage
Age of Respondents (yrs)		
< 30	80	44.69
≥ 30	99	**55.31**
Median =30.00 QD = 5	Mean=32.26	Min=20 Max= 61
Gender		
Female	141	**78.77**
Male	38	21.23
Relation		
Mother	130	**72.63**
Others	49	27.37
Education		
Primary or less (≤ 6)	65	36.31
Secondary and Higher (7-12)	84	**46.93**
Bachelor and above	30	16.76
Occupation		
House wife	82	**45.81**
Service worker	72	40.22
Self employed	25	13.97

Table 4.1 Number and percentage of respondents classified by socio-demographic factors cont. (n=179)

Socio-demographic factors	Number	Percentage
Family Income (US $)		
< 150	70	**39.11**
150-250	54	30.17
>250	55	30.73
Time given for child care		
< 8 Hrs	14	7.82
8-15 Hrs	93	**51.96**
> 16 hrs	73	40.22

The majority of the caretakers (51.96%) spent 8-15 hrs to take care of their children. More than 16 hrs care was given to the child by quite a large number of respondents (40.22%) , which can be correlated with house wife (45.81%) giving such time.

4.2 Behavioural practice of caretakers

4.2.1 Knowledge on diarrhea in under-five children

In order to examine the respondents' knowledge about children's diarrhea, that is knowledge about diagnosis, causes and prevention of diarrhea, the questions were differentiated into the groups, as shown in Table 4.2. They were asked twenty questions. Eleven items were of positive statement and nine items were negative ones. According to the percentage distribution with **more than 60% correct answers** were, item 11 (68.71%) "Giving ORS in a child with diarrhea can prevent dehydration", item 13 (89.38%) "It is better to increase home fluids, once the child starts having diarrhea at home",

Table 4.2 Number and percentage distribution of respondents with correct answers by knowledge item (n=179)

Items	Correct answers	
	Number	**Percentage**
Diagnosis of diarrhea		
1 Diarrhea is the passing of watery stools one time in a day with/without vomiting	119	66.48
2 Dehydration is the leading cause of death in children with diarrhea	94	52.51
3 Five or more watery stools without sunken eyes is severe diarrhea	83	46.36
4 A child having diarrhea, and feeling thirsty and having sunken eyes, is normal	124	69.27
5 During diarrhea drugs should be given instead of ORS	87	48.60
6 A child with diarrhea, who cannot breastfeed or take fluid, should be taken to a health service provider	157	87.70
Causes of Diarrhea		
7 Eating foods left uncovered for hours can cause diarrhea	148	**82.68**
8 Diarrhea can occur if hand washing not done before feeding the child every time	160	**89.38**
9 Frequent diarrhea may cause malnutrition	80	44.69

Table 4.2 Number and percentage distribution of respondents with correct answers by knowledge item cont. (n=179)

Items	Correct answers	
	Number	**Percentage**
Prevention of diarrhea		
10 If there is vomiting after giving ORS, medicine should be given to stop vomiting	30	**16.75**
11 Giving ORS in a child with diarrhea can prevent dehydration	123	**68.71**
12 It is better to stop giving food, fluids and milk during diarrhea	132	73.74
13 It is better to increase home fluids, once the child starts having diarrhea at home	160	**89.38**
14 Exclusive breastfeeding helps to prevent diarrhea.	87	**48.60**
15 Breastfeeding should be continued during diarrhea.	122	**68.15**
16 Water should be boiled or filtered before drinking	159	**88.82**
17 A child who does not get better with ORS, should be taken to a health service provider	149	**83.24**
Others		
18 Blood mixed diarrhea will not get better by giving medicine	68	37.98
19 Diarrhea is normal for a child's growth and development	50	27.93
20 Teeth eruption in children can cause diarrhea	21	**11.73**

item 15 (68.15%) "Breastfeeding should be continued during diarrhea", item 7 (82.68%) "Eating foods left uncovered for hours can cause diarrhea", item 8 (89.38%)

"Diarrhea can occur if hand washing not done before feeding the child every time", item 6 (87.70%) "A child with diarrhea, who cannot breastfeed or take fluid, should be taken to a health service provider, item 16 (88.82%) "Water should be boiled or filtered before drinking", item 17 (83.24%) "A child who does not get better with ORS, should be taken to a health service provider. On the other hand few questions were **answered incorrectly** by majority of the caretakers, like item 10 (83.25%) "If there is vomiting after giving ORS, medicine should be given to stop vomiting", item 18 (62.02%) "Blood mixed diarrhea will not get better by giving medicine", item 19 (27.93%) "Diarrhea is normal for a child's growth and development", item 20 (88.27%) "Teeth eruption in children can cause diarrhea", item 3 (53.64%) "Five or more watery stools without sunken eyes is severe diarrhea", item 5 (51.4%) "During diarrhea drugs should be given instead of ORS" and item 9 (55.31%) "Frequent diarrhea may cause malnutrition"

Level of Knowledge on diarrhea in under-five children

The level of knowledge of respondents about childhood diarrhea was divided into three groups; poor (<60%), fair (60-80%) and good (>80%) from the total score of 20. The majority of the respondents (53.07%) had fair level of knowledge

Table 4.3 Percentage distribution of caretakers by level of knowledge on childhood diarrhea (n=179)

Knowledge Level on childhood diarrhea	**Number**	**Percentage**
Poor (<12)	14	7.82
Fair (12-16)	95	**53.07**
Good (> 16)	70	39.11
Median = 12.00 QD= 2	Mean = 12.02 SD = 3.354	min = 4 max = 19

and poor knowledge had a very low percentage (7.82%), had good knowledge (39.11%) as shown in Table 4.3. The median score was 12 with maximum and minimum values were 19 and 4 respectively.

4.2.2 Attitude towards diarrhea in under-five children

To measure the attitude of the respondents about under-five children diarrhea, 10 items of the questionnaire were used as shown in the Table no. 4.4. There were 4 positive and 6 negative statements. Likert's scale of scoring; 5, 4, 3, 2 and 1 for strongly agree, agree, neutral, disagree and strongly disagree were given respectively for positive items. The score were reverse for negative items. Likewise in the knowledge part, attitude statements also divided into diagnosis, cause and prevention of diarrhea.

Table 4.4 Percentage distribution of caretakers per scale on the attitude items (n=179)

Items	SA	A	N	D	SD
Diagnosis of diarrhea					
1 Diarrheal disease can be transmitted not only to the other family members but also to the community as well	**33.52**	**29.05**	8.94	22.35	6.15
Cause of diarrhea					
2 Children who eat uncooked food, and drink unclean water, can get diarrhea	**55.31**	**39.11**	2.79	1.68	1.12
3 Exclusive breastfeeding up to six months of age can reduce the of occurrence diarrhea	**33.52**	**29.05**	8.94	22.35	6.15

Table 4.4 Percentage distribution of caretakers per scale on the attitude items cont.

Items	SA	A	N	D	SD
Prevention of diarrhea					
4 Medicine should be used to get better from diarrhea early	53.63	21.79	5.59	**14.53**	**4.47**
5 Diarrhea in children is not preventable	33.52	29.05	8.94	**22.35**	**6.15**
6 Avoiding fluids, milk and solid food during diarrhea will prevent vomiting which will help a child to recover faster	8.94	15.64	18.44	**41.34**	**15.64**
7 Children with more than 3 watery stools can be treated by anti-diarrheal drugs	17.32	27.37	21.79	**20.67**	**12.85**
8 Fluids and electrolytes lost during Diarrhea cannot be replaced by ORS or oral home fluids	12.85	17.88	18.44	**32.40**	**18.44**
9 Children with simple diarrhea need intra-venous (IV) fluids to prevent dehydration	13.41	28.49	22.35	**13.97**	**21.79**
Others					
Children under 5 years of age with diarrhea can die from severe diarrhea, more than the adults	**28.49**	**34.64**	25.14	10.06	1.68

SA= Strongly Agree A=Agree N=Neutral D=Disagree SD= Strongly Disagree

Among the 4 positive items, no. 1 majority of the respondents (33.52% and 29.05%) had agreed the statement “Diarrheal disease can be transmitted not only to the other family members but also to the community as well”. Similarly in item 2, majority (55.31% and 39.11%) of the caretakers had agreed “children, who eat uncooked food, and drink unclean water, are prone to get diarrhea”. In item 3 majorities (33.52% and 29.05%) had agreed to the statement “Exclusive breastfeeding up to six months of age reduces the occurrence of diarrhea”. In item10, most of the respondents (28.49% and 34.64%) agreed to the statement “Children under 5 years of age with diarrhea have more chances of dying from severe diarrhea than adults”.

Among the six negative statements item 6, majority had disagreed (41.34% and 15.64%) to the statement “Avoiding fluids, milk and solid food during diarrhea will prevent vomiting which will help a child to recover faster”. Similarly in item 8, majority had disagreed (32.40% and 18.44%) the statement “Fluids and electrolytes lost during diarrhea cannot be replaced by ORS or oral home fluids”. Very poor attitude found in item 4, by disagreeing by (14.53% and 4.47% only) in a statement “Medicine should be used to get better from diarrhea early”

Level of attitude towards diarrhea in under-five children

Respondents were divided into two groups on measuring the type of attitude towards childhood diarrhea as shown in Table 4.5. The level was categorized

Table 4.5 Percentage distribution of caretakers by level of attitude towards childhood diarrhea

Attitude Level on childhood diarrhea	**Number**	**Percentage**
Negative (≤ 34)	135	**75.42**
Positive (35-43)	44	24.58
Median = 30.00 QD = 4.5 **Mean = 29.81**	**SD = 6.35**	min =16 max= 43

as positive attitude if the score of the respondent was more than 75th percentile and negative attitude, if the score was equal or less than 75th percentile of the total score, which was 50. Majority of the respondents (75.42%) had negative attitudes towards childhood diarrhea. The mean score was 29.81 and minimum and maximum scores were 16 and 43 respectively with median 30.00

4.2.3 Practice regarding diarrhea in under-five children

Assessing the practice of the caretakers regarding childhood diarrhea was conducted by asking sixteen questions. There were 3 types of questions, one with 4 different levels of answers with the score of 3, 2, 1, and 0 for always, sometimes, often and never.

Table 4.6 Percentage distribution regarding the correct practice of caretakers on childhood diarrhea

Items	Number	Percentage
1 Taking child to a health service provider	158	**88.26**
2 Taking child to health facility with signs	170	**94.97**
3 Hand washing before preparing food		
Always	95	**53.07**
Often	59	32.96
Sometimes	25	13.97
4 Wash with soap before preparing food	103	**57.54**
5 Way of giving food to the child	73	40.78
6 Hand washing before feeding the child		
Always	91	**50.84**
Often	53	29.61
Sometimes	32	17.88
7 Wash with soap before feeding the child	110	61.45

Another type had 3 different levels of answers with the score 2, 1, and 0 as every time, sometime and never and third type was having multiple choices to choose only one to two answers and simple Yes/No answered questions. Single correct answer had score "1" and for wrong answer score "0" were given.

Results as shown in Table 4.6, as in question 1, as mild sign and symptom of diarrhea and 2, shows more severe type of sign and by correctly understanding this, the correct decision of taking the child to health service provider by recognizing the danger signs of diarrhea were in majority (88.26%) and (94.97%) respectively. Similarly in no.3 and 4, hand washing before preparing the food with soap was in higher (53.07 % and 57.54 %) percentage respectively. No.6 and 7 also showed hand washing always before feeding the child (50.84%) and that with soap (61.45%). No. 8 and 9, shows hand washing after child passes the stool and that with soap were used in majority (88.83% and 96.64%) respectively. No.10 and 11 with frequency of cleaning the child feeding utensils with soap and water were in majority (59.78% and 89.94%) respectively. Majority (94.41%) of the respondents had correct way (84.35%) of cleaning feeding bottles, correct way of preventing contamination of leftover foods, correct way (93.85%) of disposing the child's stool and mostly (89.38%) knew correctly practicing the steps to be followed when the child has diarrhea.

Table 4.6 Percentage distribution regarding the correct practice of caretakers on childhood diarrhea (cont.)

Items	Number	Percentage
8 Hand washing after child passing a stool		
Always	159	**88.83**
Sometimes	20	11.17
9 Wash with soap after self defaecation	173	**96.64**
10 Frequency of cleaning the feeding utensils of the child		
Always	107	**59.78**
Often	55	30.73
Sometimes	17	9.50
11 Way of cleaning the feeding utensils of the child	161	**89.94**
12 Preventing from contaminating cooked or left over foods	169	**94.41**
13 Way of cleaning feeding bottle used by the child	151	**84.35**
14 Use of drinking water used to feed the child	158	88.26
15 Way of disposing the child's stool	168	**93.85**
16 Way of managing during diarrhea	126	70.39

Practice Level on diarrhea in under-five children

Level of practice was categorized into three groups. It was measured as good if the score was more than 80%, moderate if the score was 60 to 80%, and poor if the score was less than 60% of the maximum score.

Table 4.7 Percentage distribution of caretakers by level of practice on childhood diarrhea

Practice Level on diarrhea	**Number**	**Percentage**
Poor (≤ 14)	24	13.41
Moderate (15-19)	67	37.43
Good (≥ 20)	88	**49.16**
Median = 19 **QD** = 2.5	Mean = 18.83 S.D. = 3.36	Min = 8 Max = 23

Table 4.7 shows that about 50% of the respondents had good level of practice on childhood diarrhea. The minimum and maximum scores were 8 and 23 respectively with 19 as the median score.

4.3 Child factors

As shown in the Table 4.8, child factor includes age of the child in months, birth weight in grams, measles immunization, milk during first six months of life, diarrhea during the past one month, episodes of diarrhea in one month and type of diarrhea. Results showed, maximum (36.31%) common age groups were from 37 to 48 months group. Minimum and maximum age was 24 months and 59 months respectively with the median as 45 months.

Table 4.8 Percentage distribution by child factors

Child factors	Number	Percentage
Age group (months)		
≤ 36	58	32.40
37-48	65	**36.31**
48-59	56	31.28
Median= 45 QD= 7.5	Mean=42.63	Min=24 Max=59
Birth weight (grams)		
1600 – 2500	31	17.32
2500 – 4000	148	**82.68**
Median= 2700 QD=380	Mean= 2845.5	Min=1600 Max= 4000

Their birth weight varied from 1600gms to 4000gms as the minimum and maximum weight with the median as 2700gms. Majority (82.68%) were in the normal weight (2500 to 4000gms) group. Measles immunization was received by all children.

Exclusive breastfeeding was received by nearly half (46.93%) of the children, whereas more than half (53.07%) had received other top milk during first six months of life. There was considerably less number of cases (21.23%) of diarrhea, as this season was at the peak of the winter and supposed to be a healthy season for the children. The majority (78.77%) had no diarrhea, 20.67% had only one episode and only 0.56% had two episodes of diarrhea. It was mostly (86.84%) associated with watery type of diarrhea.

Table 4.8 Percentage distribution by child factors (cont.)

Child factors	Number	Percentage
Measles Immunization		
Received	179	**100.00**
Milk during first six months of life		
Breast milk only	84	**46.93**
Others	95	53.07
Diarrhea during past one month		
Yes	38	**21.23**
No	141	78.77
Episodes of diarrhea in the past one month		
0	141	78.77
1	37	**20.67**
2	1	0.56
Type of diarrhea		
Watery	33	**86.84**
Blood mixed	4	**10.53**
Associated with fever	1	2.63

4.4 Environmental and Sanitation factors related to diarrhea

There were twelve questions for the environment and sanitation factor and all of them to respond as "Yes" or "No" and "Present" or "Absent". They were labelled as "Hygienic" for the correct answer and "Unhygienic" for incorrect answers.

Table 4.9 Percentage distribution of caretakers by environmental and sanitation factors

Item	Number	Percentage
Housing sanitation		
House-flies and breeding places near the house		
Hygienic	97	54.19
Unhygienic	82	45.81
Flooring of the kitchen		
Hygienic	141	78.77
Unhygienic	38	21.23
Animal raising near or around the house		
Hygienic	132	**73.74**
Unhygienic	47	26.26
Water resource		
Source of drinking water		
Hygienic	118	65.92
Unhygienic	61	34.09
Source of water for other use		
Hygienic	177	**98.88**
Unhygienic	2	1.12
Drinking water stored in		
Hygienic	163	**91.06**
Unhygienic	16	8.94

House-flies and breeding places were not present in majority (54.19%) of the respondents, but as it depends on the season, summer has more chances of becoming unhygienic. Majority (78.77%) of the respondents had hygienic floor of the kitchen, mostly (73.74%) did not have animals raising near or around the house. Majority (65.92%) had hygienic source of drinking water and even for other use mostly (98.88%) had the hygienic source. Storage of drinking water were mostly (91.06%) done in hygienic manner.

Table 4.9 Percentage distribution of caretakers by environmental and sanitation factors (cont.)

Item	Number	Percentage
Human waste disposal		
Use of latrine by everybody		
Hygienic	166	**92.74**
Unhygienic	13	7.26
Latrine condition		
Hygienic	135	75.42
Unhygienic	44	24.58
Material used for cleaning after defecation		
Water	154	**86.03**
Paper	2	1.12
Both	23	12.85

Use of latrine was mostly (92.74%) done in a hygienic manner but few went to the riverside because of their easy feeling and condition of the latrine were mostly (75.42%) hygienic and those unhygienic ones were having either scarcity of

water or earth ground floor or poor ventilation. Materials used for cleaning after defecation were mostly (86.03%) water, and both paper and water used respondents were quite less (12.85%).

Table 4.9 Percentage distribution of caretakers by environmental and sanitation factors (cont.)

Item	Number	Percentage
Solid waste management		
Garbage collection system		
Hygienic	144	80.45
Unhygienic	35	19.55
Drainage system for domestic waste water		
Hygienic	135	**75.42**
Unhygienic	44	24.58
Blocked drainage around or near the house		
Hygienic	119	**66.48**
Unhygienic	60	33.52

Garbage collection systems were regular in most (80.45%) of the respondents houses and the remaining respondents used the solid waste for making organic fertilizer inside their compound. Drainage systems for domestic waste water were mostly (75.42%) present and blocked drainage near or around their house, occured in few (33.52%) respondent's house and that also occured mostly during rainy season.

4.5 Social support and use of services during diarrhea

The respondents getting social support while their child had diarrhea, as in Table 4.10, the results show that large percentage of FCHVs (26.26%) being in the municipality area had helped them, as their help is very much used specially in remote areas.

Table 4.10 Percentage distribution of caretakers who received social support during diarrhea

Item	Number	Percentage
Female Community Health Volunteer (FCHV)	47	26.26
School	56	31.28
Mass Media		
- Radio	48	26.82
- TV	90	**50.28**
- Newspapers	18	10.06
- Health facility	23	12.85

Similarly, schools are also providing services while the child was having diarrhea. Of the mass media which had helped the most to increase awareness during diarrhea were half of the respondents (50.28%) by television and next radio (26.82%) and also by attending the health facility (12.85%) helped to manage diarrhea properly in time.

Table 4.11 Percentage distribution of caretakers using service during diarrhea

Item	**Number**	**Percentage**
Use of Health facility	110	61.45
Use of Medicine Shop	114	**63.69**
Go to traditional healer	45	25.14
Go to more than one place	90	**50.84**

Respondents were asked, if they utilized any services while their child had diarrhea, the results shown in Table 4.11, most caretakers (63.69%) went to the medicine shop and next they go to the health facility being easy access in municipality area and about half (50.84%) went to more than one place. The minority (25.14%) were habituated to go to the traditional healer.

4.6 Relationship between the occurrence of diarrhea and the study factors

As we know that diarrhea was of watery type in majority (86.84%) of the children and there were only four cases of blood mixed diarrhea out of thirty eight cases. So blood mixed diarrhea did not show a statistically significant relationship with the independent variables and here, diarrhea is described as a watery type dependent variable only.

4.6.1 Relationship between socio-demographic factors and diarrhea occurrence

Socio-demographic factors included in this part of the study were caretaker's age, gender, relation of the child, education, occupation, family income

and time given for the child care. Chi-square test was performed to test the association between these independent variables and diarrheal disease occurrence among under-five children. Simple logistic regression analysis done to know the Crude Odds ratio (OR) and Pearson's chi-square test used to know the significance of the data taking 95% confidence Interval (CI).

Table 4.12 Relationship between the socio-demographic factors of caretakers and diarrheal disease occurrence

Socio-demographic factors	Diarrheal disease occurrence					
	With diarrhea	Without diarrhea	Crude	CI		
	%	%	OR	Lower	Upper	p-value
Age of respondents (yrs)						**0.709**
≥ 30	22.50	77.50	**1.15**	0.56	2.35	**0.709**
< 30	20.20	79.80	**1.00**			
Gender						**0.053**
Male	10.53	89.47	**0.37**	0.12	1.12	**0.078**
Female	24.11	75.89	**1.00**			
Relation						**0.315**
Others	16.33	83.67	**0.65**	0.27	1.53	**0.327**
Mother	23.08	76.92	**1.00**			

Table 4.12, shows that more than 30 yrs age group of caretakers had more (22.50%) cases of diarrhea than less than 30 yrs age group (20.20%), although not much of difference, (Crude OR as 1.15) and the p-value was not significant.

Table 4.12 Relationship between the socio-demographic factors of caretakers and diarrheal disease occurrence (cont.)

Socio-demographic factors	Diarrheal disease occurrence					
	With diarrhea	Without diarrhea	Crude	CI		
	%	%	OR	Lower	Upper	p-value
Education (Yrs)						**0.126**
Primary (≤ 6)	29.23	70.77	**2.68**	0.82	8.74	**0.101**
Secondary (7-12)	17.86	82.14	**1.41**	0.43	4.65	**0.570**
Bachelor and above	13.33	86.67	**1.00**			
Occupation						**0.709**
Housewife / Agr.	20.73	79.27	**1.37**	0.42	4.54	**0.603**
Service worker	23.61	76.39	**1.62**	0.49	5.39	**0.429**
Self employed	16	84.00	**1.00**			
Family Income (US $ per month)						**0.353**
< 150	17.14	82.86	**0.83**	0.33	2.05	**0.683**
150-250	27.78	72.22	**1.54**	0.63	3.47	**0.342**
≥ 250	20.00	80.00	**1.00**			

Similarly the gender, female caretaker had taken care of more diarrhea (24.11%) than the male caretaker (10.53%) as we know that nearly 80% are female respondents and more than 70% were mothers. Relationship shows no significance. Caretakers with primary education or less had more (29.23%) diarrhea than caretakers with higher education (17.86%). More diarrhea occurrences observed (23.61%) in service worker compared to housewives (20.73%) and self employed (16%), the relationship was not statistically significant. For the middle level of family income the children had 27.78% of diarrhea cases more than other groups. The relationship was not statistically significant.

Table 4.12 Relationship between the socio-demographic factors of caretakers and diarrheal disease occurrence (cont.)

Socio-demographic factors	**Diarrheal disease occurrence**					
	With diarrhea	**Without diarrhea**	**Crude**	**CI**		
	%	**%**	**OR**	**Lower**	**Upper**	**p-value**
Time given for child care (hrs)						**0.709**
< 8 hrs	28.57	71.43	**1.40**	0.39	5.06	**0.608**
8-15 hrs	19.35	80.65	**0.84**	0.39	1.79	**0.652**
≥ 16 hrs	22.22	77.78	**1.00**			

Those caretakers who spent less time to the child (<8hrs) had higher (28.57%) percentage of children with diarrhea as compared to 8-15 hrs (19.35%) and ≥ 16 hrs (22.22%). Relationship is not statistically significant (p-value >0.05).

Although there was a difference in the occurrence of diarrhea with different independent variables of socio-demographic characteristics of the caretakers, the result has revealed that those relationships and diarrheal disease occurrence in under-five children, was not statistically significant.

4.6.2 Relationship between knowledge of caretakers and diarrhea occurrences

Children having diarrhea were mostly (23.16%) from the caretaker of fair knowledge group

Table 4.13 Relationship between the knowledge of caretakers and diarrheal disease occurrence among under-five children (n=179)

Knowledge of caretakers on childhood diarrhea	Diarrheal disease occurrence					
	With diarrhea %	Without diarrhea %	Crude OR	CI Lower	CI Upper	p-value
Knowledge Level						**0.985**
Poor (4-11)	21.43	78.57	**1.20**	0.29	4.91	**0.804**
Fair (12-16)	23.16	76.84	**1.32**	0.61	2.85	**0.477**
Good (17-19)	18.57	81.43	**1.00**			

as compared to the poor (21.43%) and good knowledge group (18.57%) as shown in Table 4.13. The result was not statistically significant (p-value >0.05).

4.6.3 Relationship between attitude of caretakers and diarrhea occurrences

Relationship between attitude of caretakers and occurrences of diarrhea in under-five children were assessed by chi-square test and simple logistic regression analysis. Caretakers with poor attitude had more (21.48%) cases of diarrhea than

Table 4.14 Relationship between the attitude of caretakers and diarrheal disease occurrence among under-five children (n =179)

Attitude of caretakers on childhood diarrhea	Diarrheal disease occurrence		Crude OR	CI		p-value
	With diarrhea %	Without diarrhea %		Lower	Upper	
Attitude Level						**0.885**
Poor (≤ 34)	21.48	78.52	**1.06**	0.46	1.06	**0.885**
Good (35-43)	20.45	79.55	**1.00**			

the caretaker with good attitude (20.45%). The relationship was not found to be significance as shown in the Table 4.14.

4.6.4 Relationship between practices of caretakers and diarrhea occurrences

Regarding overall practices of diarrheal disease occurrence, caretakers with poor practice level was higher (33.33%) among the as shown in Table 1A and fair and good practice level had less diarrhea following the trend but it did not show any significance. So the researcher tried to see the relationship of each practice questionnaire in relation to the diarrheal disease occurrence.

Table 4.15 Relationship between Caretaker's Practice and diarrhea (n=179)

Practice items	n	Diarrheal disease occurrence		p-value
		With diarrhea %	Without diarrhea %	
Hand washing before preparing food				0.871
Correct	25	20.00	80.00	
Not correct	154	21.43	78.57	
Wash with soap before preparing food				0.674
Correct	103	22.33	77.67	
Incorrect	76	19.74	80.26	
Way of giving food to your child				0.576
Correct	73	19.18	80.82	
Incorrect	106	22.64	77.36	
Hand washing times before feeding child				0.140
Correct	32	31.25	68.75	
Incorrect	147	19.05	80.95	
Use soap to hand wash				0.338
Correct	111	18.92	81.08	
Incorrect	68	25.00	75.00	
Hand washing times after child passes stool				0.845[f]
Correct	20	15.00	85.00	
Incorrect	159	22.01	77.99	

f = fishers exact test

For those where expected count was more than 20% in chi-square test, fisher's exact tests were performed. The result showed most of the questionnaires, the incorrect answers of the respondents were having diarrhea to their children, except in few like; hand washing times before feeding the child, wash with soap after self defecation, cleaning feeding utensils and managing after child passes stool as shown in Table 4.15.

Table 4.15 Relationship between Caretaker's Practice and diarrhea contd. (n=179)

Practice items	n	Diarrheal disease occurrence		p-value
		With diarrhea %	Without diarrhea %	
Wash with soap after self defecation				0.766[f]
Correct	173	21.39	78.61	
Incorrect	6	16.67	88.33	
Cleaning feeding utensils times				0.278[f]
Correct	17	29.41	70.59	
Incorrect	162	20.37	79.63	
Using soap to clean the utensils				0.441[f]
Correct	161	21.74	78.26	
Incorrect	18	16.67	83.33	
Way of avoiding contamination of food				0.962[f]
Correct	169	20.12	79.88	
Incorrect	10	40.00	60.00	
Way of cleaning feeding bottle				0.017
Correct	151	17.88	82.12	
Incorrect	28	39.29	60.71	
Type of drinking water given				0.592[f]
Correct	158	19.62	80.38	
Incorrect	21	33.33	66.67	
Manage after child passing stool				0.795[f]
Correct	168	21.43	78.57	
Incorrect	11	18.18	81.82	
Manage when child has diarrhea				0.601
Correct	151	20.53	79.47	
Incorrect	28	25.00	75.00	

f = fishers exact test

Since the respondents on practice level were not having significant relationship and not following the knowledge and attitude, so the researcher tried to see the correlation between knowledge and practice score, attitude and practice score, and attitude and knowledge score as shown in the Table 2A. The value in each correlation showed quite low as knowledge and practice (0.154), attitude and practice score (0.171) and attitude and knowledge (0.352) although all were statistically significant (p-value <0.05). So the practice does not linked to the prevention of diarrhea, which could be due to the confounding bias of the questions or improper response of the respondents or misunderstanding of the questions.

4.6.5 Relationship between child factors and diarrhea occurrences

Children in the 36 to 48 months age group had more (26.56%) diarrhea compared to those below 36 months (22.03%) and the 48 to 59 months group (14.29%) as shown in Table 4.16. The relationship was not statistically significant.

Table 4.16 Relationship between the child factors and diarrheal disease occurrence (n=179)

Child factor	Diarrheal disease occurrence					
	With diarrhea %	Without diarrhea %	Crude OR	CI Lower	CI Upper	p-value
Age of children (months)						**0.244**
< 36	22.03	77.97	**2.29**	0.89	5.88	**0.086**
36-48	26.56	73.44	**1.65**	0.63	4.28	**0.305**
≥ 48-59	14.29	85.71	**1.00**			
Birth weight (grams)						**0.257**
<2500	29.03	70.97	**1.68**	0.70	4.03	**0.246**
≥ 2500	19.59	80.41	**1.00**			
Milk during first six months of life						**0.074**
Others (**not exclusive**)	26.32	73.68	**1.95**	0.92	4.12	**0.080**
Mother or Human milk **(exclusive)**	15.48	84.52	**1.00**			

Similarly children with less than 2500gms birth weight had more (29.03%) diarrhea than those with a birth weight of 2500gms or more (19.59%). Children having low birth weight had 1.68 times greater risk of having diarrhea than those weighing 2500 gms or more. The relationship was not statistically significant. Children who received exclusive breastfeeding during the first six months of life had less (15.48%) diarrhea as compared to others (26.32%) with different types of milk. The relationship was not statistically significant.

4.6.6 Relationship between environmental and sanitation factors and diarrhea occurrences

Diarrhea occurrences were more (23.71%) in unhygienic places as compared to the hygienic (18.29%) in cases of house-flies and breeding places near the house. Regarding flooring of the kitchen item, diarrhea occurred in unhygienic places than in hygienic places. Similarly animals raising near or around the house, unhygienic had more (27.66%) diarrhea cases as compared to the hygienic (18.94%) as shown in Table 4.17

Table 4.17 Relationship between the environmental and sanitation factors of caretakers and diarrheal occurrence (n =179)

Environmental and sanitation factors	Diarrheal disease occurrence		Crude OR	CI		p-value
	With diarrhea %	Without diarrhea %		Lower	Upper	
Household condition						
House-flies and breeding places near the house						**0.375**
Unhygienic	23.71	76.29	**0.72**	0.35	1.49	**0.378**
Hygienic	18.29	81.71	**1.00**			
Flooring of the kitchen						**0.680**
Unhygienic	23.68	76.32	**1.20**	0.51	2.81	**0.677**
Hygienic	20.57	9.48	**1.00**			
Animal raising near or around the house						**0.219**
Unhygienic	27.66	72.34	**1.64**	0.76	3.55	**0.212**
Hygienic	18.94	1.06	**1.00**			

In source of drinking water, unhygienic had higher (26.23%) diarrhea cases; in source of water for other use, unhygienic had higher (24.53%) number of diarrhea cases and the results revealed that the statistics were not statistically significant (p-value >0.05).

Table 4.17 Relationship between the environmental and sanitation factors of caretakers and diarrheal disease occurrence among under-five children cont. (n =179)

Environmental and sanitation factors	Diarrheal disease occurrence		Crude OR	CI		p-value
	With diarrhea %	Without diarrhea %		Lower	Upper	
Water resource						
Source of drinking water						**0.944**
Unhygienic	26.23	73.77	**1.03**	0.47	2.27	**0.944**
Hygienic	18.64	81.36	**1.00**			
Source of water for other use						**0.188**
Unhygienic	24.53	75.47	**1.65**	0.77	3.54	**0.196**
Hygienic	16.44	83.56	**1.00**			
Drinking water storage						**0.020***
Unhygienic	26.85	73.15	**2.53**	1.12	5.73	**0.026**
Hygienic	12.68	87.32	**1.00**			

*p-value <0.05

In drinking water storage, unhygienic had higher (26.85%) diarrhea cases as compare to the hygienic (12.68%). Here the results revealed that the relationship was statistically significant.

Table 4.17 Relationship between the environmental and sanitation factors of caretakers and diarrheal disease occurrence among under-five children cont.(n =179)

Environmental and sanitation factors	Diarrheal disease occurrence		Crude OR	CI		p-value
	With diarrhea %	Without diarrhea %		Lower	Upper	
Human waste disposal						
Use of latrine by everybody						**0.387**
Unhygienic	30.77	69.23	**1.73**	0.50	5.94	**0.269**
Hygienic	20.48	79.52	**1.00**			
Latrine condition						**0.261**
Unhygienic	27.77	72.73	**1.57**	0.71	3.46	**0.485**
Hygienic	19.26	80.74	**1.00**			
Material used for cleaning after defecation						
Unhygienic	33.33	66.67	**1.90**	0.34	10.80	**0.889***
Hygienic	20.81	79.19	**1.00**			

*p-value = 0.889 when fisher exact test performed

In the variable, use of latrine by everybody, unhygienic had higher (30.77%) diarrhea cases; latrine condition also unhygienic had higher (27.27%); materials used for cleaning after defecation had higher (33.33%) diarrhea cases. Expectant cell count was more than 20% in chi-square test so Fisher's exact test was performed. Although unhygienic had more diarrhea cases but their relationship was not statistically significant.

Table 4.17 Relationship between the environmental and sanitation factors of caretakers and diarrheal disease occurrence among under-five children contd. (n =179)

Environmental and sanitation factors	Diarrheal disease occurrence		Crude OR	CI		p-value
	With diarrhea %	Without diarrhea %		Lower	Upper	
Solid waste management						
Garbage collection system						**0.112**
Unhygienic	31.43	68.57	**1.99**	0.87	4.54	**0.104**
Hygienic	18.75	81.25	**1.00**			
Drainage system for domestic waste water						**0.781**
Unhygienic	22.73	77.27	**1.12**	0.50	2.55	**0.780**
Hygienic	20.74	79.26	**1.00**			
Blocked drainage around or near the house						**0.045***
Unhygienic	52.63	47.37	**2.12**	1.02	4.41	**0.044**
Hygienic	29.79	70.21	**1.00**			

* p-value <0.05

In the item garbage collection system, unhygienic had higher (31.43%) cases of diarrhea compared to the hygienic (18.75%); drainage system for domestic water also had higher unhygienic (22.73%) diarrhea cases as compare to the hygienic (20.74%). In both of them the results showed that the relationship was not statistically significant. Similarly, blocked drainage around or near the house had higher (30.00%) diarrhea cases as compare to the hygienic (16.81%) and this relationship was found to be statistically significant (p-value < 0.05).

4.6.7. Relationship between predictors and diarrheal disease occurrence

The model of logistic regressions was applied to determine the association of the predictors with diarrheal disease occurrence. Although there was

Table 4.18 The Model of Multiple Logistics regressions

Predictors	Adjusted OR	95% CI for OR		p-value
		Lower	Upper	
				0.070
Birth weight level				
<2500	**1.38**	0.54	3.52	0.499
≤ 2500	**1.00**			
Knowledge score	**1.05**	0.93	1.19	0.421
Attitude score	**1.01**	0.95	1.08	0.734
Practice score	**0.96**	0.85	1.07	0.463
Drinking water storage				
Unhygienic	**2.58**	1.12	5.94	0.026*
Hygienic	**1.00**			
Blocked drainage				
Unhygienic	**2.03**	0.22	1.11	0.089
Hygienic	**1.00**			

*p-value < 0.05

only two variables were statistically significant but other not significant were also used to adjust OR as shown in Table 4.18.

Birth weight level was not found to have a significant association with diarrhea but it showed the strength of association (OR 1.38) with diarrhea in under-

five children. Knowledge score showed the same value like that of attitude score (OR 1.01). Children with unhygienic drinking water storages had 2.58 times greater risks of having diarrhea than those with hygienic ones after adjusting the other factors.

4.7 Relationship between social support, use of service and caretaker's behaviour

Researcher wanted to know the caretakers behaviour at different level of knowledge, attitude and practice especially when they are in the need of the support due to illness. They take the help of FCHV, as shown in Table 4A, being a municipality area, normally very less people take her help but here it shows that poor knowledge, negative attitude and poor practice level respondents were taking her help. Similarly from school, as in Table 5A, also poor knowledge, negative attitude and poor practice level respondents were using maximum. This could be the reason that good knowledge with positive attitude and good practice respondents with above middle level income, prefer to go to the nearby hospital or private clinics. Similar findings were observed in mass media like TV as in Table 6 A and from health facility as in Table 7A. Traditional healer like in Table 8A, where poor knowledge level show not using traditional healer, could be because of very low percentage (7.82%) of poor knowledge level caretakers and use of pharmacy in Table 9A, poor knowledge level, with negative attitude and poor practice level respondents were going to the pharmacy too. Visiting multiple places as in Table 10A, where poor knowledge level, negative attitude and poor practice level attendant has visited more than one place to get the service while the child was sick. Some of the findings have shown significant p-value but because of the less number of samples it does not correlate with the outcome. This could be because illness was so less that many did not need to go or take help and the questionnaire was not sufficient to collect the data about those who did not need support.

CHAPTER V
DISCUSSION

This cross sectional descriptive study was conducted to describe the preventive factors relating to the occurrence of diarrheal diseases among under-five children of the Lalitpur district of Nepal. The Community Based Integrated Management of Childhood Illness (CB-IMCI) program was started in 2008 in this district, since then more cases of diarrhea with some dehydration has been noticed than the more severe cases. IMCI deals with management of diarrhea very effectively and it has contributed to decreasing the severity and mortality of diarrhea and encouraging caretakers to start giving home fluids or ORS at the start of diarrhea.

A sample of 179 caretakers of under-five children were selected by clustered sampling, 70 were from the Adarsha Vidya Mandir Higher Secondary School, Manbhawan, Lalitpur, and 109 were from the Navjeevan English Secondary School, Bagdole, Lalitpur. Face to face interviews using a structured questionnaire were performed. Data collection started on January 25, 2010 and completed by February 2, 2010. In this study, the overall diarrheal disease occurrence was 21.23 %, which is higher than the current prevalence of diarrhea in the country (12%). It could be because of the peak winter season causing diarrhea due to rotavirus infection (5, 54).

Diarrhea is still a major killer and despite the existence of inexpensive and efficient means of treatment, diarrhea kills more children than AIDS, malaria and measles combined, what has been addressed by UNICEF and WHO report on October 14, 2009, titled “Diarrhea: Why Children are still Dying and What can be done” It includes the information on the causes of diarrhea, data on access to means of prevention and treatment and a seven point plan to reduce diarrheal deaths (11).

5.1 Socio-demographic factors

In this study, the majority of the caretakers were mothers aged 30 or more and the result had shown an association between the caretakers and diarrheal disease occurrence among under-five children in more than 30 yrs old. The results of this study is inconsistent to the study in Jordan by El-Gilani AH et al where mothers aged less than 25 yrs were having more diarrhea, but their age limit is 25 but ours is 30 yrs old (17).

Majority of the caretakers had completed their education at secondary or higher levels (46.93%). The caretakers' level of education was inversely associated to the frequency of diarrhea among under-five children. Diarrhea preventive behavior was seen more in bachelor educated than the secondary and higher secondary and then lower down. This shows the positive association to the study of Kyriacou A. et al in screening for fecal contamination in primary school Crete, Greece in which those children who had parents with the highest education level (>12years), had the lowest percentage (48.8%) of fecal contamination on their hands (21). At this age of fast developing communication era, one does not need to be in school to get knowledge about diarrhea prevention because the media like radio, television, newspapers and health facility information could be sufficient to develop diarrhea preventive behavior. Truong TY had demonstrated no significant association between education and diarrhea among under-five children in Ratchabury province (20).

It was observed that the majority of the caretakers were housewives (45.81%) which include agriculture also because housewives mostly look after the agriculture which is a common practice in most of the families. Self employed occupation had comparatively less diarrhea but there was no significant difference among three levels in relation to the occurrence of diarrhea among under-five children. The result of this study is similar to the study of Vongxay P. in Khon Kaen province, Thailand. This could be because of their living environment being homogenous in nature although there might be different types of occupation (19).

The researcher had found that the majority (40%) of the caretakers was from the lower income group and rest were in lower percentage, but the occurrence of diarrhea among under-five children was in higher side (27.78%) in the middle income group compare to the other groups, and it was not statistically significant. There could be inaccurate declaration of their true household income. Result was inconsistent to the study of Vongxay P., whose study showed the risk of diarrhea two times higher in low family income group compare to the high income group (p-value 0.014). Nguyen TLH, in Vietnam observed that mothers with higher age, bachelor degree and family income ranging from US $ 300-499 had good preventive behavior regarding the occurrence of diarrhea among under-five children (18).

Majority of the caretakers (51.96%) had spent 8-15 hrs time with the child which does not include while they are at the school. Those who were giving less time (< 8hrs) were having more diarrhea in under-five children which is not statistically significant. This study could not compare to those children who spent number of hours in day care centre or schools for comparable study.

5.2 Behavioral factors of caretakers

More than half (53.07%) of the caretakers had fair level of knowledge. The detailed information regarding the knowledge of the caretakers was analyzed in detail and those caretakers who had good knowledge (>80%) is mentioned below:

a. It is better to increase home fluids, once the child starts having diarrhea at home
b. Eating foods left uncovered for hours can cause diarrhea
c. Diarrhea can occur if hand washing not done before feeding the child every time
d. A child with diarrhea, who cannot breastfeed or take fluid, should be taken to a health service provider
e. Water should be boiled or filtered before drinking
f. A child who does not get better with ORS, should be taken to a health service provider

There were quite high percentage (83.25%) of caretakers who answered wrongly in variable “If there is vomiting after giving ORS, medicine should be given to stop vomiting” mostly parents worry a lot when child does not take ORS and starts vomiting then they think of giving medicine to stop vomiting. Although paediatricians advise that it is better to continue giving ORS but slowly unless the child goes into severe dehydration. Similarly in the variable “Blood mixed diarrhea will not get better by giving medicine” many caretakers (62.02%) had wrongly said that this was correct and it could be because of the question was more technical. Surprisingly many caretakers (88.27%) still believe on “Teeth eruption can cause diarrhea”. Nearly one third of the caretakers (31.29%) were wrong in the variable “Giving ORS in a child with diarrhea can prevent dehydration” and similarly one third of the caretakers (31.85%) were wrong in the variable “Breastfeeding should be continued during diarrhea” About half of the caretakers (51.40%) were wrong in variable “Exclusive breastfeeding helps to prevent diarrhea”.

The occurrence of diarrhea in under-five children among the knowledge group, it was highest (24.00%) in the fair group and lowest observed in the poor group (18.89%) and good knowledge group (21.43%). The result did not follow the trend and it was not statistically significant, although the fair group had some association with diarrhea. It could be because of the accessibility of the nearby health facilities like hospitals / private clinics / nursing homes, and their education level also being in higher side, they take to the facility at the earlier stage of diarrhea. The mass media like radio and television has influenced a lot to the general public regarding management of diarrhea, so they start managing diarrhea early even though they are less educated which can be co-related with the finding of more than 80% respondents correctly accepting “better to increase home fluids once the child starts having diarrhea at home” and nearly 90% respondents accept “water should be boiled or filtered before drinking”. Some previous studies approved that there was no significant association between the knowledge and practice as the researcher observed here. This probably meant that having good or poor knowledge does not necessarily lead the people to practice accordingly. Truong TY. had found no significant association between maternal knowledge and diarrhea in under-five children (20). In

opposition to that a study by Vongxay P. had shown a significant association (p value 0.001) between mother's knowledge and diarrhea in under-five children (19).

Majority of the caretakers (75.42%) had negative attitude towards the occurrence of diarrhea in under-five children. However when their descriptive information was explored it was found that there were few variables which were having positive (>60%) attitude of respondents towards occurrence of diarrhea in under-five children, as mentioned below:

a. Diarrheal disease can be transmitted not only to the other family members but also to the community as well
b. Children who eat uncooked food, and drink unclean water, are prone to get diarrhea
c. Exclusive breastfeeding up to six months of age reduces the occurrence of diarrhea
d. Children under five years of age with diarrhea have more chances of dying from severe diarrhea than adults

Researcher found an association of attitude with the diarrhea in under-five children as percentage of diarrhea was higher (21.48%) in negative attitude than the positive (20.45%) one. Truong found statistically significant negative association between attitude of mother and diarrheal disease (20). Basically diarrheal disease is more related with the human behavior which can be observed through practice among under-five children and their caretakers. So it does not always follow that good attitude should have less and poor attitude have more diarrhea, because people may have good knowledge, good attitude but may not practice according to their knowledge. The researcher found that the correlation coefficient between knowledge score and attitude score was very low (0.352) as shown in Table 3A, so motivation to perform the task is more important.

This study found out that nearly half (49.16%) caretakers were doing good practice during diarrhea in under-five children. The descriptive information was

explored and few variables were found to be good (> 80%) preventive behavior as mentioned below:

a. Taking child to a health service provider
b. Taking child to a health facility with clinical signs
c. Always hand washing after child passing stool
d. Wash hands with soap after self defecation
e. Way of cleaning the feeding utensils of the child
f. Preventing from contaminating cooked or leftover foods
g. Use of drinking water to feed the child
h. Way of disposing the child's stool
i. Way of management during diarrhea

The occurrence of diarrhea follows the trend of diarrhea among poor, fair and good practice group as highest (33.33%) in poor practice level, fair level (22.39%) and lowest (17.05%) in the good practice level. All the level showed no association with diarrhea and was not statistically significant. This could be not having compliance with knowledge, attitude and practice among the respondents. Similar finding was observed in a study by Labay EM (51). On the contrary Vongxay P. found that the risk of diarrhea for the children with mother's poor practice had approximately 9 times higher than the children with mother's good practice (19).

Regarding hand washing the study found that (53.07% and 50.84%) before preparing food and before feeding the child and in both occasion washed hand with the soap. Similarly about the way of disposing the child's stool , cleaning feeding utensils, use of drinking water, disposing the child's stool, way of managing diarrhea at the earliest and feeding bottles used by the child is correctly practiced (> 60%) by the caretakers. Pinfold VJ et al found the significant reduction (39%) in diarrheal disease by simple hand washing in a study in Khon Kaen province, Thailand (23). A safe stool disposal as primary barrier to transmission of infective agents, may be more important than hand washing before eating, is explained in a review article by Curtis V. et al (24).

In this study practice level of respondents (49.16%) having good practice on diarrhea, although statistically not significant. If individual variables are explored, as some of the variables like “hand washing with soap and water after child passes stool” correctly practiced by more than 90% of the caretakers,” preventing contamination of cooked or leftover foods” and “way of disposing child’s stool” correctly practiced by more than 94% of the caretakers. So it could be because of confounding bias, improper questions or respondents misunderstanding might have resulted to the knowledge, attitude and practice compliance not going together. It appears that they may not be practicing as per their knowledge and attitude. A correlation analysis is shown in the Table 2A, by comparing the knowledge, attitude and practice score each other which shows lower values.

5.3 Child Factors

This study found that the high number (36.31%) of age group of the child was 37-48 months old, and median age was 45 months. Diarrhea was more (26.56%) common in 36-48 months age group and there was a positive association (Crude OR 1.65) with diarrhea, although statistically not significant. Less than 36 months were having risks of having diarrhea by 2.29 times compared to the 48-59 months old children. In Nepal, diarrhea is most commonly observed in the age group of 6-11 months and 12-23 months age (5). Thongkarajai P. et al in Khon Kaen, found the similar finding, the researcher could not study this because of the play group class of the child in school starts from two years only. On the contrary Vongxay P. study found that at 2-3 yrs age group, found maximum (42.7%) number of diarrhea cases (19). Older children were probably more mobile and playful than younger children and unknowingly they may have the habit of putting fingers or toys in the mouth.

Majority of the children were in the 2500 – 4000gms weight group and the median weight was 2700gms. This study found that maximum numbers of diarrhea cases (29.03%) in the low birth weight (< 2500gms) compare to the normal weight (≥ 2500gms). In the study of Buonya GB et al in Papua New Guinea found the

same association as low birth weight babies having more diarrhea (34). On the contrary Labay EM and Truong TY found no significant association (51, 20). This could be because of good ante-natal check up and good prenatal services being available in the municipality area.

More than half (53.07%) of the children, were not exclusively breastfed during their first six months of life and they were having more (26.32%) diarrhea. They were 1.95 times in risks of having diarrhea compared to the exclusively fed (15.48%) under-five children and it is not statistically significant. Infants under 2 months of age who are not breastfed are 25 times as likely to die of diarrhea than infants exclusively breastfed. Evidence also shows that early initiation of breastfeeding can prevent 22% of all deaths among babies below one month in developing countries (37). On the contrary to this Labay EM and Truong TY in separate studies found no association between breastfeeding and occurrence of diarrhea (51, 20). 53% of children in Nepal are exclusively breastfed (5) whereas in Thailand in only 5% as mentioned in MICS (36).

All the children had received measles vaccination. As we know measles vaccine is especially considered because of its direct relation with morbidity and mortality of diarrhea. Despite the major impact made on this disease by successful immunization program, 2000 deaths of young children still occur every day from measles often in association with diarrhea and pneumonia (35).

The results revealed that the incidence of diarrhea in under-five children was 21.23% which is quite high as compare to the national prevalence (12%) of diarrhea. This could be because data collected at the peak of the winter season when viral infection commonly occurs in children (5, 54). The majority (78.77%) of the children had no diarrhea. One time episode of diarrhea was maximum (20.67%) in the last one month, only (0.56%) one child had two episodes of diarrhea in the past one month. Diarrhea was mostly (86.84%) associated with watery type. The study area is a community based integrated management of Childhood Illness (CB-IMCI) district which gives emphasis on management of Diarrhea, ARI, Malaria, Measles and

Malnutrition in under-five children. Since the program started, because of the better management and improved registration of diarrhea cases the incidence has increased from 239/1000 in 2008 to 524/1000 in 2009 and the severity of diarrhea has decreased. This study showed 212/1000 cases of diarrhea, comparatively less because it does not cover rural areas of the Lalitpur district and data collected at winter season which is supposed to be a healthy season for under-five children. Measles immunization coverage in the district is 91% compared to the national 85% coverage (5). (Source: Brouchre Lalitpur District Health Information 2009/2010)

Similar study by Vongxay P. found, one time diarrhea in the last six months (84.1%) (19).In developing countries, children under three years old experience on average three episodes of diarrhea every year (3). In Nepal children suffer from diarrhea by 3.3 episodes per child per year (14). Blood mixed diarrhea (10.53%) was found among under-five children, which is higher than the national average (2%) but because of the small number of diarrhea cases we could not conclude its significance (5).

5.4 Environment and sanitation factors

In the household conditions this study showed, house-flies and breeding places near the house had higher (23.71%) number of diarrhea and they were in 1.39 times greater risks of diarrhea compared to the hygienic ones, flooring of the kitchen unhygienic was associated (23.68%) and animals raising near or around the house, unhygienic (27.66%) were associated with diarrhea in under-five children and 1.20 times in risks of having diarhhea, although it was not statistically significant. In a study by Vongxay P. showed that 80.5% of the children got diarrhea with flies in the household and only 19.5% got diarrhea without flies, which was significant (19).

In the analysis for source of drinking water, unhygienic (26.23%) associated with diarrhea as compare to the hygienic (18.64%). Similarly source of water for other use, unhygienic (24.53%) which was 1.65 times in risks of diarrhea although it was not statistically significant. Drinking water storage unhygienic

(26.85%) compare to the hygienic (12.68%) diarrhea in under-five children, was statistically significant (p-value 0.020) and they were in 2.53 times risks of having diarrhea. Study by Salasai H. also found the similar finding from Thailand (46).

In human waste disposal, use of latrine had association of children with diarrhea in unhygienic (30.77%) condition compare to the hygienic (20.48%), similarly in latrine condition unhygienic had higher (27.27%) diarrhea cases, this study revealed no statistical significance. Indiscriminate defecation near the home or village, was found to be associated with an increased incidence of diarrhea (64%) (Stanton and Clemens 1987; Han and Moe 1990).

In solid waste management, garbage collection system had association with unhygienic (31.43%) diarrhea cases in compare to the hygienic (18.75%), similarly in the drainage system, unhygienic (22.73%) and hygienic (20.74%) had association with diarrhea, although the data were not significant. Blocked drainage around or near the house had unhygienic (52.63%) and hygienic (47.37%) with 2.12 times risks of having diarrhea compared to the hygienic ones, and it was statistically significant (p-value 0.045). A study by Sheth M. et al in India 2004, about diarrhea prevention through food safety education found that environmental sanitation and personal hygiene were main contribution to the reduction of incidence of diarrhea (53). Two variables were significant in environment and sanitation as drinking water storage (p-value 0.020) and blocked drainage near or around the house (p-value 0.045). So the researcher tried to see if there is any relation between them by doing cross-tabulation as shown in Table 3A. The result showed that the unhygienic was in higher percentage, so not much of significance.

5.5 Social Support and Use of service

FCHVs work at the lowest unit of the government health system and they are more popular in the remote areas of Nepal. They work as a volunteer and their number is around 48000 in the whole country. They look after the preventive part of

different program like family planning, diarrhea, pneumonia, HIV/AIDS, Immunization and child health nutrition.

They take the help of FCHV, as shown in Table 4A, being a municipality area, normally very less people take her help but here it shows that poor knowledge, negative attitude and poor practice level respondents were taking her help. Similarly from school, as in Table 5A, also poor knowledge, negative attitude and poor practice level respondents were using maximum. This could be the reason that good knowledge with positive attitude and good practice respondents with above middle level income, prefer to go to the nearby hospital or private clinics. Similar findings were observed in mass media like TV as in Table 6 A and from health facility as in Table 7A. Traditional healer like in Table 8A and use of pharmacy like in Table 9A, poor knowledge level, with negative attitude and poor practice level respondents were going to the traditional healers and same observed in pharmacy too. Visiting multiple places as in Table 10A, where poor knowledge level, negative attitude and poor practice level attendant has visited more than one place to get the service while the child was sick. Some of the findings have shown significant p-value but because of the less number of samples it does not correlate with the outcome. This could be because illness was so less that many did not need to go or take help and the questionnaire was not sufficient to collect the data about those who did not need support.

In Nepal, 60.5% listen to the radio, watches television by 38% and read news papers by 30% of population once a week respectively(5). In a study of Sokhanya I, it was found that 69.92% received TB information by watching television and from reading news papers and magazines (61.79%) (52). A study by Tomoko Hiruta, found that most of the mothers got information about prevention of diarrhea from mass media (93.50%) and from health personnel (91.34%) (43).

Model of logistic regressions

The model of logistic regressions was applied to know the association of the predictors with diarrheal disease occurrence. Although there were only two variables which were statistically significant, in addition to it, others used were not significant, but they were also used to adjust OR as shown in Table 21.

Birth weight level had no statistical significance but it showed the strength of association that low birth weight children were 1.38 times more in the risks of having diarrhea as compare to the normal birth weight children. Knowledge and attitude level total score showed the same value (OR1.05), showing very weak association with the occurrence of diarrhea in under-five children. Drinking water storage showed the association as the respondents with unhygienic behaviour can have the risks of diarrhea 2.58 times compare to the hygienic ones. Blocked drainage also showed good strength of association (adjusted OR 2.03) and practice level values showed no association with diarrhea, could be because of less number of diarrhea cases. This also revealed that the data are not statistically significant.

Limitation of the study

This study was conducted in one district of Nepal, because of its high child mortality and prevalence of diarrhea in under-five children. It was carried out in an urban area and by socioeconomic status index, the wealth quintile as shown by residence and regions; an overwhelming majority of the population residing in urban areas is from the richest quintile. The cause of Malnutrition is multi-factorial and diarrhea could be one of the causes of malnutrition or vice versa. With regard to the feeding practices of the children, it has been found that male children, children in urban areas, children with mothers with some secondary or higher education, and children in the highest wealth quintile are more likely to be fed according to the Infant and Young Child Feeding (IYCF) recommendations from Nepal than other children. While studying the nutrition status of children, it has been found that children of

mothers with higher education levels and those living in households in the highest wealth quintile are least likely to be under weight (NDHS 2006). Considering all the above facts, researcher did not try to determine the association with malnutrition.

This study was conducted in a short period of time during winter season in pre-primary schools located in an urban area of Kathmandu Valley. The incidence of diarrhea in Nepal has two peaks the winter season (December to February), has mostly viral diarrhea, and during the summer (June to August) it has mostly bacterial diarrhea. Because, therefore, the incidence of diarrhea is seasonal, its findings cannot be generalized to the whole year. The observation of environment and sanitation conditions had been completed from information provided by the caretakers and the severity of diarrhea were not observed or assessed in this study. Further study, therefore, in the community may be desirable to overcome these limitations.

The weaknesses of this study include the following:

1) All diarrhea cases were based on information given by the caretakers, without any confirmation from the attending health practioner or from any health facility record which can have chances of misdiagnosis or misclassification. In addition to that the data were collected at one time-point, and the risk of childhood diarrhea varied with the season.

2) Being a cross-sectional study, the point of making causal inferences from the result is limited.

3) Observations of the environment and sanitation part were completed by the answers from the respondent

CHAPTER VI
CONCLUSION AND RECOMMENDATION

6.1 Conclusion

This cross sectional study was conducted in schools in the Lalitpur district of Nepal with the objectives to identify the factors related to the occurrence of diarrheal disease among pre-school children in under-five years of age. The association of various factors like socio-demographic, behavioral practice of caretaker, child factor, social support, Use of service and environment and sanitation factors were considered. The researcher found the result as following:

Majority of the caretakers were mothers aged 30 and more with median age of 30 years. Caretaker's minimum age was 20 and maximum age was 61yrs. Most of them had completed their secondary and higher secondary schools. Their main occupation as house wife including agriculture and majority were in low income group. Mostly they gave the time for child care was 8-15 hrs except in the school time.

Majority of the caretakers had fair level of knowledge on childhood diarrhea and mostly had negative attitude on diarrhea although greater portion on individual variables had positive attitude and half of the caretakers had good level of practice during diarrhea in under-five children

Most of the under-five children were of 37 to 48 months age group with median age being 45 months. Majority of them had normal birth weight and almost all had received measles immunization. Nearly half of them had received exclusive breastfeeding during first six months of their life. About 21 % of children under-five years had experienced diarrhea during the previous one month from the date of the interview. Majority (78.77%) did not have diarrhea. It was mostly of one time episode (20.67%) in the last one month and it was watery in type.

In relation to the environment and sanitation, regarding housing sanitation mostly it was hygienic and about water resource for drinking, for other use and storage of water were all of hygienic practice. Mostly they had hygienic practice in solid waste management also.

About one quarter of the respondents received support from female community health volunteer (FCHV) during their child having diarrhea. Nearly one third caretakers received support from school and half of the respondents received information about diarrhea from television.

Nearly two third of the respondents went to medical shop for taking the advice and medicine during their child having diarrhea. Similarly half of the caretakers went to more than one place for advice during diarrhea.

To test the statistical significance of the relationship between the independent variables and occurrence of diarrheal disease among under-five children, application of Binary logistic regression, Chi-square and Fisher exact test were done and further to check their association multiple logistic regression was applied. The study found mostly not significant statistically.

This study had been conducted in the schools of the municipality area with all the available facilities but if conducted in community based rural settings using in-depth interview, the results could have been different. So the results of this study cannot be generalized.

6.2 Recommendation based on the findings

1. Clean storage of drinking water and not having blocked drainage around or near the house which could have contaminated the food and drinking water, were found to be quite significant and hygienic. It should be encouraged to continue and disseminated this message during the health education activities performed by Lalitpur district health office.

2. Majority of the respondents had correctly accepted the statements like “better to increase home fluids once the child starts having diarrhea”, “eating foods left uncovered can cause diarrhea” ,“water should be boiled or filtered before drinking”, “exclusive breastfeeding up to six months of age reduces the occurrences of diarrhea” and “hand washing with soap after child passes stool”. Lalitpur district health office has worked a lot to reach these messages at the community level and request to strengthen the health education with more important health messages to the community.

3. Most of the respondents still have false belief and practice like “vomiting after giving ORS, medicine should be given”, “teeth eruption can cause diarrhea”, “diarrhea is normal for child’s growth and development”, “medicine should be used to get better from diarrhea early” and “blood mixed diarrhea will not get better by giving medicine”. Lalitpur district health office should give priority to disseminate to these statements positively as an important health messages to the community.

4. Cohort study is required to examine the relationship between the study factor and occurrence of diarrhea.

5. Children in both rural and urban areas should be included in further study.

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APPENDICES

APPENDIX A

Table 1A Relationship between the practice of caretakers and diarrheal disease occurrence among under-five children (n =179)

Practice of caretakers on childhood diarrhea	Diarrheal disease occurrence		Crude OR	CI		p-value
	With diarrhea %	Without diarrhea %		Lower	Upper	
Practice level						**0.234**
Poor (≤ 14)	33.33	66.67	**0.41**	0.15	1.13	**0.086**
Fair (15-19)	22.39	77.61	**0.58**	0.21	1.61	**0.293**
Good (≥ 20)	17.05	82.95	**1.00**			

Table 2A Correlation analysis among Knowledge, Attitude and Practice of caretakers

Variables	Correlation coefficients	p-value
Knowledge and Practice score	0.154	0.040
Attitude and Practice score	0.171	0.022
Attitude and knowledge score	0.352	0.001

Table 3A Relationship between Drinking water storage and Blocked drainage

Drinking water storage	Blocked drainage: Unhygienic Number	Unhygienic %	Hygienic Number	Hygienic %
Unhygienic	25	35.21	46	64.79
Hygienic	35	32.41	73	67.59

p-value = 0.698

Table 4A Relationship between Behavioral practice and use of FCHV as social support,

Social support with behavioral practice	n	Use FCHV %	Not use FCHV %	p-value of the chi-square test
Knowledge Level				**0.003**
Good (> 16)	70	38.57	61.43	
Fair (12-16)	95	15.79	84.21	
Poor (<12)	14	35.71	64.29	
Attitude Level				**0.101**
Negative (≤ 34)	132	15.15	84.85	
Positive (35-43)	47	6.38	93.62	
Practice level				**0.194**
Good (≥ 20)	88	25.00	75.00	
Fair (15-19)	67	22.39	77.61	
Poor (≤ 14)	24	41.67	58.33	

Table 5A Relationship between Behavioral practice and use of School as social support (n=179)

Social support with behavioral practice	n	Use of School %	No use of School %	p-value of the chi-square test
Knowledge Level				**0.003**
Good (> 16)	70	38.57	61.43	
Fair (12-16)	95	15.79	84.21	
Poor (<12)	14	35.71	64.29	
Attitude Level				**0.101**
Negative (≤ 34)	156	28.21	71.79	
Positive (35-43)	23	13.04	86.96	
Practice level				**0.194**
Good (≥ 20)	88	25.00	75.00	
Fair (15-19)	67	22.39	77.61	
Poor (≤ 14)	24	41.67	58.33	

Table 6A Relationship between Behavioral practice and use of Mass media TV as social Support(n=179)

Social support with behavioral practice	n	Use of TV %	No use of TV %	p-value of the chi-square test
Knowledge Level				**0.784**
Good (>16)	70	47.14	52.86	
Fair (12-16)	95	52.63	47.14	
Poor (<12)	14	50.00	50.00	
Attitude Level				**0.275**
Negative (≤ 34)	156	51.28	48.72	
Positive (35-43)	23	39.13	60.87	
Practice level				**0.486**
Good (≥ 20)	88	51.14	48.86	
Fair (15-19)	67	44.78	55.22	
Poor (≤ 14)	24	58.33	41.67	

Table 7A Relationship between Behavioral practice and use of health facility(n=179)

Use of service with behavioral practice	n	Use of health facility	No use of Health facility	p-value of the chi-square test
		%	%	
Knowledge Level				**0.283**
Good (> 16)	70	65.71	34.29	
Fair (12-16)	95	61.05	38.95	
Poor (<12)	14	42.86	57.14	
Attitude Level				**0.605**
Negative (≤ 34)	156	62.18	37.82	
Positive (35-43)	23	56.52	43.48	
Practice level				**0.069**
Good (≥ 20)	88	61.36	38.64	
Fair (15-19)	67	68.66	31.34	
Poor (≤ 14)	24	41.67	58.33	

Table 8A Relationship between Behavioral practice and use of traditional healer (n=179)

Use of service with behavioral practice	n	Use of traditional healer	No use of traditional healer	p-value of the chi-square test
		%	%	
Knowledge Level				**0.014**
Good (> 16)	70	28.57	71.43	
Fair (12-16)	95	26.32	73.68	
Poor (<12)	14	00	100.00	
Attitude Level				**0.911**
Negative (≤ 34)	156	25.00	75.00	
Positive (35-43)	23	26.09	73.91	
Practice level				**0.001**
Good (≥ 20)	88	12.50	87.50	
Fair (15-19)	67	28.36	71.64	
Poor (≤ 14)	24	62.50	37.50	

Table 9A Relationship between Behavioral practice and use of pharmacy (n=179)

Use of services with behavioral practice	n	Use pharmacy	No use of pharmacy	p-value of the chi-square test
		%	%	
Knowledge Level				**0.097**
Good (> 16)	70	72.86	27.14	
Fair (12-16)	95	58.95	41.05	
Poor (<12)	14	50.00	50.00	
Attitude Level				**0.226**
Negative (≤ 34)	156	65.38	34.62	
Positive (35-43)	23	52.17	47.83	
Practice level				**0.001**
Good (≥ 20)	88	51.14	48.86	
Fair (15-19)	67	70.15	29.85	
Poor (≤ 14)	24	91.67	8.33	

Table 10A Relationship between Behavioral practice and visit to more than one place (n=179)

Use of services with behavioral practice	n	Visit to more than one place	No visit to more than one place	p-value of the chi-square test
		%	%	
Knowledge Level				**0.132**
Good (>16)	70	57.14	42.86	
Fair (12-16)	95	49.47	50.53	
Poor (<12)	14	28.57	71.43	
Attitude Level				**0.449**
Negative (≤ 34)	156	51.92	48.08	
Positive (35-43)	23	43.48	56.52	
Practice level				**0.001**
Good (≥ 20)	88	36.36	63.64	
Fair (15-19)	67	61.19	38.81	
Poor (≤ 14)	24	75.00	25.00	

APPENDIX B
QUESTIONNAIRE

Factors related to the occurrence of diarrheal disease among under-five children in Lalitpur District of Nepal

This questionnaire has been prepared to generate data for a thesis as part of an MPHM course. All the information gathered will be kept strictly confidential.

General Information

Date of Interview ----------

Name of the caretaker ----------

Address ----------

Part I : Socio-demographic factors of caretakers

1. Age _____ yrs.
2. Gender of caretaker
   - [ ] 1 Female
   - [ ] 2 Male
3. Relationship to the child
   - [ ] 1 Mother
   - [ ] 2 Father
   - [ ] 3 Grandparent
   - [ ] 4 uncle/ Aunt
   - [ ] 5 other (please specify)
4. Education level
   - [ ] 1 No school
   - [ ] 2 Primary (1-6)
   - [ ] 3 Secondary (7-10)
   - [ ] 4 Higher secondary (10+2)
   - [ ] 5 Bachelor and above

5. Occupation

[ ] 1 Housewife or unemployed [ ] 2 Service worker

[ ] 3 Self employed [ ] 4 Agriculture

[ ] 5 Others (please specify)

6. Family Income in Nep Rs. (US $)

[ ] 1 Less than 10,000 (150) [ ] 2 10,000 to 15,000 (150-250)

[ ] 3 15000 and above (250)

7. Time given for the child's care in 24 hours

[ ] 1 Less than 8 hours [ ] 2 8-15 hours

[ ] 3 More than 16 hours

Part II : Behavioural Practice of Caretaker

1. Knowledge of caretaker about diarrhea

Make the following statements by a tick (√) in yes or no

S.No.	Questions	Yes	No
1	Diarrhea is the passing of watery stools one time in a day with/without vomiting		
2	If there is vomiting after giving ORS, medicine should be given to stop vomiting		
3	Blood mixed diarrhea will not get better by giving medicine		
4	Diarrhea is normal for a child's growth and development		
5	Dehydration is the leading cause of death in children with diarrhea		
6	Teeth eruption in children can cause diarrhea		
7	Five or more watery stools without sunken eyes is severe diarrhea		
8	A child having diarrhea, and feeling thirsty and having sunken eyes, is normal		

S.No.	Questions	Yes	No
9	Giving ORS in a child with diarrhea can prevent dehydration		
10	It is better to stop giving food, fluids and milk during diarrhea		
11	It is better to increase home fluids, once the child starts having diarrhea at home		
12	Exclusive breastfeeding helps to prevent diarrhea.		
13	Breastfeeding should be continued during diarrhea		
14	Eating foods left uncovered for hours can cause diarrhea		
15	During diarrhea drugs should be given instead of ORS		
16	Diarrhea can occur if hand washing not done before feeding the child every time		
17	A child with diarrhea, who cannot breastfeed or take fluid, should be taken to a health service provider		
18	Water should be boiled or filtered before drinking		
19	Frequent diarrhea may cause malnutrition		
20	A child who does not get better with ORS, should be taken to a health service provider		

2. Attitude of caretaker on diarrhea

Caretaker attitude to the following statements are classified into 5 levels : SA = strongly agree, A = Agree, N = Neutral, D = Disagree and SD = strongly disagree. The Interviewer must select the one which is nearest to the respondent's opinion

Questions	SA	A	N	D	SD
1. Medicine should be used to get better from diarrhea early					
2. Diarrheal disease can be transmitted not only to the other family members but also to the community as well					
3. Diarrhea in children is not preventable					
4. Avoiding fluids, milk and solid food during diarrhea will prevent vomiting which will help a child to recover faster					
5. Children who eat uncooked food, and drink unclean water, are prone to get diarrhea					
6. Children with more than 3 watery stools should be treated by anti-diarrheal drugs					
7. Fluids and electrolytes lost during diarrhea cannot be replaced by ORS or oral home fluids					
8. Exclusive breastfeeding up to six months of age reduces the occurrence of diarrhea					
9. Children under 5 years of age with diarrhea have more chances of dying from severe diarrhea than adults					
10. Children with simple diarrhea need intra-venous (IV) fluids to prevent dehydration					

3. Practice of caretakers

The Interviewer must ask each question and indicate the answer which is closest to the respondent's practice (Choose only one answer)

1. When do you take your child to a health service provider?

[ ] 1 passing watery stools only once in 24hrs. [ ] 2 not able to drink or drinking poorly

[ ] 3 drinking and eating well

2. When do you take your child health facility if he has following signs

[ ] 1 develops sunken eyes [ ] 2 child playful

[ ] 3 drinking and feeding well

3. How often do you practice hand washing before preparing food?

[ ] 1 every time (> 3 times a day) [ ] 2 often (twice a day)

[ ] 3 sometimes (once a day) [ ] 4 never (please skip to Q 5)

4. Do you wash with soap before preparing food?

[ ] 1 no, water only [ ] 2 yes, water and soap

5. How do you give food to your child?

[ ] 1 by using my bare hands [ ] 2 by using a spoon

[ ] 3 both

6. How often do you practice hand washing before feeding your child?

[ ] 1 every time (> 3 times a day) [ ] 2 often (twice a day)

[ ] 3 sometimes (once a day) [ ] 4 never (please skip to Q8)

7. Do you wash with soap before feeding your child?

[ ] 1 no, water only [ ] 2 yes, water and soap

8. How often do you practice hand washing after child passing a stool?

[ ] 1 every time [ ] 2 sometimes

[ ] 3 never (please skip to Q10)

9. Do you wash with soap after you have defecated?

[ ] 1 no, water only [ ] 2 yes, water and soap

10. How often do you clean the feeding utensils of your child?

[ ] 1 every time (> 3 times a day) [ ] 2 often (twice a day)

[ ] 3 sometimes (once a day) [ ] 4 never (please skip to Q12)

11. Do you use soap or detergent to clean the feeding utensils of your child?

[ ] 1 no, water only [ ] 2 yes, water and Soap/detergent

12. How do you keep or prevent flies from contaminating your cooked or leftover foods?

[ ] 1 with the use of food covers [ ] 2 cupboard

[ ] 3 refrigerator [ ] 4 Do nothing

13. How do you clean the feeding bottle that is being used by your child?

[ ] 1 washing them with soap and boiling them

[ ] 2 washing them with soap and water only

[ ] 3 washing with water only

[ ] 4 do not bottle feed but use cup and spoon

14. What kind of drinking water do you use to feed your child?

[ ] 1 boiled water

[ ] 2 unboiled water from deep well

[ ] 3 unboiled tap water

[ ] 4 jar or bottle of mineral water

15. What do you do when your child passes a stool?

[ ] 1 throw it in the toilet

[ ] 2 leave it around the house

[ ] 3 throw in an open fixed space

16. What do you do when your child has diarrhea?

[ ] 1 give ORS or homemade fluids at home

[ ] 2 go to see a health service provider (doctor, paramedic)

[ ] 3 go to see the nearest pharmacy and follow the pharmacist's advice

[ ] 4 go to see Female Community Health Volunteer (FCHV)

[ ] 5 go to see a traditional healer (Dhami, Jhakri)

[ ] 6 other (please specify)

Part III : Child Factors

The child should be under 5 years of age on the day of the interview.

1. Age of the Child in months _____

2. Birth weight in grams _____

3. Immunization (Measles vaccine is given between 9 months to 1year of age; EPI schedule)

[ ] 1 received [ ] 2 not received

4. What type of milk was given to your child during the first six months of life?

[ ] 1 breast milk only (exclusive breastfeeding)

[ ] 2 powdered milk

[ ] 3 cow's or buffalo's milk

[ ] 4 breast milk and other milk as mentioned above

[ ] 5 other (please specify)

5. Did your child experience an episode of diarrhea (watery or loose stools >3 times in 24 hours) in the past one month including today?

[ ] 1 yes [ ] 2 no (please skip to Q part IV)

6. If so then, how many times diarrhea occurred lasting for at least two days at one time in the past one month ?

[ ] 1 one time [ ] 2 two time [ ] 3 three or more times

7. What was the type of diarrhea?

Watery	[ ] 1 yes	[ ] 2 no
Bloody	[ ] 1 yes	[ ] 2 no
Associated with fever	[ ] 1 yes	[ ] 2 no

Part IV : Social Support

1. During diarrhea do you get support from your nearby Female Community Health Volunteer?

[ ] 1 yes [ ] 2 no

2. Do you get help from the school while the child is having diarrhea?

[ ] 1 yes [ ] 2 no

3. Which of the following mass media has helped you most to know about diarrhea?

[ ] 1 radio [ ] 2 television

[ ] 3 newspapers [ ] 4 posters in health facilities

Part V : Use of Service during diarrhea

1. Did you attend a health facility while the child had diarrhea?

[ ] 1 yes [ ] 2 no

2. Did you go to a Medicine shop (Pharmacy) to get medicine?

[ ] 1 yes [ ] 2 no

3. Did you go to a traditional healer (dhami, Jhakri) while the child had diarrhea?

[ ] 1 yes [ ] 2 no

4. Did you visit more than one place (as explained above) for diarrhea problem?

[ ] 1 yes [ ] 2 no

Part VI : Environment and Sanitation

Household condition

1. Condition around your house regarding house-flies and breeding places

[ ] 1 present [ ] 2 absent

2. Flooring of the kitchen

[ ] 1 cement [ ] 2 earth ground

[ ] 3 other

3. Animal raising or livestock under or around the house?

[ ] 1 present [ ] 2 absent

Water resource management

4. Current source of drinking water

[ ] 1 deep tube well [ ] 2 tap water

[ ] 3 tap water boiled or filter [ ] 4 natural water (dhunge-dhara)

5. Source of water for other use

[ ] 1 deep tube well [ ] 2 tap water

[ ] 3 shallow well [ ] 4 rain water

6. Drinking water stored in

[ ] 1 jar with cover [ ] 2 filtered

[ ] 3 jar without cover [ ] 4 other (please specify)

Human waste disposal

7. Does everybody use the latrine?

[ ] 1 yes [ ] 2 no

8. Latrine condition (adequate ventilation, water and cement flooring)

[ ] 1 hygienic [ ] 2 unhygienic

9. Material used for cleaning after defecation

[ ] 1 water [ ] 2 paper

[ ] 3 both [ ] others (please specify)

Solid waste management

10. Solid waste or garbage collection (routinely)

[ ] 1 present [ ] 2 not present

11. Is there a drainage system for domestic waste water?

[ ] 1 present [ ] 2 absent

12. Any blocked drainage around or near your house?

[ ] 1 present [ ] 2 not present

Thank you very much for your cooperation

Namaste

Name of the Interviewer _____

BIOGRAPHY

NAME	Tekendra Karki
DATE OF BIRTH	January 2, 1953
PLACE OF BIRTH	Bhojpur, Nepal
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