

**A DESCRIPTIVE STUDY ON WATER SANITATION
HYGIENE AND DIARRHOEAL MORBIDITY AMONG
UNDER FIVE YEARS CHILDREN AT COMMUNITY
LED TOTAL SANITATION ELICITED AREA IN
NAWALPARASI**



Anup K.C.

**Department of Public Health
School of Health and Allied Sciences
Pokhara University
Kaski, Nepal
2012**

**A DESCRIPTIVE STUDY ON WATER SANITATION
HYGIENE AND DIARRHOEAL MORBIDITY AMONG
UNDER FIVE YEARS CHILDREN AT COMMUNITY
LED TOTAL SANITATION ELICITED AREA IN
NAWALPARASI**

Anup K.C.

In partial fulfillment of the requirements for the
Degree of Bachelor of Public Health (BPH)

A dissertation submitted to
Department of Public Health
School of Health and Allied Sciences
Pokhara University
Lekhnath-12, Kaski, Nepal

December 2012

APPROVAL SHEET

DECLARATION

To the best of my knowledge and belief I declare that this dissertation entitled "A DESCRIPTIVE STUDY ON WATER SANITATION HYGIENE AND DIARRHOEAL MORBIDITY AMONG UNDER FIVE YEARS CHILDREN AT COMMUNITY LED TOTAL SANITATION ELICITED AREA IN NAWALPARASI" is the result of my own research and contains no materials, academic or non-academic, previously published by any other person or sources, except where the due acknowledgement is mentioned. This dissertation report contains no material, which has been accepted for the award of any other degree or diploma in any university or academic institutions.

Signature:

Name: Anup K.C.

Registration No: 2008-1-37-0005

Examination Roll No: 92044

Date:

SUPERVISOR CERTIFICATE

I, Mr. Ishor Sharma, the supervisor of Mr. Anup K.C., a BPH student in the Department of Public Health, School of Health and Allied Sciences at Pokhara University, have been through this dissertation titled “A DESCRIPTIVE STUDY ON WATER SANITATION HYGIENE AND DIARRHOEAL MORBIDITY AMONG UNDER FIVE YEARS CHILDREN AT COMMUNITY LED TOTAL SANITATION ELICITED AREA IN NAWALPARASI” and I am satisfied that the documentation is academically sufficient as a basis for examination and approve this research work.

Signature: _____

Name: Ishor Sharma

Designation: Assistant Professor

Date: _____

CONTENTS

Approval Sheet.....	i
Declaration.....	ii
Supervisor Certificate	ii
List of Tables	vi
Acronyms.....	vii
Acknowledgement	viii
Summary	ix
CHAPTER I: INTRODUCTION.....	1-4
1.1 Background.....	1
1.2 Problem Statement	2
1.3 Rationale of study.....	3
1.4 Research questions	3
1.5 Objective	4
1.5.1 General objective	4
1.5.2 Specific objectives	4
1.6 Expected Outcome	4
CHAPTER II: LITERATURE REVIEW	5-7
CHAPTER III: METHODOLOGY	8
3.1 Research design.....	8
3.2 Study population	8
3.3 Sampling frame	8
3.4 Sampling techniques	8
3.5 Study Area.....	8
3.6 Sample size calculation	8
3.7 Inclusion Criteria.....	9

3.8 Data collection tools.....	9
3.9 Data collection techniques and process.....	9
3.10 Data processing and analysis.....	9
3.11 Validity and reliability	9
3.12 Pre-testing of the tool	10
3.13 Ethical considerations	10
CHAPTER IV: RESULTS.....	11-25
4.1 General information	11
4.1.1 Religion of respondent	11
4.1.2 Ethnicity of the respondent	12
4.1.3 Educational status of household head	12
4.1.4 Educational status of mother of children below five years.....	13
4.1.5 Occupational status of household head	14
4.1.6 Economic status of household	15
4.2 Sanitation profile.....	15
4.2.1 Sanitation coverage	15
4.2.2 Defecation places for household with no-sanitation	16
4.2.3 Status of the sanitation	16
4.2.4 Sanitary inspection	17
4.3 Water	17
4.3.1 Source of water	17
4.3.2 Water source Surface	18
4.4 Hygiene	18
4.4.1 Hand washing with soap/ detergent practices at critical times	18
4.4.2 Disposal of feces of children of age below five years	19
4.4.3 Waste disposal practices	19
4.4.4 Water purification	20

4.5. Diarrhoeal disease among under five years of age children.....	20
4.5.1 Diarrhoeal disease among under five years of age children	20
4.6 Statistical analysis	21
4.6.1 Association between socio-demographic characteristics and diarrhea among under five years aged children	21
4.6.2 Association between sanitation and diarrhoeal disease among children age below five years	22
4.6.3 Association between water source and diarrheal among under five years aged children	23
4.6.4 Association between hygiene and diarrheal disease among under five years aged children	24
CHAPTER V: DISCUSSION	26-28
CHAPTER VI: CONCLUSION AND RECOMMENDATION	29-30
6.1 Conclusion.....	29
6.2 Recommendation.....	30
REFERENCES	31
APPENDICES	xi
Annex A: Questionnaire.....	xi
Annex B: Map	xvi

LIST OF TABLES

Table 1 Religion of respondent.....	11
Table 2 Ethnicity of respondents	12
Table 3 Educational status of Household Head	12
Table 4 Educational Status of mother.....	13
Table 5 Occupational status of household head.....	14
Table 6 Economic Status	15
Table 7 Sanitation Profile	15
Table 8 Defecation Places for Household with No-Sanitation	16
Table 9 Status of the sanitation.....	16
Table 10 Sanitary inspection.....	17
Table 11 Source of Water	17
Table 12 Water source Surface	18
Table 13 Hand washing practices	18
Table 14 Disposal of feces of children of age below five years	19
Table 15 Waste disposal	19
Table 16 Water purification	20
Table 17 Diarrheal Disease among children below five years of age.....	20
Table 18 Association between Socio-demographic Characteristics and Diarrhea Under five	21
Table 19 Association between Sanitation and Diarrheal Disease among Children Age below Five Years	22
Table 20 Association between Water Source and Diarrheal Disease among Children Age below Five Years.....	23
Table 21 Association between Hygiene and Diarrheal Disease among Children Age below Five Years	24

ACRONYMS

MGD	Millennium Development Goal
CLTS	Community Led Total Sanitation
WSH	Water Sanitation and Hygiene
I/NGO	International/ Non-Government Organization
IPRA	Ignited Participatory Rural Appraisal
ODF	Open Defecation Free
NDHS	National Demographic and Health Survey
UNICEF	United Nation International Children's Emergency Fund
WHO	World Health Organization

ACKNOWLEDGEMENT

I would like to mention my sincere thankfulness and deep sense of gratitude to all of those who provided their valuable assistance to accomplish this task successfully. Likewise my hearty gratefulness to all the parents of children aged under five years who voluntarily provided helpful hands during course of this study and warmly received my visits, answered the questionnaires and shared insights from their private lives with me.

Furthermore, I have been blessed with profoundly presence of exceptionally brilliant teachers throughout my academic span. The faculty and staff of School of Health and Allied Science, Pokhara University is no exception and, with heartfelt gratitude, I acknowledge their high support and guidance in successful completion of this thesis. In the same way, I extend my deepest appreciation to the Assistant Professor, Mr Ishor Sharma my supervisor, whose comments and guidelines have been of greatest value for the preparation of this thesis. In addition I would like to express my immense gratefulness to BPH coordinator Mr. Hari Prasad Kafle, Mr. Dilip Kumar Yadav, Mr. Ramji Prasad Adhikari and Mr. Hom Bahadur Thapa for their counseling and direction. It is matter of absolute pleasure and pride to thank Mr Chabbi Gaudel and entire RWSSP-WN family for their cooperation and encouragement. A special mention of my family here with reverence and love, my father Mr Krishna Bahadur K.C., mother Ms. Chandrawati K.C., sisters Bhawana K.C. and Sunayana K.C., for their endless encouragement and intellectual sharing for this thesis work.

I am deeply indebted to Mr Narayan Lamsal, a social worker from Dhaubadi-7, WASH unit of District Development Office, Nawalparasi and Engineer Utsav Thapa for their incredible support throughout data collection of the research.

I honestly dedicate this thesis to RWSSP-WN and the helping hands of this dissertation with the great love and respect.

SUMMARY

An improved access to safe water, sanitation and good hygiene are keys to a clean environment, socio-economic development and sound public health. Around half of the global population, 2.5 billions still lacks an access to improved sanitation facilities and 1.1 billion defecate in open areas. According to the MDG report 2012, total 89% of the population in 2010 had access to the improved form of water sources. Centre for Disease Control and Prevention has listed more than 144 entries associated with water-diseases, contamination and injuries. Diarrhea is one of the devastating diseases resulting 4 billion cases each year and 2.2 million deaths globally. More than 60% of deaths associated with diarrhea annually disproportional falls upon children below five years of age. The estimated impact of the improved water supply, excretion disposal and hygiene for all would decrease global child mortality by one-third.

Mentioning Nepal, only 38.2% of households are privileged with sanitation (improved non-shared) facilities, 38.4% of the people defecate in open places and 11% of total population has to rely on unimproved form of water supply. Around 12,700 children under-five face death annually due to poor hygiene and sanitation. Nepal has the wide disparity in the coverage of sanitation within VDCs, districts, region and as well within ecological area.

Kaski has the sanitation coverage of 87% while Nawalparasi has only 48%. According to a report made by 'Water Aid' during mid-2011, Nawalparasi district had put in amount Rs 241,104,077 since 2004/05 that yields the sanitation and drinking water coverage by 48% and 84% respectively. Remote VDC's located at hilly and terai belts of the district are a lead in water, sanitation and hygiene problems, and among them two are Bedauli and Dhaubadi VDCs. Despite the fact that development partners and Government of Nepal has made abundant investment for the attainment of ODF status by 2013, the district is still lagging the sanitation, water and hygiene coverage.

The descriptive cross-sectional study was carried out in 193 households with under five years children at Badauli and Dhaubadi VDCs. One child under five from each household was involved for the preparation of the research study. 177 samples were extracted using probability proportional to size sampling from two VDCs relative to population size. The data were collected using a structured questionnaire from the

mothers of the children and observations were made over the sanitation and water sources. The collected data were entered and analyzed through SPSS. The univariate analysis was done at 95% confidence interval to determine statistical significances using chi-square test and odds ratio.

In 177 sampled households, 70.6% of the households had access to sanitation and rest 50 households members practiced an open defecation. All the households were accessed to improved form of water sources. The study of hygiene level found 28% of mothers wash hand with a soap at critical times and 108 household disposes the faeces of the children in an improved way. During 12 months or a year period about 15% of the children were found to be infected with diarrhea.

In the statistical analysis, mothers' and household heads' education status, sanitation, water, and hand washing with soap at critical times had no significant association with the diarrhea. In the contrary to these, economic status, observable faeces and disposal of faeces of the children were found to be statistically significant with diarrhea among the children. The estimated risk for the children to suffer from the diarrhea at the house with unimproved faeces disposal of the child and the observable faeces were 0.170 and 8.935 times higher than a child from the house with an improved way of faeces disposal and observable faeces respectively.

In the comparison made with other literatures, WHS indicators at the CLTS elicited area of Nawalparasi were better and diarrheal incidence among the children were found to be lower than of many other related articles. The findings of this study suggested that hygiene aspects should be more focus rather than the physical accessibility of sanitation and water sources.

CHAPTER I

INTRODUCTION

1.1 Background

The improved access to safe water and sanitation with good hygiene are keys to a clean environment, socio-economic development and sound public health. While sanitation and hygiene improvements are regarded as some of humanity's greatest proceeds of the last century⁽¹⁾ but around half of the global populations, 2.5 billion still lack access to improved sanitation facilities⁽²⁾. Attainment of MDG target by making 75% of the global people access to sanitation has been challenged by the great disparity of sanitation according to regions and socio-economic development. In Oceania region only five million people don't have improved form of sanitation while Southern Asia has the worst situation with 1070 million people with no sanitation. Disparity is found to be more apparent in the rural area with every seven out of ten people in rural area are deprived from the sanitation facilities. Majority of 76% of the people in the urban where as only 45% of the rural are privileged with improved sanitation.⁽²⁾

Access to safe water is considered as one of the basic needs and the rights of the human beings. According to the MDG report 2012, 89% of people in 2010 were accessed to the improved form of water sources. A region wise disparity in access to improved form of water supply is found to be more pronounced. Almost 54 out of 100 people in Oceania region use improved water in comparison to Latin America and the Caribbean region with 94 people. In the same way, only 81% of the rural area people used improved water source, in compared with 96% of urban people.⁽²⁾

Centre for Disease Control and Prevention has listed more than 144 diseases associated with water-diseases, contamination and injuries. WHO has estimated that half of the hospital beds in developing nations are occupied by the patients of water and sanitation related resulting to 3.5 million deaths annually. Diarrhoea is one of the devastating diseases resulting 4 billion cases each year and 2.2 million deaths globally. More than 60% of death associated with diarrhoea annually disproportional falls upon children below five years of age.⁽³⁾

Globally about 14 million deaths among children are estimated due to inadequate access to WSH. Above all, health burden due to inadequate WSH falls disproportionately upon very young children.⁽⁴⁾ The estimated impact of the improved water supply, excrete disposal and hygiene for all would decrease global child mortality by one-third.

Despite introduction of various policies and reforms in Nepal, sanitation statistics are disheartening and the implications are unambiguous, still there is a hope and chances that coverage in sanitation will increase soon. Nepal is one of the signatory countries in MDG and MDG 7 and MDG 4 includes environmental sustainability and improvement of child health. In order to address the sanitation and child health problems of country, several I/NGOS, Governmental organizations including developmental partners are working with various approaches. Community Led Total Sanitation is one of the participatory approaches applied in different part of country and has been able to alter the water hygiene and sanitation profile of the community.

1.2 Problem Statement

According to the NDHS (2011) in Nepal, only 38.2% of the households are privileged with sanitation (improved non-shared) facilities, 38.4% of people defecate in open areas and 11% of total population has to rely on unimproved form of water supply.⁽⁵⁾ The people's abandonment from most basic needs: water, hygiene and sanitation yields many WSH related diseases that may lead to mortality. More population of the country (72 percent) has deviated health conditions due to WSH related diseases. Children aged below five are more susceptible to these diseases. Around 12,700 children aged under five face death annually due to poor hygiene and sanitation.⁽⁶⁾ Nepal has the wide disparity in the coverage of sanitation within VDCs, districts, region and also with in ecological area. Kaski has the sanitation coverage of 87 percentages while Nawalparasi has only 48 percentages.⁽⁷⁾ In the report of DWSS and NMIP, Hilly region has the highest sanitation coverage with 52% and Terai region has the least with 35.3%.⁽⁸⁾

The condition is more pitiable in the district like Nawalparasi that consists of huge number of so-called excluded and marginalized communities. According to a report made by WaterAid during mid-2011, the district has put in amount Rs 241,104,077 since 2004/05 that yield the sanitation and drinking water coverage by 48% and 84%

respectively.⁽⁷⁾ Remote VDC's at hilly and terai belts of the district are at the front in water, sanitation and hygiene problems, two of them are Beadauli and Dhaubadi VDCs. Despite the fact that development partners and Government of Nepal has made abundant investment for the attainment of ODF status by 2013 the district is still lagging at the sanitation, water and hygiene coverage.

1.3 Rationale of study

In Nepal, several reforms are conducted at the water and sanitation sectors to address irregularities that existed in water and sanitation fields in Nepal which affect environment and health of country people. Since 1950, many reforms have taken place and in the run of six decades different approaches in sanitation have been exercising in the country.

It is a fact that rare researches have been carried out in Nepal that addresses the effect of the sanitation approaches in health and development of people. So as to forecast the contribution made by CLTS approaches on the water, hygiene and sanitation, this research work is conducted. The research confines itself only to the efforts of WSH on diarrhoeal diseases among children less than five. Some more justifications behind conducting research are mentioned below:

- a. This study aimed to be helpful to develop the plan, policy, and programs about WSH for Governmental organizational, Developmental partners, and all the authorities concerned working in the area of WSH and child health.
- b. To confer the recommendations and guidelines regarding WSH.

1.4 Research questions

- a. What was the situation of water sanitation and hygiene at Nawalparasi?
- b. To what WSH altered the diarrhoeal morbidity among the children of age below five within 12 months?

1.5 Objective

1.5.1 General objective

To assess WSH and diarrhoeal disease within 12 months among under five years at CLTS Triggered Area of Nawalparasi.

1.5.2 Specific objectives

- a. To examine the availability of sanitation profile of CLTS triggered area of Nawalparasi.
- b. To identify source of water used at the household level.
- c. To find out the hygiene behavior of the people.
- d. To assess the contribution made by WSH on the diarrhoeal diseases with in 12 months among the children of age below five years.

1.6 Expected Outcome

- a. The study aimed to reveal the WSH outline of the study area.
- b. The study was expected to explore contribution made by WSH on diarrhoeal morbidity among children of under five years.
- c. This study intended to stimulate and arouse the interest of health professionals, experts and related personals to conduct further research in this area.
- d. This study was targeted to assist awareness-based program and maintain healthy lifestyle for the community and for the certain age-group children.

CHAPTER II

LITERATURE REVIEW

This study examined the association between drinking water, sanitation access, hygiene and likelihood that a child would be diarrheal. This literature review inspected and sum up key studies on child diarrhoea and the health outcomes of improving drinking water, sanitation and hygiene. Literatures discovering the impacts of clean drinking water sanitation and hygiene on child diarrhea were reviewed, although such studies were rather limited.

A case-control study conducted to evaluate improved environmental sanitation on diarrhea morbidity found that Improved sanitation appears to reduce diarrheal incidence, with an odds ratio estimate of 0.77 ($\chi^2 = 2.09$, $p = 0.15$). The results indicate that children living in families who use good quality water supplies and latrines experience 20% less diarrhea as reported to the health clinics during the warm, rainy season.⁽⁸⁾

In a research conducted to assess impact of latrine utilization on diarrhoeal diseases in the rural community of East Gojam found that most (61%) households with traditional pit latrines had latrine utilization. In a bivariate analysis, the extent of latrine utilization was significantly associated with presence of primary or secondary school children in the house [AOR: 1.47, 95% CI: (1.04-2.06)], perceived reasons for latrine construction [AOR: 2.89, 95% CI: (1.24-6.72)] and learning from neighborhoods [AOR: 10.07, 95% CI: (1.97-51.56)], ecology of 'Kolla' [AOR: 0.47, 95% CI: (0.29-0.74)] and 'Woyna-Dega' [AOR: 0.55, 95% CI: (0.38-0.81)], and owning latrines for >2 years [AOR: 2.13, 95% CI: (1.57-2.89)]. The occurrence of childhood diarrhea was not statistically associated with the extent of latrine utilization [AOR: 0.63, 95% CI: (0.22-1.81)]; however, only owning latrines for >2 years remained significant in a multivariate analysis [AOR: 0.28, 95% CI: (0.12-0.66)].⁽⁹⁾

Stephen P. Luby, Amal K. Halder et.al conducted an observational study in 347 households from 50 villages across rural Bangladesh in 2007. For the subsequent 2 years, a trained community resident visited each of the enrolled households every month and collected information on the occurrence of diarrhoea in the preceding 48 hours among household residents under the age of 5 years. Compared with children living in households where persons prepared food without washing their hands,

children living in households where the food preparer washed at least one hand with water only (odds ratio [OR] = 0.78; 95% confidence interval [CI] = 0.57–1.05), washed both hands with water only (OR = 0.67; 95% CI = 0.51–0.89), or washed at least one hand with soap (OR = 0.30; 95% CI = 0.19–0.47) had less diarrhoea. In households where residents washed at least one hand with soap after defecation, children had less diarrhea (OR = 0.45; 95% CI = 0.26–0.77). There was no significant association between hand washing with or without soap before feeding a child, before eating, or after cleaning a child's anus who defecated and subsequent child diarrhoea.⁽¹⁰⁾

In the study conducted at the Rural Zimbabwe to examine the effect of the partial latrine coverage on the diarrhoeal morbidity at household and community level found that in Community A, 62% of the children lived in household with a latrine and in community B, there was no sanitation Diarrheal morbidity was 68% lower in community A than community B. In addition the children from the households in community A without latrine had diarrhoeal morbidity than the children in community B.⁽¹¹⁾

The study conducted for the assessment of prevalence and environmental determinants/factors of under-five diarrheal morbidity in Nekemte town at Western Ethiopia found that prevalence of diarrhoeal morbidity over a period of two weeks preceding the study was about 28.9%. In the Bivariate analysis, a number of risk factors including distance from drinking water sources (time taken to-and-from the sources), availability & ownership of the latrine, refuse disposal, the presence of feces around the pit-hole ($P < 0.001$) and presence or absence of pit-hole cover & feces seen in the compound ($P < 0.05$) appeared to be significantly associated with under-five childhood diarrhoeal morbidity. However, absence of refuse disposal facility and presence of feces around the pit-hole were the only significant variables on multivariate analyses ($P < 0.05$).⁽¹²⁾

In a health impact evaluation of the Rural Sanitation Pilot Project in Mohale's Hoek district, Lesotho, indicated that under-5-year-olds from households with a latrine may experience 24% fewer episodes of diarrhoea than such children from households without a latrine (odds ratio = 0.76; 95% confidence interval, 0.58-1.01). The impact of latrines on diarrhea was greater in those households that used more water, practiced

better personal hygiene, and where the mothers had a higher level of education or worked outside the home.⁽¹³⁾

In a comprehensive literature review conducted through analysis of 144 research articles six of them related to impact of hygiene on diarrhoeal morbidity reported that median reduction on the morbidity of diarrheal diseases was 33%. The 30 studies were related to sanitation and 21 of them reported that improved sanitation lead to improved health and 11 of them showed 22% reduction in morbidity where as the 18 rigorous studies showed the reduction in the morbidity due to the sanitation is 36%. In the study of 16 articles, seven of them reported that access to quality water reduced diarrhoeal morbidity by 17% where as four of the seven rigorous studies reduction in the morbidity by 15% only.⁽¹⁴⁾

In a study conducted at Ikafara it was found that having a latrine within the compound was associated with lower odds of having a case of disease (OR, 0.40 [0.16 to 0.94]; P 5 0.037). Out of 307 latrines, 278 (91%) latrines were simple and were less frequently associated with diarrhoea than ventilated improved pit latrines (OR, 0.50 [0.23 to 1.09]; P 5 0.082). There was not a significant relationship between the risk of having a case of disease and religion (OR, 1.01 [0.62 to 1.64]; P 5 0.96); having been in “shamba” (agricultural garden outside of town) in the last 7 days (OR, 1.6 (0.86 to 2.94); P 5 0.14); having a career education (OR, 1.05 [0.96 to 1.15]; P 5 0.26); type of house (OR, 1.30 [0.77 to 2.16]; P 5 0.33); iron roof (OR 1.35 [0.82 to 2.22]; P 5 0.24); type of water source (compared with tap water, the covered well has an OR of 0.60 [0.30 to 1.21], the uncovered well has an OR of 0.48 [0.81 to 2.68], and the river has an OR of 1.21 [0.70 to 21.04] [P 5 0.51]), boiling drinking water (OR, 0.67 [0.25 to 1.80]; P 5 0.43); filtering drinking water (OR, 1 [0.25 to 3.40]; P 5 1); or having a toilet cover (OR, 1.25 [0.71 to 2.18]; P 5 0.43).⁽¹⁵⁾

CHAPTER III

METHODOLOGY

3.1 Research design

This research is based on Descriptive study design.

3.2 Study population

The study populations for this research study were children .below five years

3.3 Sampling frame

The sampling frame for this research study was based on the listing of a child or children aged below five from the respective Sub-Health Post.

3.4 Sampling techniques

This research adopted multistage sampling technique. The two VDCs were selected randomly out of five CLTS triggered VDCs of Nawalparasi. Afterwards, the households were selected according to ward level at VDC. Then the households with a child or children below five years were selected according to the ethnic distribution from the ward level.

3.5 Study Area

Dhaubadi and Bedauli VDCs of Nawalparasi district

3.6 Sample size calculation

$$n = \frac{(Za)^2 P(1 - P)}{d^2}$$

Where,

d= margin of error=0.05

P= expected proportion=0.881

a= statistic at level of confidence=0.05

n=161

Assuming the non response rate of 20% the sample size will be 161+32=193

3.7 Inclusion Criteria

- a. Households with children below five year of age.
- b. A child is taken for the study from every household.
- c. Mother of a child of age below 5 years (if available at research time).
- d. When mother was not present at home, father of the child was taken as the respondent.

3.8 Data collection tools

In this research study, questionnaires and observational tools were used as method of data collection. The questionnaire was categorized into General information, Sanitation, Water, Hygiene, Diseases and observation sections.

3.9 Data collection techniques and process

Pretested structured questionnaire was prepared after receiving the beforehand consent from every (193) parents of child/children aged under five. In this research 20% was regarded as non-response rate and only 177 responses were collected.

The interview technique and observation method were followed during data collection in the particular community and extended from 19th August to 2nd September 2012.

3.10 Data processing and analysis

Data collected was edited and processed on the same day of data collection to correct errors and for coding. The collected questionnaire was arranged according to VDC wise. The data was entered through SPSS and descriptive and other statistical analysis was performed through SPSS. In univariate analysis, the odds ratio with confidence interval as 95% was calculated to find statistical significances. Descriptive statistics were applied over demographic characteristics, sanitation coverage, water sources and hygiene practices.

3.11 Validity and reliability

Questionnaire was pretested and modifications were made. Experts' and Scholars' opinions were incorporated in every aspects of the study.

3.12 Pre-testing of the tool

Questionnaire and observational checklist were pretested and modified at the points of difficulties taking into account the situation and circumstances in the community. Pre-testing was carried at twenty households at suburb area of Pokhara Sub-metropolitan city and necessary amendments were performed too.

3.13 Ethical considerations

The research study proceeded post approval of research committee at Department of Public Health, Pokhara University. Before the survey came to an effect, the purpose and need of the study was explained to the respondent member. Informed and before-hand consent was granted from Municipality office as well as from respondents during the data collection. Confidentiality of the data were maintained and used only for this research purpose.

CHAPTER IV

RESULTS

The findings of the research are presented on six major headings: General information, Sanitation profile, Water, Hygiene, Diarrhoeal occurrence among under five years aged children and Statistical analysis. The respective headings are presented into different sub-heading according to need.

4.1 General information

4.1.1 Religion of respondent (n=177)

Table 1 Religion of respondent

Characteristics	Frequency	Percent
Hindu	157	88
Muslim	14	7.9
Christian	6	3.4
Others	0	0

Majority of the respondents 157 (88%) were Hindus which was followed by Muslim and Christians with 14 (7.3%) and 6 (3.4%) respectively.

4.1.2 Ethnicity of the respondent (n=177)

Table 2 Ethnicity of respondents

Characteristics	Frequency	Percent
Dalit	31	17.5
Indigenous/Ethnic Group	60	33.9
Muslim	14	7.9
Disadvantaged Terai Caste	56	31.6
Others	16	9

It was been found that majority of respondent 60 (33.9%) were affiliated with Indigenous/Ethnic group. Disadvantaged Terai group hold second position with 56 (31.6%). In a same way so called Dalit and Muslim were found 31 (17.5%) and 14 (7.9%) respectively. The so called other groups were found to be 16 (9%) only.

4.1.3 Educational status of household head (n=177)

Table 3 Educational status of household head

Characteristics	Frequency	Percent
Uneducated	74	41.8
Primary	63	35.6
Some secondary	27	15.3
SLC or Above	13	7.3

In the study of educational status⁽⁵⁾ of the household head, it was found that majority of the household heads 74 (41%) were found to be deprived from the formal system of education. A formal system of primary education was obtained by 63 (35.6%) of household heads and followed by secondary level education by 27 (15.3%). A few household heads 13(7.3%) obtained higher education, SLC or above.

4.1.4 Educational status of mother of children below five years (n=177)

Table 4 Educational status of mother

Characteristics	Frequency	Percent
Uneducated	65	36.7
Primary	45	25.4
Some Secondary	40	22.6
SLC or Above	27	15.3

The study revealed that 65 (36.7%) mothers were uneducated, and had no access to formal education. The proportion of the primary and lower secondary educated mothers were 45 (25.4%) and 40 (22.6%). And only 27 (15.3%) mothers were found to privileged with SLC or above.

4.1.5 Occupational status of household head (n=177)

Table 5 Occupational status of household head

Characteristics	Frequency	Percent
Agriculture	92	52
Non-industry	7	4
Services	23	13
Wage labor	28	15.8
Occupation by caste	8	4.7
Household work	10	5.9
Trade	5	2.8
No occupation	3	1.7
Others	2	1.1

The study found that occupational status of household heads⁽¹⁶⁾ irrespective of his/her usual presence at home. Ninety two (52%) household heads reported agriculture and 28(15.8%) mentioned wage labor as their major form of occupation. Almost 13% of the household said service as their main occupation and was followed by household workers with 5.9%. The numbers of household heads following caste-occupation is seven and holds 4.7% of the total households' head. The proportion of the heads involved in Non-industrial work and trade were 4% and 2.8% respectively. It was followed by non-occupational household heads with 1.7 percent. About one percent of the total household head was found to be employed in other forms of occupation.

4.1.6 Economic status of household (n=177)

Table 6 Economic status

Characteristic	Frequency	Percent
Ultra Poor	85	48
Transect Poor	33	18.6
Non-Poor	59	33.3

Three main types of the economic status⁽¹⁷⁾ were subjects of the study. Eighty five (48%) of the households were found to be Ultra Poor. Proportions of the households being Transect poor were 18.6% and 33.3% (59) household were at non-poor category.

4.2 Sanitation profile.

4.2.1 Sanitation coverage (n=177)

Table 7 Sanitation coverage

Characteristics	Frequency	Percent
Sanitation	125	70.6
No-sanitation	52	29.4

The sanitation was an indicator of NDHS (2011). The study revealed that majority 125 (70.6%) of the houses were found to be privileged with an improved non-shared latrine. But still 52 (29.4%) of the households were assessed with sanitation other than improved-non shared latrine.

4.2.2 Defecation places for household with no-sanitation (n=52)

Table 8 Defecation Places for Household with No-Sanitation

Characteristics	Frequency	Percent
Shared	2	3.85
Open-defecation	50	96.15

Among the household with no sanitation, two of them (3.85%) defecated at neighbors' toilet and members of 50 households (96.15%) defecated at open places.

4.2.3 Status of the sanitation (n=125)

Table 9 Status of the sanitation

Characteristics	Frequency	Percent
Need reconstruction	1	0.8
Need no maintenance /construction	114	91.2
Need further construction	10	8

Status of Sanitation⁽⁹⁾ referred to the superstructure of the latrine. More than 91% required no maintenance or construction. But eight percent required further construction which means ten of the toilets' needn't fulfill physical condition criteria. It required either construction/renovation like roofing, placing door or other materials etc. The finding revealed that less than one percent requires a complete reconstruction of toilets.

4.2.4 Sanitary inspection (n=125)

Table 10 Sanitary inspection

Characteristics	Frequency	Percent
Brush	86	68.8
Cleaning Chemical	48	38.8
Sufficient Water*	100	80
Appropriate Distance**	91	73.6
Impervious	121	96.8

**it resembles 10 liters or more amount of water in a bucket at toilet*

***it resembles 30meters or more distance between water source and toilet*

The Sanitary Inspection was based on the observation over the some vital requirements and necessities at sanitation facilities. Overall 125 sanitations were observed. Brushes for cleaning the pan of latrine was available at 86 or (68.8%) sanitations. Likewise only 48 (38.8%) sanitations preferred chemical products for cleaning the toilet. Proportional sanitation with sufficient water was 80% (100) and about 73% of sanitations were at appropriate distance from main source of water. Majority (96.8%) of the toilet surface were found to be impervious.

4.3 Water

4.3.1 Source of water (n=177)

Table 11 Source of water

Characteristics	Frequency	Percent
Piped water inside yard	27	15.3
Public tap	62	35
Tube well inside yard	88	49.7

Drinking water source was NDHS indicator. All household were found to be assessed with the improved form of water sources. About 50% households were accessed with

tube/bore-hole. Proportion of the household assessed to the public tap and piped water supplying system at house yard were 35% and 15% respectively.

4.3.2 Water source Surface (n=177)

Table 12 Water source Surface

Characteristics	Frequency	Percent
Impervious	161	91
Non-impervious	16	9

On the observation made on over the surface of the water surface it was found that major proportion of the water source surface 161(91%) was impervious and only 16(9%) water source surface was non-impervious.

4.4 Hygiene

4.4.1 Hand washing with soap/ detergent practices at critical times (n=177)

Table 13 Hand washing practices

Characteristics	Frequency	Percent
Yes	50	28
No	127	72

In the study hand washing at critical times referred to hand washing after defecation, before preparing food, before eating, before feeding children, after work and after washing children's bottom .The above finding reveals that only 50 (28%) respondents washed hands and 127 (72%) respondents didn't wash their hands with soap or other agents at critical times.

4.4.2 Disposal of feces of children of age below five years (n=177)

Table 14 Disposal of feces of children of age below five years

Characteristics	Frequency	Percent
Improved	108	61
Non-improved	69	39

In the study improved fecal disposal pointed to disposal of feces of children at improved sanitation. And non-improved disposal referred to disposal of faeces by burying, throwing or directly washing the faeces by the source of water. Majority of the households (61%) responded that they disposed faeces in an improved way. Meanwhile still 31% of household disposed the faeces in non-improved ways.

4.4.3 Waste disposal practices (n=177)

Table 15 Waste disposal practices

Characteristics	Frequency	Percent
Safe disposal	147	83.1
Unsafe disposal	30	16.9

In the study the safe disposal of waste referred to the disposal of the solid waste and garbage including animal- dung at bio-gas, inside pit or containers and the unsafe disposal meant the way of disposing other than safe disposal method. The Safe disposal was found to be practiced at 147 (83.1%) households whereas 30 (16.9%) of households disposed the waste generated in an unsafe manner. This part of study was based on the environmental observation.

4.4.4 Water purification (n=177)

Table 16 Water purification

Characteristics	Frequency	Percent
Yes	48	27.1
No	129	72.9

The Water purification was understood as to ways like boiling, adding bleach/chemicals, filtration, sodas etc for the treatment of the drinking water. The proportion of the households where water was found to be treated was only 27.1% whereas 72.9% households didn't treat drinking water.

4.5. Diarrhoeal disease among under five years of age children

4.5.1 Diarrhoeal disease among under five years of age children (n=177)

Table 17 Diarrhoeal Disease among under five years aged children

Characteristics	Frequency	Percent
Yes	27	15.3
No	150	84.7

It was found that (15.3%) or 27 under five years aged were infected with diarrhoea. A majority (84.7%) of the children were found to be non-infected with the disease.

4.6 Statistical analysis

4.6.1 Association between socio-demographic characteristics and diarrhea among under five years aged children

Table 18 Association between socio-demographic characteristics and the diarrhea among under five years aged children

Characteristics	Diarrhoea		χ^2	P-value
	Yes (%)	No (%)		
Mother's educational status				
No education	12(18.5)	53(81.7)	4.129	0.248
Primary	6(20)	39(80)		
Some secondary	8(13.3)	32(86.7)		
SLC or above	1(3.7)	26(96.3)		
Household head educational status				
No education	16(21.6)	58(78.4)	4.150	0.212
Primary	8(12.7)	55(87.3)		
Some secondary	2(7.4)	25(92.6)		
SLC or above	1(7.7)	12(92.3)		
Economic status				
Ultra poor	20(74.1)	65(43.3)	10.927	0.004
Transect poor	5(18.5)	28(18.7)		
Non-poor	2(7.4)	57(38.0)		

Mother's educational status: It was found that 12 (18.5%) uneducated mother's children were mainly infected with diarrhea. And 6 (20%) children of primary-level

educated mothers were infected from diarrhea. The proportion of lower secondary and SLC or above educated mothers with the diarrhoeal infected children were 13.3 % and 3.7 % respectively. There was no significant difference between mothers with formal educational status and the diarrhoea ($\chi^2=4.129$, $P>0.05$).

Household head educational status: It revealed that there was no significant difference with the household heads' formal educational status and the diarrhoea ($\chi^2=0.415$, $P=0.212$). The proportion of non-educated and primary-level educated household heads with the diarrhoeal infected children house were 21.6 % (6) and 12.7% (8) respectively. It was found that total 7.4 % (2) household heads' children with the lower secondary education were infected from diarrhoea. Furthermore 7.7% or (1) higher educated household heads had children infected from diarrhoea.

Economic status: During the study of the economic status and incidence of diarrhoea among children aged below five, it was found proportion of the diarrhoeal children from Ultra poor and Transect poor family that 74.1% and 18.5%. But the proportion fell among non-poor with 7.4% diarrhoea infected children. The association between the economic status and diarrhoea among children of age below five years was significant ($\chi^2 =10.927$, $P<0.05$).

4.6.2 Association between sanitation and diarrhoeal disease among children age below five years

Table 19 Association between sanitation and diarrhoeal disease among under five years aged children

Characteristics	Diarrhoea		χ^2	P-value	OR
	Yes (%)	No (%)			
Sanitation	13(10.4)	112(89.6)	7.756	0.005	0.315
No sanitation	14(26.9)	38(73.1)			

In the study of association between sanitation and diarrhoea among the children below five, it was found that 13(10.4%) of children with the sanitation at home were found to be diarrhoeal. The proportion of children with no sanitation practices at home was 26.9% and 112(89.6%) children with sanitation at home had no diarrhoeal diseases. Despite no sanitation access or means 38(73.1%) children had no diarrhoeal diseases.

The association between the source and diarrhoea among children aged under five was not significant. ($\chi^2=7.756$, $P=0.05$). An improved sanitation appeared to reduce diarrhoeal diseases with odd estimate of 0.315.

4.6.3 Association between water source and diarrheal among under five years aged children

Table 20 Association between water source and diarrheal disease among under five years aged children

Characteristics	Diarrhoea		χ^2	P-value
	Yes (%)	No (%)		
Piped water inside yard	2 (6.9)	27 (93.1)	2.153	0.341
Public tap	9 (15)	51 (85)		
Tubewell/ Bore well inside yard	16 (18.2)	72 (81.8)		

In the study between water supply and the diarrhoeal disease, it was found that 2 (6.9%) children with piped water supply at home premises were found to be infected with diarrhoea. The proportion of the diarrhoea infected children with Public tap and tube well/bore-hole facility were 15% and 18.2 % respectively. The association between the source and diarrhoea among children aged below five was not significant. ($\chi^2=2.153$, $P>0.05$).

4.6.4 Association between hygiene and diarrheal disease among under five years aged children

Table 21 Association between hygiene and diarrheal disease among under five years aged children

Characteristics	Diarrhoea		χ^2	P-value	OR
	Yes (%)	No (%)			
Hand washing with soap at critical times					
Yes	1(2.0)	49(98)	9.470	0.002	0.79
No	26(20.5)	101(79.5)			
Disposal of <5s' faeces					
Improved	7(6.5)	101(93.5)	16.493	0.001	0.170
Non-improved	20(29)	49(32.7)			
Observable Faeces Around					
Yes	16 (43.2)	21(56.8)	28.347	0.001	8.935
No	11(7.9)	129(92.2)			
Waste Disposal*					
Safe	11(35.7)	136(64.3)	40.51	0.001*	0.71
Unsafe	16(53.3)	14(46.7)			
Water Purification					
Yes	4(8.3)	44(91.7)	2.44	0.118	2.387
No	23(17.8)	06(82.2)			

*Fishers Exact Test Applied

Hand washing with soap at critical times: The association between the hand washing at critical times with soap or detergent was found to be statistically significant with the diarrhoeal morbidity ($P < 0.005$). The risk of having the diarrhoea was found to be about less than a time more in the children of parents' with non hand-washing practices at critical times.(OR 0.79, 95%CI). It was found that only 2% children were found to be infected with diarrhoea whose parents had hand-washing tendency at the critical times by soap/detergent. And 26 (20.5%) children were found

to be infected with diarrhoea whose parents never followed hand-washing behaviors at critical times with soap or other agents.

Disposal of <5s' faeces: In the study of the association between the faeces disposal of children, despite the improved fecal disposal at home; it was found that 6.5% of children were found to be infected with diarrhoea. And 67.3% children from unimproved fecal disposal at home had diarrhea. The table showed that there was a significant association between the fecal disposal and diarrhoeal morbidity ($P < 0.005$) but the risk of children being infected with diarrhoeal disease is very low to those without an improved fecal disposal by 0.170 times. (OR 0.170, $\chi^2 = 16.493$, 95% CI).

Observable faeces around: The association between the observable faeces around the dwelling was found to be statistically significant with the diarrhoeal morbidity ($P < 0.005$). The risk of having the diarrhoea is found to be about nine times more in the children whose house surroundings are found with observable faeces (OR 8.935, $\chi^2 = 28.34$, 95% CI). It was found that 43% (16) of the children who had observable feces at home are infected from diarrhoea. In the same way, only 7.9% (11) of the children had diarrhoea despite no observable faeces. The children infected with diarrhoea were only 11 who had no observable feces.

Waste disposal: In regard to the waste disposal and the diarrhoea, Fisher's Exact Test was applied. There was a significance differences between the diarrhoea and the waste disposal. The difference of the diarrhoeal morbidity among the children from safe waste disposal households was more than 17%. The proportion of the children's with no diarrhoea and representing the household with safe and unsafe waste practices were 64.3% and 46.7% respectively. The chance for children to suffer because of diarrhoea for the unsafe waste disposal was 0.71. (OR 0.71, $\chi^2 = 40.51$, 95% CI, $P < 0.05$)

Water purification: The proportion of children drinking treated water but infected with diarrhea was found to be 8.3% (4) and those who didn't have access to treated drinking water is 17.8% (23). The association didn't reach statistical significance ($\chi^2 = 2.44$, 95% CI, $P > 0.005$). The children who had no access to drink the purified water had higher risk of suffering from diarrhoea by 0.635 than one who drink the purified water.

CHAPTER V

DISCUSSIONS

The study revealed the improved non-shared sanitation coverage of the CLTS triggered area of Nawalparasi is higher than that of national status (38.2%) by nearly a double. However the shared improved sanitation and open defecation is lower by about 17% and eight percent respectively.⁽⁵⁾ A breakthrough has been made in sanitation by more than forty percent in comparison to 28.9% at the year 2065/66⁽¹⁹⁾. The annual growth rate of sanitation increment of Nepal stands at 1.9%⁽⁵⁾ where as the annual growth rate of sanitation increment at CLTS triggered area is 10.25%.

The study presented that the improved non shared latrine coverage's was 70%. The study would be relevant when compared with 19 CLTS villages of Nepal whose latrine coverage ranged from 53% to 93% with only one exceptional village whose latrine coverage fell from 100% to 28%. In a same way in 12 CLTS villages at Bangladesh ranged from 72% to 93 %.⁽²⁰⁾

RWSSP-WN in its baseline report of the year 2065/66 stated that only 24% of the households have access to the improved form of drinking water.⁽¹⁹⁾ The most admirable is the water supply coverage where the entire household was found to be access with the improved form of water supply leaving behind the national coverage by 11 %⁽⁵⁾. Prior to the 2015 the study area has already met the MDG target to access the population by 73% water coverage and 53% sanitation.⁽⁷⁾

This study showed that households with sanitation had 16.5% lower incidence of the diarrhoea than that of those with household without sanitation. The incidence is found to be lower than that of the study at Rural Zimbabwe that has 68 % lower incidence of diarrhoea in community with latrine than that of community without latrine.⁽¹¹⁾ But in Mohake's district the children with latrine experiences 24% fewer episodes of diarrhea (OR=0.76).⁽¹³⁾

The method of disposal of faeces of the children varied according to the respondent: 61% of them responded safe disposal (at improved sanitation) and remaining 29% disposed in an unsafe way (throwing outside the dwelling and directly washing faeces through running water). The safe disposal of children faeces was better when it compared with researches at Amhara Region (65.9%)⁽¹⁰⁾, Lesotho (50%)⁽¹⁴⁾, and the Philippines (39%).⁽²¹⁾ The study in Srilanka, a South Asian country showed that the

unsafe disposal of faeces is associated with 54% higher risk of diarrhoea among children below five years.⁽²²⁾ The proportion of the diarrhoeal infected children aged below five years with the improved faeces disposal practices at house are 6.5%. The significance association between the diarrhoea morbidity and faeces disposal suggests a safe disposal of faeces of the children. The similar several other studies has recommended a safe disposal faeces of this age group children to prevent from various infectious diseases especially diarrhoea. In the same way, a consultation held by WHO regarding sanitation- hygiene suggested that the human faeces should be safely disposed, especially of faeces of younger children, infants and children associated with diarrhoeal diseases.

The diarrhoeal morbidity (15.3%) in this study would be better when compared with the study at Nemeta(28.9%). The study at Nemeta had shown a similar result showing the significance association between the diarrhoea faeces at the compound and the refuse disposal ($P>0.005$).⁽¹³⁾

In the present study, there was no such significant association between hand washing habits at critical times with soap and diarrhoea morbidity. A study in Bangladesh indicated a similar result. In the study of association between child diarrhoea and hand washing practices, the result revealed that there was no significant association between child diarrhoea with the hand washing with or without soap before eating, before feeding children, after cleaning bottom of the children.⁽¹¹⁾ Before the initiation of CLTS about three years ago, hand washing tendency with soap at critical times in Nawalparasi stood at 3.24%. A Present study found that the at CLTS triggered area at Nawalparasi the behavioral practices of hand washing had increased to 28%.⁽¹⁹⁾ It shouldn't be forgotten that behavioral practices like hand washing at critical times are important aspects of CLTS approaches.

The Water treatment or disinfection is one of the important behavioral aspects of public health. The water treatment practice was found to be low. The study has shown the non-significance association of the diarrhoea morbidity with water treatment. A similar study at Ifakara Tanzania supports the study showing no significance between the diarrhoea among children below five years and boiling drinking water and filtering drinking water. But the odds estimate ($OR=0.635$) of reducing the diarrhea among household adopting either of water treatment procedure (by like boiling,

sodas etc) is lower than that of filtering (OR=1) boiling (OR= 0.67) reducing diarrhoea.⁽¹⁵⁾

CHAPTER VI

CONCLUSION AND RECOMMENDATION

6.1 Conclusion

This paper examined the water, sanitation and hygiene and the extent of the diarrhea among the children aged below five year. Access to the improved sanitation, water and hygiene had increased to the great extent after the initiation of the CLTS approach, progress was noted by comparing the baseline of RWSSP-WN.

The statistical analysis like chi-square and odds-ratio were taken to examine the extent of WHS and diarrhoeal morbidity. Although there was no significant difference between parents' education and diarrhoeal disease, the morbidity decreases with the increase in educational status of parents. There was a negative effect because of poverty found on the diarrhoea morbidity, the proportion of the diarrhoea increase in poverty level. According to my opinion, it's not only poverty that solely affects the diarrhoea. The major element is a weak extent of the poor hygiene among the poverty-stricken family which has caused risk diarrhoeal diseases. Contrary to the finding of many researches which show the significant association between improved sanitation, improved water source and the diarrhoea, this research has no such significant association between improved sanitation, improved water source and diarrhea but many hygiene related activities were found highly significant with diarrhoeal morbidity.

The study suggested focusing on the hygiene aspects of the sanitation practices. As the disposal of faeces of child, observable faeces around the house and unsafe waste disposal practices, the concerned authority sanitation should more concentrated on the hygiene aspects in order to make child health condition sound and healthy.

As it was the cross-sectional study, a point of time couldn't demonstrate the strong evidences of diarrhoeal morbidity in regard to the available sanitation water and hygiene. The availability of limited literature of the diarrhoeal morbidity in the CLTS triggered area, this study could not discuss on WSH and diarrhea in regard to the CLTS.

6.2 Recommendation

It has been recommended that the sanitation demand at such rural communities must be encouraged. In order to control the diarrhea among the children, an effective Behavior Change Communication (BCC) must be focused by government and other authority concerned rather than constructing a physical toilet. The market based supply chain must be extended by participating of private sectors, local NGO, marginalized groups through an inclusion process. Besides these, developing researches activities regarding WSH and disseminating the results must be enforced to an earlier effect.

REFERENCES

1. Bell B. Analysis of School-Led Total Sanitation in Chitwan, Nepal: UN-HABITAT; 2010.
2. The Millennium Development Goal Report 2012. New York: United Nations; 2012.
3. Index of Water & Sanitation Related Diseases. 2010 [cited 2012 Jul 15]; Available from: http://www.watercan.com/PDF/disease_index.pdf
4. Sustainable Sanitation: The Five Year Drive To 2015: UN WATER 2007.
5. Nepal Demographic and Health Survey 2011: Population Division Ministry of Health and Population; 2011.
6. Sanitation and Hygiene Master Plan: Government of Nepal; 2011.
7. WaterAid. An appeal to people's representatives, politicians, policy-makers and government officials. WaterAid; 2011.
8. Nationwide Coverage and Functionality Status of Water Supply and Sanitation in Nepal: National Management Information Project (NMIP), Department of Water Supply and Sewerage (DWSS); 2011.
9. Young B, Brisco J. A case-control study of the effect of environmental sanitation on diarrhoea morbidity in Malawi. *Journal of Epidemiology and Community Health*. 1987;42:83-8.
10. Anteneh A, Kumie A. Assessment of the impact of latrine utilization on diarrhoeal diseases in the rural community of Hulet Ejju Enessie Woreda, East Gojjam Zone, Amhara Region. *Ethiop J Health Dev*. 2010;24:110-7.
11. Stephen P, Halder K, Huda T, Unicomb L, Johnston B. The Effect of Handwashing at Recommended Times with Water Alone and With Soap on Child Diarrhea in Rural Bangladesh: An Observational Study. *PLoS Med*. 2011;8(6):1-10.
12. RPM. G. Sanitation, Community Environments and Childhood Diarrhoea in Rural Zimbabwe. *J Health Popul Nutr*. 2001;19(2):73-82.
13. Regassa G, Birke W, Deboch B, Belachew T. Environmental Determents of Diarrhoea Among Under-Five Children in Nekemete Town, Western Ethiopia. *Ethiop J Health Sci*. 2008;18:39-44.

14. Daniels D, Cousens S, Makoae L, Feachem R. A case-control study of the impact of improved sanitation on diarrhoea morbidity in Lesotho. *Bulletin of the World Health Organization*. 1990;68(4):455-63.
15. Esrey S, Potash J, Roberts L, Shiff C. Effects of improved water supply and sanitation on ascariasis, diarrhoea, dracunculiasis, hookworm infection, schistosomiasis, and trachoma. *Bulletin of the World Health Organization*. 1991;69:609-17.
16. Gascon J, Vargas M, Schellenberg D, Urassa H, Casals C, Kahigwa E, et al. Diarrhea in Children under 5 Years of Age from Ifakara, Tanzania: a Case-Control Study. *Journal of Clinical Microbiology* 2000 7 September 2000;38:4459–62
17. Baseline Survey Report Nawalparasi District: Nawalparasi District Development Committee; 2000.
18. Thapa A, Dhanguna A, Tripathi Y, Aryal B, Adhikari R, Gurung L. Dynamics of Vicious and Virtuous Cycles of Poverty in Rural Nepal: Western Development Region 2012.
19. District Wise Summary Of PPM Indicators (From Baseline) RWSSP-WN; 2010.
20. Sustainability and equity aspects of total sanitation programmes A study of recent WaterAid-supported programmes in three countries WaterAid; 2009.
21. Baltazar J, Briscoe J, Mesola V, Moe C, Solon F, Vanderslice J, et al. Can the case-control method be used to assess the impact of water supply and sanitation on diarrhoea? A study in the Philippines. *Bulletin of the World Health Organization*. 1998;65:627-35.
22. Mertens T, Jaffar S, Fernando M, Cousens S, Feachem R. Excreta disposal and latrine ownership in relation to childhood diarrhoea in Sri Lanka. *International Journal of Epidemiology*. 1992;21:1157–64.
23. 1. A Simple Poverty Scorecard for Nepal: Documentation for Data-Entry Software. 2009 [cited 2012 Jun 15]; Available from: http://www.microfinance.com/English/Papers/Scoring_Poverty_Data_Entry_Documentation_Nepal_EN_2003.pdf.

24. Part B. Activity Summary Sustainable Sanitation and Hygiene for all-Nepal.–
2010 [cited 2012 Dec 10]; Available from:
[http://www.usaid.gov/countries/southasia/nepal/Documents/water-san-partb-
activity-summary.pdf](http://www.usaid.gov/countries/southasia/nepal/Documents/water-san-partb-activity-summary.pdf).

APPENDICES

Annex A: Questionnaire

A DESCRIPTIVE STUDY ON WATER SANITATION HYGIENE AND DIARRHOEAL MORBIDITY AMONG UNDER FIVE YEARS CHILDREN AT COMMUNITY LED TOTAL SANITATION ELICITED AREA AT NAWALPARASI

Introduction of Interviewer

Namaste. My name is Anup K.C., Public Health Student by Profession. I am here to get some information from you concerning sanitation condition at your community. The information gathered shall be used solely for the purpose for the research.

I assure that the information you will give me will be treated confidentially and your identity will never be closed to any person. I like to inform you that you are not compelled in any answer way to answer the question I shall be asking you. You may opt out if you wish. I however entreat you to voluntarily accept to answer these questions, so that together we can plan and offer better program to this community to improve sanitation condition.

District: Nawalparasi VDC..... Ward No.....

Tole:

Date:

Section A: General Information:

1. Name of the Respondent:

2. Gender: I. Female ()

II. Male ()

3. Name of family head:

4. Religion:

5. Ethnicity:

I. Dalit ()

II. Indigenous/ Ethnic()

III. Muslim ()

IV Disadvantaged Terai Caste()

V. Others

Section B Disposal and management of human feces

i. Do you have toilet at your home?

1. Yes ()

2. No ()

ii. If yes, type of toilet

1. Piped sewer system ()

2. Septic tank ()

3. Pit latrine ()

4. Other.....

iii. If no, where do you go for defecation?

1. On near field ()

2. On bushes ()

3. Neighbor toilet ()

4. Forest ()

5. River and stream ()

6. Other

iv. Can your children go for latrine by his/herself?

1 Yes ()

2 No ()

v. If yes where s/he goes for defecation?

1 At toilet ()

2. Open defecation ()

vi. If no, where you manage the feces of your child?

1 At latrine ()

2. Burry ()

3. Directly wash with water ()

4. Throw ()

5. Others.....

iv. Do you share with other than family member?

1. Yes ()

2.No ()

Section C Water and purification

i. What is the main source of water in your household?

1. Piped water with dwelling ()

2. Piped water to yard ()

3. Public tap ()

4. Borehole/ Tube well ()

5. Protected dug well ()

6.Surface water ()

ii. What you usually do for water purification

1. Boil ()

2. Add bleach/ chorine ()

3. Strain it through clothes ()

4. Use filters ()

5. Sodas ()

6. No purification ()

7. No purification ()

Section D Hygiene

I Do you wash your hand with soap or cleaning agents at following critical times?

- | | |
|---------------------------------------|----------------------|
| 1. After defecation () | 2. Before cooking() |
| 3. Before eating food () | 4. After work () |
| 5. Before feeding children () | |
| 6. After cleaning bottom of child () | 7. Above all () |

II. Solid Management

1. How your family manages their daily wastage?

- | | |
|------------------------------------|-----------------------------|
| 1. Dispose in own yard () | 2. Throw inside premises() |
| 3. Deposit in Container nearby () | 4. Collectors collect () |
| 5. Throw on the streets () | 6. Others () |

Section E Diarrhea

I. Do your children suffer from diarrhea disease within this year?

- | | |
|------------|-----------|
| 1. Yes () | 2. No () |
|------------|-----------|

Section F Observation Check List

- | | | |
|---------------------------------|-------------------------------------|----------------------|
| i Toilet: | Yes () | No () |
| ii Physical Structure: | No need of further construction () | Need maintenance () |
| | Need Reconstruction () | |
| iii Distance from water source: | Less than 30 feet () | More than 30 () |
| iv Toilet Surface: | Impervious () | Non-Impervious () |
| v Toilet Brush: | Yes () | No () |
| vi Cleaning Agent: | Yes () | No () |
| vii Toilet in Use: | Yes () | No () |
| viii Observable Feces | Yes () | No () |
| ix Water Surface: | Impervious () | Non-impervious () |
| x Waste Management: | Safe () | Unsafe() |

Indicator	Value	Points Score
1. How many household members are 12-years-old or younger?	A. Four or more	0
	B. Three	6
	C. Two	12
	D. One	16
	E. None	28
2. How many children ages 5 to 12 attend school?	A. Not all	0
	B. No children ages 5 to 12	2
	C. All	5
3. Do any household members attend a private school?	A. No	0
	B. Yes	8
4. Does the female head/spouse know how to read a letter?	A. No	0
	B. No female head spouse	5
	C. Yes	8
5. What is the main material of the roof?	A. Straw/thatch, Wood/plank, Earth other	0
	B. Tiles/slate	4
	C. Galvanized iron, Concrete, cement	10
6. What type of toilet is used in your household?	A. No toilet	0
	B. Household non-flash communal, flush	7
7. What type of stove does your household mainly use for cooking?	A. Open fire, other	0
	B. Mud stove, smokeless	5
8. How many radio/tape/CD players does the household own?	A. None	0
	B. One	6
	C. Two or more	13

9. Does the household own any	A. No	0
Bicycles, motorcycles/scooters,	B. Yes	5
Motor cars,etc?		
10. Does the household own any	A. No	0
Television/decks?	B. Yes	11
Total Score		

Thanks for Your Valuable Participation

Annex B: Work Plan