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SCHOOL OF PUBLIC HEALTH,

COLLEGE OF HEALTH SCIENCES, UNIVERSITY OF GHANA

WATER AND SANITATION AND DIARRHOEA IN CHILDREN UNDER-FIVE YEARS OLD IN ASUOGYAMAN DISTRICT

BY:

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A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT FOR THE AWARD OF MASTER OF PUBLIC HEALTH (MPH) DEGREE

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DECLARATION

I, Ruth Abban declare that this dissertation is the result of my own original research. Except for references to the work of others that have been sited and appropriately acknowledged, this is the result of an independent investigation. This dissertation has not been presented elsewhere, either in whole or in part for another degree.

……

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DEDICATION

This work is dedicated to my husband, Eric Evans Abban, who has been an immense encouragement to me throughout my academic exploits. To my children, Ajua Odeiba, Ewuresi Eyimpa and Fiifi Kizzie, thank you so much for the patience you had for me despite my continuous absence from home. I appreciate your unflinching support.

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I am most grateful to my Lord and Saviour Jesus Christ: thus far, has His grace brought me.

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I appreciate the members of the Asuogyaman District Health Management Team (DHMT) as well as the District Assembly for their hospitality and support.

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ABSTRACT

Background- The promotion of sanitation and hygiene as well as potable water supply has emerged as one of the cost-effective possible interventions against high burden diseases like diarrhoea in developing countries. Diarrhoea cases among diseases reported at the Out-patient department attendances has been increasing for the past few years in health facilities in Asuogyaman district. The aim of this study was to determine environmental risk factors for diarrhoea in children under-five years in Asuogyaman district, with special emphasis on water supply, sanitation facilities and hand washing.

Methods- This study was a household based cross-sectional study, consisting of 400 mother/caregiver-child pairs (where the children were between 0 to 59 months of age) residing in Asuogyaman District. Data collection tools used were structured questionnaires and an observation check list. Information concerning the prevalence of diarrhoea in the child under-five years was obtained from the mothers over a two-weeks recall. Data on the background of the study population, sanitation facilities used by household, the practice of hand washing with soap and water by mothers, the sources of household water supply, treatment of drinking water, storage of household drinking water as well as the knowledge of mothers about causes of diarrhoea were obtained and analysed. The crude estimate of odds ratio was determined for each potential factor of diarrhoea using simple logistic regression techniques. The adjusted odds ratios were determined using a multivalent logistic regression technique. Only variables that were significantly associated with diarrhoea were considered in the multivariable logistic regression model and tested in turn using likelihood ratio test. Statistical analysis was done using stata for windows (stata corp, college station Texas.)

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Results- The prevalence of diarrhoea in children under-five years in Asuogyaman was 35.5%. Risk factors for diarrhoea in Asuogyaman district include the use of unimproved sources of drinking water as well as the use of public toilet facilities by caregivers. After adjusting for the independent effects of all potential factors in the multivariable logistic model, poor knowledge of caregivers about causes of diarrhoea and poor hand washing practices remained the most significant risk factors for diarrhoea. Though all households visited had soap and about 69% of caregivers had access to and used improved sources of drinking water, just about 19.8% of caregivers mentioned washing their hands with soap and water without prompting. They had a 63% reduced risk of diarrhoea in their children. Caregivers knowledge about causes of diarrhoea was the most significant risk factor associated with diarrhoea in the children. Caregivers who had a good knowledge about causes of diarrhoea had a 75% reduced risk of diarrhoea compared to children of caregivers who had a poor knowledge about causes of diarrhoea (Adjusted Odds ratio=0.25, 95% CI= (0.015, 0.44), p-value<0.0001).

Conclusion-Children in Asuogyaman district are at risk of diarrhoea when they are not exclusively breastfed, when they are given unimproved sources of drinking water and when public toilet facilities are used by caregivers. Poor knowledge of caregivers about causes of diarrhoea as well as Inappropriate hygiene behaviour such as poor practice of hand washing are the most significant risk factors for diarrhoea in Asuogyaman district.

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Table of Contents

DECLARATION ii

DEDICATION iii

AKNOWLEDGEMENT iv

ABSTRACT v

LIST OF TABLES Page x

LIST OF FIGURES Page xi

LIST OF PICTURES Page xii

LIST OF ACRONYMS xiii

DEFINITIONS OF TERMS xiv

CHAPTER 1 1

INTRODUCTION 1

1.0 BACKGROUND 1

1.1 STATEMENT OF THE PROBLEM 3

1.2 JUSTIFICATION FOR STUDY 7

CHAPTER 2 10

LITERATURE REVIEW 10

2.1 DIARRHOEA 10

2.2 WATER SUPPLY AND DIARRHOEA 12

2.3 SANITATION AND DIARRHOEA 13

2.4 HAND WASHING AND DIARRHOEA 14

2.5 CAREGIVERS KNOWLEDGE AND DIARRHOEA 16

CHAPTER 3 17

METHODS 17

3.1 STUDY DESIGN 17

3.2 STUDY AREA 17

3.3 STUDY VARIABLES 18

University of Ghana http://ugspace.ug.edu.gh

3.4 STUDY POPULATION 21

3.5 SAMPLING 22

3.6 SAMPLE SIZE CALCULATION 23

3.7 DATA COLLECTION TECHNIQUES/METHODS AND TOOLS 24

3.8 QUALITY CONTROL 25

3.9 DATA PROCESSING AND ANALYSIS 25

3.9.1 Statistical Methods 25

3.10 ETHICAL CONSIDERATONS/ISSUES 26

3.11 PRE-TEST OR PILOT STUDY 27

CHAPTER 4 28

RESULTS 28

4.1 BACKGROUND CHARACTERISTICS OF RESPONENTS 28

4.2 PREVALENCE OF DIARRHOEA AMONG CHILDREN UNDER 5 YEARS 32

4.3SAFETY OF DRINKING WATER AND DIARRHOEA 33

4.4 SANITATION FACILITIES AND DIARRHOEA. 36

4.5 HAND WASHING AND DIARRHOEA 38

4.6 CAREGIVER'S KNOWLEDGE ABOUT CAUSES OF DIARRHOEA 40

4.7 LOGISTIC REGRESSION OF FACTORS FOR DIARRHOEA IN ASUOGYAMAN DISTRICT. 42

CHAPTER 5 44

DISCUSSIONS 44

BACKGROUND CHARACTERISTICS 44

5.4 SANITARY FACILITIES AND DIARRHOEA 48

5.6 KNOWLEDGE OF CAREGIVERS ABOUT CAUSES OF DIARRHOEA 51

5.7 STUDY LIMITATION 52

CHAPTER 6 54

CONCLUSION AND RECOMMENDATIONS 54

6.1 CONCLUSION 54

6.2 RECOMMENDATIONS 54

University of Ghana http://ugspace.ug.edu.gh

REFERENCES.....56

APPENDIX 1- CONSENT FORM FOR PARTICIPANTS IN DIARRHOEA SURVEY IN ASUOGYAMAN DISTRICT. 61

University of Ghana http://ugspace.ug.edu.gh

LIST OF TABLES

Page

Table 4.1 – Distribution of Diarrhoea by Child's Socio-demographic Characteristics.....27

Table 4.2 – Distribution of Diarrhoea by Caregiver's Socio-demographic Characteristics.....29

Table 4.3 – Distribution of Diarrhoea in Relation to Water Supply 32

Table 4.4 – Distribution of Diarrhoea in Relation to Sanitation Facilities.....37

Table 4.5 – Distribution of Diarrhoea in Relation to Hand Washing Practice.....38

Table 4.6 – Distribution of Diarrhoea by Caregiver's Knowledge about Diarrhoea Causes.....38

Table 4.7 – Logistic Regression Showing Risk Factors for Diarrhoea.....41

University of Ghana http://ugspace.ug.edu.gh

LIST OF FIGURES Page

Figure 1.1- Positions and Frequencies of Reported Diarrhoea Cases in Asuogyaman District.....5

Figure 4.1- Diarrhoea Prevalence by Child's Socio-demographic Characteristics.....28

Figure 4.2- Diarrhoea Prevalence by Caregivers Level of Education.....30

Figure 4.3- Diarrhoea Prevalence in Asuogyaman District.....31

Figure 4.4- Diarrhoea Prevalence in Relation to Child's Source of Drinking Water.....34

Figure 4.5- Diarrhoea Prevalence by Type of Sanitation Facilities Used by Caregivers.....35

Figure 4.6- Diarrhoea Prevalence in Relation to Caregivers Hand Washing Practices.....37

Figure 4.7- Diarrhoea Prevalence in Relation to Caregivers Knowledge About Causes of Diarrhoea.....39

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LIST OF PICTURES

Page

Picture 5.1- Picture Showing Kindergarten Pupils Washing Their Hands at School.....43

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LIST OF ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
DHMT	District Health Management Team
WHO	World Health Organisation
GDHS	Ghana Demographic and Health Survey
VRA	Volta River Authority
UN	United Nations
UNICEF	United Nations Children's Education Fund
WASEP	Water and Sanitation Extension Project
WHO	World Health Organization

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DEFINITIONS OF TERMS

DIARRHOEA- This is the passage of three or more loose or watery stools over 24 hours with or without dehydration (WHO, 2001).

SANITATION- This is the hygienic disposal and recycling of waste material, particularly, human excrement and urine (WHO, 2008).

IMPROVED SANITATION- It is a system in which excreta are disposed off in such a way that they reduce the risk of faecal oral transmission to its users and the environment (United Nations, 2003). This includes connection to a public sewer, septic system, pour-flash latrines, simple pit latrines and ventilated improved latrines.

UNIMPROVED SANITATION- This is the absence of sanitation facilities, the use of bucket latrines, public latrines or open pit latrines (WHO/UNICEF, 2000).

IMPROVED WATER SUPPLY – This includes household connection, public stand pipes, bore holes and protected spring (WHO/UNICEF, 2000).

UNIMPROVED WATER SUPPLY – This includes protected rivers or ponds, unprotected wells or springs and unmonitored vendor-provided water (WHO/UNICEF, 2000)

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CHAPTER 1

INTRODUCTION

1.0 BACKGROUND

As far back as 4th December, 2006, World Health Organisation (WHO), declared 2008 as an International Year of Sanitation. This concern underscores the observation that safe water and adequate sanitation contribute immensely to health and productivity for development in any country (WHO, 2008). Globally, there have been a lot of responses to water, sanitation, health and productivity. The seventh of the eight Millennium Development Goals is to reduce by half the proportion of people without sustainable access to safe water supply and basic sanitation (United Nations, 2005). This target is yet to be met in many developing countries; meanwhile, sanitation continues to be an increasing problem (Kosek et al, 2003). A salient quote made by the former United Nations Secretary General goes:

> "We shall not finally defeat AIDS, tuberculosis, malaria or any other infectious disease that plague the developing world until we have won the battle for unsafe drinking water, sanitation and basic health care". – Former United Nations Secretary General, Kofi Annan (WHO, 2004).

In this twenty-first century, even with increasing technology, most women and children in developing countries continue to battle with health effects attributable to water supply. Lack of basic facilities like sanitation and water continues to pose serious public health problems (Gore-Dale & Faure, 2002). Global diarrhoea morbidity rate has failed to decrease in spite of the long-term tendency for water supply and to some extent sanitation coverage rate to increase (WHO/ UNICEF, 2005). The promotion of sanitation and hygiene as well as water supply has emerged as one of the cost-effective possible interventions against high burden diseases in developing countries (Laxminarayan et al., 2006).

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Diarrhoea is usually a symptom of gastro-intestinal infection which is caused by a variety of bacterial, viral and some parasitic organisms. Clinically, it is defined as the passage of three or more loose or watery stools over 24 hours with or without dehydration (WHO, 2001). Infection is spread by eating contaminated food or drinking water or from person to person as a result of poor hygiene (WHO, 2001). Eighty-eight percent of diarrhoeal diseases are attributed to unsafe water supply, inadequate sanitation and poor hygiene (WHO, 2004). Investment into water quality and quantity alone can reduce appreciably, diarrhoea mortality attributable to unsafe water, bad sanitation and poor hygiene (Gore-Dale & Faure, 2002). High numbers of babies and children may die of diarrhoea, malnutrition and HIV/AIDS if there is lack of access to safe water (United Nations, 2005). Children deserve a better environment and the highest standard of living possible according to the convention on rights of the child (WHO, 2004). Since water has always taken a key role in people's culture and priorities, it is only natural that water should be given priority, followed by sanitation and hygiene. The status of knowledge on water, hygiene and sanitation indicates that, there has been a lot of research into types of water supply, water quality and cost, household handling of water, storage and treatment of drinking water, sanitation methods, waste water management and hygiene practices (WHO,2004). However, very few studies attempt relating the factors mentioned above to specific health effects (WHO, 2004).

The Asuogyaman District is the 10th largest District out of 17 Districts in the Eastern Region of Ghana. It covers a surface area of 1507 sq km. It had a population of 80,529 according to the 2000 population census. Eighty-five percent of the active work force is farming. It is predominantly a youthful population. The topography of the district is generally undulating. The mean annual rainfall is about 1130mm. The major wet season is from May to June (DHMT, 2008). The vegetation is forest, semi-forest and savannah. Asuogyaman is marked by great differences in economic, social and health indicators (DHMT, 2008). Socially, the four main ethnic groups are the Ewes, the Guans, the Adangbe's and the Akans. Though

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pipe borne water is the predominant source of water supply from Kpong and Volta River Authority(VRA) water works in Asuogyaman (Acquah et al. , 2008), diarrhoea remains a persistent health problem among children below the age of five years (DHMT, 2008).

1.1 STATEMENT OF THE PROBLEM

On a given day, approximately 50% of the world's hospital beds are filled with patients suffering from water and sanitation related diseases (WHO, 2008). According to WHO facts and figures, globally, ninety percent of deaths that occur as a result of diarrhoea are children under five years, mostly in developing countries. Each year, 1.8 million children in developing countries die from diarrhoeal diseases, the second leading cause of death after pneumonia and globally, diarrhoea kills at least five times more children than HIV/AIDS (WHO, 2008). Diarrhoea due to infection is widespread throughout the developing world. In Southeast Asia and in Africa, diarrhoea is responsible for as many as 8.5% percent of all deaths respectively (WHO & UNICEF, 2005). More than 700,000 African Children die every year from diarrhoea (WHO, 2004).

Eighty percent of diarrhoea diseases are attributed to unsafe water supply, inadequate sanitation and hygiene (WHO, 2004). The simple act of washing hands at critical times can reduce the number of diarrhoea cases by up to thirty five percent. Additional improvement of drinking water quality, such as point of use disinfection would lead to a reduction in diarrhoea episodes by forty five percent (WHO, 2004).

Worldwide, about 1.1 billion people lack access to improved water sources and 2.4 billion have no basic sanitation (WHO, 2004).

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The consumption of unsafe water in Ghana, along with poor sanitation and hygiene practices continue to result in diarrhoea, worm infestation and other water and sanitation related diseases that can lead to death or disability. Children are the worst affected, meanwhile, diarrhoea is the largest preventable killer of children under-five years (Ghana Health Service, 2003). Diarrhoea is responsible for 80% of all deaths in children under the age of five in Ghana; some 15,000 children whose lives could have been saved by simple preventive steps such as washing hands with soap (Hickling, 2007). Every year, Ghana suffers an estimated 9 million episodes of diarrhoea and 84,000 diarrhoea deaths among children under-five years (Scott, 2007). In Ghana, dehydration from severe diarrhoea is a major cause of ill health and death among children. Studies show that the highest exposure to diarrhoea causing agent in Ghana is by the use of contaminated water, poor excreta disposal, and unhygienic practices (Ghana Statistical Services, 2000). To bolster interventions, hygiene and sanitation education aimed at changing behaviour is continually undertaken in affected schools and communities (Hickling, 2007).

Diarrhoea has persistently presented itself among the top ten causes of out-patient department attendances for the past few years in Asuogyaman district. In the years 2005 and 2006, diarrhoea was on the tenth position of the top ten causes of out-patient department (OPD) attendances in health facilities in Asuogyaman district. In the year 2007, diarrhoea shifted to the sixth position, with an increase in the frequency of occurrences (DHMT, 2008). This is an indication that there is a surge in diarrhoea cases. (See figure 1.1below)

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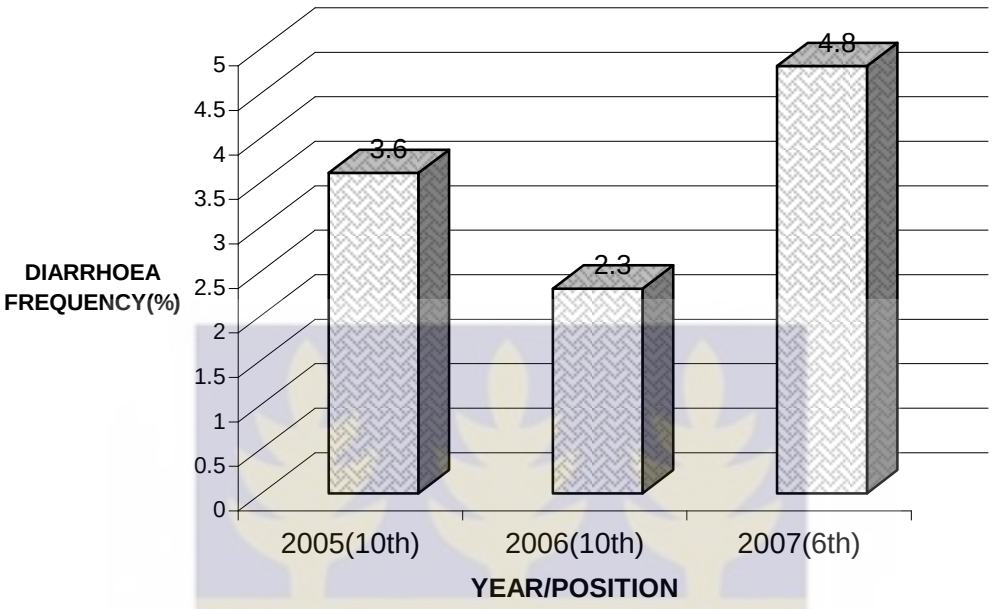
FIGURE1. 1: POSITION AND FREQUENCY OF REPORTED DIARRHOEA CASES AMONG O.P.D. ATTENDANCES FROM 2005-2007,ASUOGYAMAN DISTRICT.



This situation is alarming because sixty-five percent of the diarrhoea cases reported were children below five years, the most vulnerable in society (DHMT, 2008).

What could be the factors responsible for the surge in diarrhoea cases in Asuogyaman district? Is drinking water supply associated with diarrhoea cases in children in Asuogyaman district? Are the types of sanitation facilities used by households associated with the increases in diarrhoea cases? Will the practice of hand washing with soap protect children from diarrhoea episodes? Is caregiver's knowledge about the cause of diarrhoea a risk factor for diarrhoea in children under-five years in Asuogyaman district?

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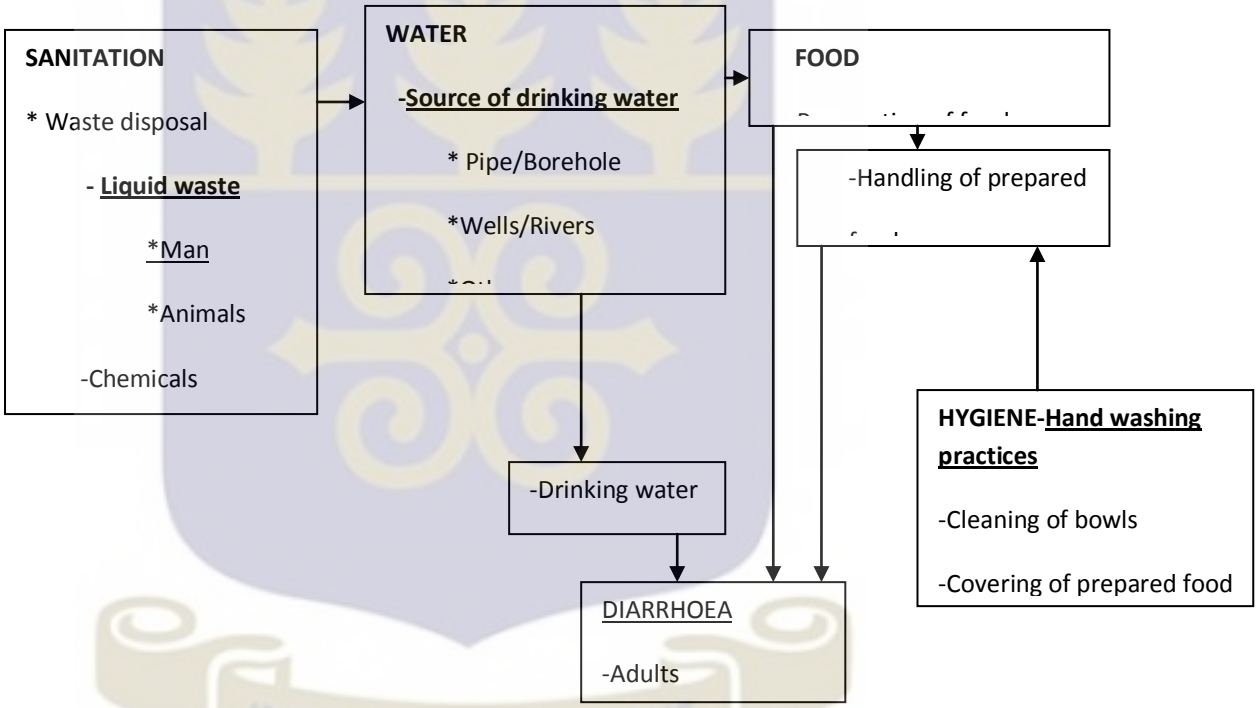
1.1 CONCEPTUAL FRAMEWORK

ASSOCIATION BETWEEN WATER, SANITATION, HYGIENE PRACTICES AND DIARRHOEA IN CHILDREN UNDER FIVE YEARS



(* Factors being considered in this study are the ones in bold prints and underlined.)

Eighty eight percent of diarrhoeal diseases are attributed to unsafe water supply, inadequate sanitation and hygiene (WHO, 2004). Drinking of water and consumption of food are the main routes by which pathogens responsible for diarrhoea are carried to man through ingestion. Good sanitation practices prevents the transmission of these pathogen from waste materials

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or faeces to man. Pathogens from waste materials can get into house-hold water fetched from unsafe sources. The transport practices as well as poor treatment of the water may further contribute to water contamination. When such water is consumed or used in food preparation, pathogens may be transferred to man. Hygiene practices ensure that prepared food or water is safe for consumption. Hand washing practices are critical in preventing pathogens from the environment from getting into contact with prepared food or drinking water (ready for consumption).

1.2 JUSTIFICATION FOR STUDY

Diarrhoea diseases and nutritional status are complex and synergistic. It is a serious global issue because hundreds of million of children are affected. Persistent diarrhoea in a child may result in chronic malnutrition leading to childhood underweight, stunting, wasting or even the death of the child (Alam et al., 2000). Diarrhoea kills children by draining liquid from the body and thus dehydrating the child. A child's life is in danger if there are several watery stools within an hour or if there is blood in faeces (Alam et al., 2000).

Though one of the targets for the year 2007 by the Asuogyaman District Health Management Team(DHMT) was to decrease nutritionally related diseases through effective health education and health promotion activities, mild mal-nutrition for children 0-59 months increased from 11% in 2006 to 17% in 2007 (DHMT, 2008). This may be attributable to frequent watery stools in the lives of children under- five years of age.

Report of the District Water Sanitation Project by the District Assembly indicates the use of water from the lake and rivers in communities residing along the river banks instead of the safe pipe-borne water that had been provided by the District Assembly for these communities (Acquah et al, 2008). There is therefore the need to verify the water situation and assess its

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contribution to diarrhoea. There is also the need to investigate the contribution of sanitation and hygiene measures in relation to diarrhoea, so that effective strategies can be put in place to decrease the prevalence of diarrhoea in children under-five years in subsequent years.

1.5 OBJECTIVES

1.5.1 GENERAL OBJECTIVE

The general objective is to determine the association between diarrhoea in children under-five years, water supply, hygiene practice and sanitation facilities in Asuogyaman District.

1.5.2 SPECIFIC OBJECTIVES

The specific objectives are;

1. To determine the prevalence of diarrhoea in children under-five years in Asuogyaman district.
2. To assess the safety of drinking water and its association with diarrhoea in children under 5 years.
3. To assess the sanitation facilities used by households and its association with diarrhoea in children under 5 years.

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4. To determine the practice of hand washing with soap by caregivers and its association with diarrhoea in children under 5 years.

5. To determine the knowledge of mothers about the causes of diarrhoea in children below five years in Asuogyaman district.

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CHAPTER 2

LITERATURE REVIEW

2.1 DIARRHOEA

Clinically, diarrhoea is defined as the passage of three or more loose or watery stools over 24 hours with or without dehydration (WHO, 2001). Diarrhoea is usually a symptom of gastro intestinal infection which is caused by a variety of bacterial, viral and parasitic organisms. Infection is spread by eating contaminated food or drinking water or from person to person as a result of poor hygiene (WHO, 2001). Human excreta have been implicated in the transmission of many infectious diseases that lead to diarrhoea (WHO, 2001). The germ is passed on through faeces and urine. (Laxminarayan et al, 2006).

So many risk factors predispose children to diarrhoea. A case-control study on risk factors for persistent diarrhoea in children below five years concluded that, discouraging the irrational use of drugs for the treatment of diarrhoea, promotion of exclusive breastfeeding and vaccination in children as well as a standard case management course for doctors, and the provision of safe drinking water and sanitation facilities are important for the prevention of persistent diarrhoea (Kirk et al., 2005). Another study conducted by a community based research team in Nairobi determined the risk factors associated with diarrhoea in children below 5 years. The cross sectional survey was conducted in Laini-Sava village in Nairobi. Households with children below five years were purposively sampled. One hundred and five households with 170 children were included in the study. Children with diarrhoea and those who had diarrhoea two weeks preceding the study were compared with those without. The prevailing environmental conditions, methods of faeces disposal and hygienic practices were considered. Prevalence of diarrhoea diseases was at 36%. Apparently 79% of pit latrines had been filled up and evidently not in use. Hence, the community resorted to other crude

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unhygienic means of faeces disposal. The writers concluded that, diarrhoea is a serious health problem in an overcrowded Kiberg slum. Poor environmental conditions, poor methods of faeces disposals and high poverty level expose the community to diarrhoea diseases (Kong'u, 2002). Mother's education has also been found to be a significant risk factor for diarrhoea in a lot of studies. A mother's level of education is inversely correlated with the frequency of diarrhoea episodes in her children (Gutierrez & Reyes, 1999). A study that confirmed the importance of sanitation and maternal education was an ecological based retrospective study on impact of health services, sanitation and literacy in the morbidity and mortality of under-five year old. This study came out with a finding that, sanitation factors were the principal risk factors of gastroenteritis (Gutierrez & Reyes, 1999). A World Health Organisation (WHO) systematic review of 2 small controlled trails and 17 observational studies that came out with a finding demonstrating a relatively reduced risk of gastro intestinal infections and all cause mortality for exclusively breastfed infants compared to partially breastfed infants from 4 to 6 months regardless of when the latter stopped exclusive breastfeeding (WHO, 2002). Another cross sectional study that assessed breastfeeding practices in Sri Lanka reported that breastfeeding was associated with significantly less diarrhoeal diseases even after infants had attained six months (Agampodi et al,2006). A 2004 health survey conducted in Bangladesh by UNICEF showed that some children between 6 to 24 months had experienced diarrhoea within the preceding forth night. The chances of getting diarrhoea where compounded for children in the lowest wealth bracket with a 9% prevalence rate (UNICEF, 2004).

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2.2 WATER SUPPLY AND DIARRHOEA

The quality of water as defined by the Guideline for Drinking Water Quality is such that it is suitable for human consumption and for all domestic purpose, including personal hygiene (WHO, 2004). Improved drinking water supply includes household connection, public stand pipes, bore holes and protected spring but does not include rain water harvesting systems, protected rivers or ponds, unprotected wells or springs and unmonitored vendor-provided water; bottled water is not considered improved due to quantity limits arising from its high expense as a household water supply, except when it is only being used as drinking water (Ash et al., 2005).

Since diarrhoea continues to be a leading cause of mortality and morbidity among young children in developing countries (WHO, 2001), some writers assessed the effectiveness of interventions to improved water quality for the prevention of diarrhoea. They searched relevant references from identified studies and researches and compared randomised and quasi-randomised controlled trials interventions aimed at improving the micro biological quality of drinking water in settings where diarrhoea disease was endemic. In general, the evidence suggested that household interventions were more effective in preventing diarrhoea than interventions at the water source (Clasten & Roberts, 2006). A study conducted to assess the risk of enteric diseases among children living in a water reclamation area in Mexico City indicated that lower risk of diarrhoea was observed in individuals enjoying a full-day water supply and storing water in covered receptacles as well as using a flush toilet (Cifuentes & Suarez, 2002). Some other researchers in a randomized control trail concluded that, interventions to improved water quality are generally effective in preventing diarrhoea and

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interventions to improve water quality at household level are more effective than those at the source and that this study could be verified over a long duration in a variety of settings using randomized controlled trials (Clasten & Bastable, 2003). Two hundred and ten interventional studies were examined from which 64 were selected that detailed water supply, water quality, sanitation and hygiene interventions and examined diarrhoea in non outbreak conditions (Fewtrell & Colford, 2004). Results from this meta- analysis suggest that water supply interventions in developing countries are effective in reducing illnesses. One study examined did suggest that household connection is an effective intervention against diarrhoea (Fewtrell & Colford, 2004).

2.3 SANITATION AND DIARRHOEA

Sanitation is the hygienic disposal and recycling of waste material, particularly, human excrement and urine. Sanitation is particularly important in the isolation of water supply system from sewage discharge. Each year, more than 1.6 million children under the age of 5 years die of diarrhoea and other illness brought on by dirty water and lack of access to sanitation (WHO, 2008). Improved sanitation is a system in which excreta are disposed off in such a way that they reduce the risk of faecal oral transmission to its users and the environment (United Nations, 2005). The Global Water Supply and Sanitation Assessment 2000 defined the following systems as improved: private and public sewerage system, septic flush latrines and simple pit latrines. Open pit, service/bucket latrines were described as unimproved. The former due to their failure to isolate faeces from the environment and the latter due to the potential health risks associated with manual emptying (Ash et al., 2005).

Assessment of health impact of improved household sanitation by Scott (2006) suggests the health benefits of improved household sanitation ranged from reduction in diarrhoea, helminth infections and trachoma. Provision of consistent use of sanitation isolates contaminated faeces from the environment, thus breaking the faecal oral transmission of

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disease (Scott, 2006). The evidence for the protective effect of sanitation against diarrhoea is greatest; with latrines potentially reducing diarrhoea diseases by an average of 36% (Scott, 2006). According to the human development report 2006 of the United Nations Development Programme (UNDP), up to 60% of infant deaths can be prevented by access to a flush toilet (Info change News and Features, 2006). Another study by Prado and Strina (2003) came out with a finding that, children living in houses with toilet facilities are about 50% less likely to contact diarrhoea than a household with no such facility. In this study, availability of toilets was associated with a 27% reduction in the risk of diarrhoea. The effect was significant even after all other variables had been controlled for.

In the Meta –analysis on sanitation interventions by Fewtrell and Colford (2004), few studies were available for analysis on sanitation which seemed to suggest that people prefer water to sanitation. Despite the low number of studies, there is an indication that sanitation interventions are effective in reducing diarrhoea levels (Fewtrell & Colford, 2004).

2.4 HAND WASHING AND DIARRHOEA

Hygiene has been found to be a primary preventive measure against diarrhoea (WHO, 2004). Even though water supply and sanitation impacts on diarrhoea, hygiene measures further minimises the effect of poor water supply and poor sanitation on diarrhoea (United Nation, 2005).

A lot of studies have pinpointed the effect of hygiene on diarrhoea. One published article (Mara, 2003), suggests that hygiene is potentially one of the most effective means of reducing the global burden of diarrhoea diseases in children. She stated that if hygiene promotion is to succeed, it needs to identify and target only those few hygiene practices which are the major source of risk in any setting. The writer hypothesize that any behaviour which prevent stools from getting into the sphere of domestic activities is likely to impact on

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health. The conclusion was that, hand washing at some critical points such as after visiting the toilet, before eating, and before preparing food, could interrupt several transmission routs. Many studies suggested that hand washing was one of the factors that lowered the incidence of diarrhoea. In a meta-analysis, some writers concluded that diarrhoeal pathogens in the domestic domain can only result if stools are inadequately disposed off or if hands are inadequately washed after visiting a sanitation facility. They writers further stated that hand washing with soap was associated with a 47% reduced risk of diarrhoea in children (Curtis et al., 2000). Another Advocacy article by 'The Economist', (2000) proposes that the second biggest killer of children in the world is not malaria or tuberculosis but rather diarrhoea. Easy access to water for all, better health education and dehydration therapy has been used over the years to prevent diarrhoea. Now, the best solution was simple to persuade people to wash their hands with soap ('The Economist', 2000). In developing countries, most households have soap, but only 15% - 20% of caregivers routinely use it to wash their hands after going to the toilet, cleaning a dirty baby or undertaking other tasks that have the potential of spreading the "lethal bugs" ('The Economist', 2000).

An assessment of effect of hand washing with soap on diarrhoea risk in the community by Carncross et al. (2006), in a systematic review found that washing hands with soap can reduce the risk of diarrhoea diseases by up to 47% and hand washing promotion could save one million lives. Another study examined the effect of hand washing on a child's health using a randomised control trail. Promotion of hand washing with soap on the incidence of diarrhoea was assessed. In neighbourhoods with hands washing promotion, 3000 households each were assigned antibacterial soap and plain soap for about one year. One of the primary study outcomes were diarrhoea. Compared with controls, children younger than 15 years in households who washed their hands with soap had 53% lower incidence of diarrhoea (-68% to -41%). The study concluded that hand washing with soap prevents diarrhoea (Luby, 2005). A meta-analysis on hygiene interventions in developing countries measured hygiene

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implemented widely (Fewtrell & Colford, 2004). Most emphasised the importance of hand washing and safe disposal of faeces. Splitting interventions according to whether the studies focused on hygiene education or actual hand washing. Studies directed at hand washing showed a greater impact on illness (Fewtrell & Colford, 2004). In this analysis, water, sanitation and hygiene interventions were found to be very productive ways to reduce diarrhoea disease. Improved water supply reduces morbidity by 32%. Hygiene interventions, including education and promotion of hand washing reduce diarrhoea cases by 45% and improvement in drinking water quality household water quality through household water treatment, such as chlorination at point of use and adequate domestic storage leads to a reduction of diarrhoea episode by 39% (Fewtrell & Colford, 2004).

2.5 CAREGIVERS KNOWLEDGE AND DIARRHOEA

UNICEF and the Government of Bangladesh initiated the Environmental Sanitation Hygiene and Water Supply Project which was aimed at reducing diarrhoea in children and woman living in slums. One key objective was to improve personal hygiene by creating awareness about the practice of hygiene. Understanding of what causes diarrhoea improved. Only 4% of those surveyed in 2004 did not know what caused diarrhoea. In 2002, this was 12%. There were also improvements in reporting measures to prevent diarrhoea, such as keeping food covered increased from 56% to 82%. Safe Water Supply increased from 19% to 24%. Garbage left lying around decreased from 69% to 41% (UNICEF, 2004). In a prospective follow-up study carried out after a case control study on hygiene behaviour in relation to diarrhoea, the conclusion reached was that, washing of hands, domestic cleanliness, a better economic position, the use of diapers as well as schooling had a positive influence on general hygiene behaviour (Gorter & Sandiford, 1998

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CHAPTER 3

METHODS

3.1 STUDY DESIGN

This study is a household based cross – sectional study carried out from the 19th to the 28th of June 2008. Since there had been no such previous study in Asuogyaman district, a cross-sectional study was selected to provide baseline information on the prevalence of diarrhoea and also to assess the relationship between diarrhoea and water, diarrhoea and sanitation for further hypothesis generation. Due to limited time and logistics constraint, a longitudinal study which could have been used to determine the trend over a long period of time was not considered.

3.2 STUDY AREA

Asuogyaman district was one of the 15 new districts created in 1988 as a result of Ghana Government re-demarcation exercise carried out to operationalise the decentralization programme in the country. It is the 10th largest district in Eastern region and is made up of 5.7% of the total land area in the region with a total population of about 83,680. It has a youthful population who are predominantly farmers and traders (DHMT, 2008). In spite of the district's proximity to Accra, the nation's capital, it is predominantly a rural district with a poor state of socio-economic and rural infrastructural development. The presence of a naturally hilly landscape together with the presence of existing water bodies as well as the creation of the Akosombo hydro electric dam has created beautiful scenery. However, the buildings found in the district are a mixture of under developed, old as well as new houses. The latter is found along the streets and in Akosombo, making the towns along the street look attractive,

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but most towns in the interior were not well planned and are not well developed. Most common houses have poor drainage, dilapidated walls, exposed foundations and leaking roofs. The main improved toilet facilities are water closets found along the Akosombo /New Akradi road as well as KVIP's and VIP's. Three main pipe borne water systems are available; One at Kpong, another at Akosombo and the last at Dodi Asantekrom (Acquah et al., 2008).

3.3 STUDY VARIABLES

3.3.1 DEPENDENT VARIABLE- MAIN OUTCOME

3.3.1.1. Diarrhoea.

To determine diarrhoea as the main outcome measure in children from 0 months to 59 months in a cross-sectional survey, prevalence is used. During the interview of mothers or caregivers, the field workers asked the mothers about the occurrence of a day of diarrhoea in her child within the past 2 weeks preceding the survey. Diarrhoea, defined as the occurrence of 3 or more watery stools within 24 hours.

3.3.2 INDEPENDENT VARIABLES

3.3.2.1 Safety of drinking water

This was defined according to the primary source of the drinking water as improved or unimproved. Other variables considered were, the kind of drinking water storage vessels, that is, earthenware containers and other containers (not earthenware), house hold treatment of

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drinking water, storage containers for drinking water: if it have been covered or left uncovered as well as the duration of storage of the drinking water. The duration of storage of the drinking water was defined as period of time the water was kept in the containers before emptying and refilling the containers. This was categorised as follows, 0=kept between 0 to 3 days. 1= kept for more than 3 days.

3.3.2.2 Sanitation facilities used by the household

Under sanitation facilities, factors examined were the kind of facility available for use by the caregiver as well as the type or design of the facility used by the caregiver. The kind of facility available for use by the caregiver were grouped into 3, household facility defined as a facility found in the house and used by the members of the house alone, community or a public facility , if the facility was for public use, and no facility if the care giver uses the open field. The type/design of the facility used were pre-coded and grouped into two. 0= improved sanitation facilities, 1= unimproved sanitation facilities.

3.3.2.3 The practice of hand washing with soap

This variable was defined as a caregiver, remembering and mentioning the use of soap (found present in the household by investigator) for washing hands without being prompted. Circumstances under which caregivers hands were washed was also probed. This was categorised into three; before eating, after visiting the toilet, and before the preparation of food.

3.3.2.4 Caregivers knowledge about causes of diarrhoea

Probable causes of diarrhoea were listed as attributable to contaminated food, contaminated water, dirty hands, and poor environmental sanitation. These expected responses were graded and scored. Poor knowledge= none of the above, fair knowledge= only one of the above, good knowledge =2 or more of the above.

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3.3.2.5 Sex of child

This was coded into 0=male, 1=female.

3.3.2.6 Age of child (months)

The child's current age in months was calculated using the child's health records. In a case were this record was not available the date of birth was provided by the mother. The current age in months was categorised as follows; 0=1-5months, 1=6-11months, 2=12-17months, 3=18-23 months, 4= 24+ months.

3.3.2.7 Child's Schooling

Care givers were asked whether the child had started schooling and coded as;

0=not started schooling, 1=started schooling,

3.3.2.8 Breastfeeding practices

Exclusive breastfeeding was defined as children who were giving breast milk alone during the first six months of life and infants who were not yet six months and were still being fed on breast milk alone. None exclusive breast feeding referred to any child that was being given or had been given water or food before 6 months of age. This variable was coded into two; 0= non exclusive breastfeeding and 1= exclusive breastfeeding.

3.3.2.9 Caregiver's education

The highest level of education a caregiver had attained was asked and coded as follows: Caregivers education was coded as; 0 =No formal education for any caregiver who had not been to school or completed primary education. 1= caregivers who had completed primary education. 2= caregivers who had completed Junior Secondary School (JSS) or Middle School.

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3= caregivers who had completed Senior Secondary School or had attained any level of education higher than that.

3.3.2.10 Caregiver's age

The ages of the caregivers were asked and coded as follows: 0=17-20 years, 1=20-24 years, 2=25-29years, 3=30-34years, 4=35-39 years and 5=40+ years.

3.3.2.11 Care giver's marital status

All caregivers who were divorced, single or widowed was recoded as 0=single. Those who were married, or cohabiting with a partner was recoded as 1=married.

3.3.2.12 Caregiver's employment status

This was coded into; 0= unemployed 1=employed.

3.3.2.13 Access to news

Enquiries were made to solicit information on whether a caregiver had a functioning Television set or a tape. Evidence of none of the above was considered as not having access to news and coded as 0= no access. Possession of a functioning Television set or a tape, as considered as having access and coded as 1 =access.

3.4 STUDY POPULATION

The study population consisted of mother/caregiver-child pairs (where the children were below 59 months of age) and resided in Asuogyaman District. Respondents were mothers or caregivers of children below 59 months of age in Asuogyaman.

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3.5 SAMPLING

This was a multi-stage sampling involving four stages.

Stage 1: Selection of sub- districts.

Respondents were proportionately selected from all the four sub-districts as well as Akosombo in Asuogyaman District. Atimpoku/ Senchi sub district (24% of the population), Akwamufie/Apegusu sub-district (24% of the population), Anum/Bosu sub-district (21% of the population), Adgena/Gyakiti sub-district (15% of the population) and Akosombo which is made up of 16% of the population.

Stage 2: Selection of communities

All the communities from each of the sub districts were listed. (Due to time and logistics constraint, communities which could only be reached by boat were excluded). Two communities were picked randomly from the list of communities in each sub district with more than 20% of the entire population by ballot. By ballot, a community each was randomly picked from the list of communities in each sub district with a population of less than 20% of the entire population. This resulted in the selection of eight communities from the entire district. The questionnaires for each sub- district with more than 20% of the entire population was divided and shared equally between the two communities selected in that particular sub-district. Communities involved in the study were, Akosombo- Combined (from Akosombo) ,Atimpoku town and Small London (from Atimpoku/ Senchi sub district) , Bosu

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and Dodi Asantekrom (from Anum/Bosu sub-district) , Mangoase and Apegusu (from Akwamufie/Apegusu sub-district) , then Adgena (from Adgena/Gyakiti sub-district).

Stage 3:Selection of households

In the selected communities a transect walk was done, and with the help of opinion leaders, the centre of the community was located. A pen was tossed and the house where the tip of the pen pointed was selected. Upon leaving the house, the house towards the left was selected. If there happen to be no house towards the left, the pen was tossed again to select another house. This process was repeated till all the questionnaires for a particular community had been administered.

Stage 4: Selection of care giver

Upon entering any house a child was randomly selected from all the children less than five years present in the house by balloting using balloting papers. The caregiver of the selected child was selected by default for interviewing. Only one respondent was selected from each house. If no child was found below age five in a selected household, the interviewer goes through the process of selecting a house for the next eligible respondent.

3.6 SAMPLE SIZE CALCULATION

Since there has been no earlier district-wide survey in Asuogyaman reporting diarrhoea rates, the sample size was calculated based on a nutritional survey carried out in small London, a community in Asuogyaman that reported a prevalence of diarrhoea as 40%. With policy

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changes and training of health staff, it was estimated that there should be a 30% reduction in diarrhoea rates by the time of the study. At 5% level of significance powered at 90%, Epi info Microsoft windows was used in the sample size calculation to arrive at a sample size of 390. To make room for non responds and interviewer's error, the sample size was rounded to 400.

3.7 DATA COLLECTION TECHNIQUES/METHODS AND TOOLS

The data collection tools were a structured questionnaires and an observation check list. A pre-coded structured questionnaire administered in the local language was used for data collection. Information concerning the prevalence of diarrhoea in the child was obtained from the caregiver over a 2 weeks recall by interviewer. Data on the age of mothers/caregivers, educational status of caregiver, gender of child, and age of the child, child's schooling as well as breastfeeding practices was inquired from caregiver and recorded by the field assistant. Interviewers using a pre-coded structured questionnaire to elicit information on the sanitation facilities used by household, the practice of hand washing with soap and water by mothers, the sources of household water supply, storage of house household drinking water, treatment of drinking water as well as the knowledge of mothers about causes of diarrhoea .

By non participant observation and with a check list, type of toilet facilities used, and the source of water supply, household water storage as well as a designated place and materials for hand washing in houses was ascertained. The period of data collection was from morning to late afternoon for one and half weeks.

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3.8 QUALITY CONTROL

Data collection tools were pre-tested and adjustments made to validate the questionnaire. Rigorous training on data collection was provided for the research assistants prior to the commencement of the data collection comprising of how to administer the questionnaire in the local language, role playing as well as pre-testing. Incompetent research assistants were dropped. Four non-health professional research assistants were finally recruited to administer the questionnaires in the local language. While four health professionals played supervisory roles in the sub districts were the questionnaires were administered. All questionnaires were numbered and checked for completeness, consistency and accuracy by the principal investigator. Some completed questionnaires were randomly selected and the same respondent followed up to verify correctness of data collected by research assistants. The data was entered twice soon after collating into Epi-info to ensure consistency in the data collected and to make sure no data is lost.

3.9 DATA PROCESSING AND ANALYSIS

Questionnaires were re-numbered prior to data entry. Data base was created in Epi-info 3.3.2 and the data entered into Epi-info 3.3.2. The data was then transported into Microsoft Office Excel 2003, and analysed using stata for windows (stata corp, college station Texas.)

3.9.1 Statistical Methods

The outcome of interest is the occurrence of at least 1 episode of diarrhoea among children under-five years over a 2 weeks recall by the caregiver. Data was collected on sanitation, source of drinking water, hand washing with soap among others. The data was captured in Epi- info. For easy analysis and interpretation, sanitation facilities and the main sources of drinking water was categorised into improved and unimproved.

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The prevalence of diarrhoea was determined by estimating the number of children under-five years that had had diarrhoea within the last 2 weeks prior to the survey as a proportion of the total number of children under-five years reported in the study. The crude estimate of odds ratio was determined for each potential factor of diarrhoea using simple logistic regression techniques. The adjusted odds ratios were determined using a multivalent logistic regression technique. Only variables that were significantly associated with diarrhoea were considered in the multivariable logistic regression model and tested in turn using likelihood ratio test. Statistical analysis was done using stata for windows (stata corp, college station Texas.)

3.10 ETHICAL CONSIDERATONS/ISSUES

Ethical clearance was sort from the Ghana Health Service Research Ethics Committee. Permission to undertake this study in Asuogyaman district was obtained from the Asuogyaman District Chief Executive and the District Health Administration. Upon entering a house, selected caregivers who volunteered after being made to understand the purpose and procedures of the study were interviewed. A written or verbal consent was obtained from all such study participants. The study presented minimum risk to participants. Information gathered was treated confidentially and only used for research purposes.

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3.11 PRE-TEST OR PILOT STUDY

The pre-test exercise was done at Afabeng, a community adjacent to the offices of the District Assembly. This community had similar characteristics as the research communities but was not part of the research communities involved in the study. The pre-testing helped in making the necessary corrections needed to validate the questionnaire. Fourteen questionnaires were administered during the pre-testing.

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CHAPTER 4

RESULTS

4.1 BACKGROUND CHARACTERISTICS OF RESPONENTS

4.1.1. Children's socio-demographic characteristics

A total of 400 children were sampled during the survey. Table 4.1 below, presents the prevalence of diarrhoea according to the socio-demographic characteristics of children involved in the survey. Of the 400 children sampled for the survey, 49% (196) were males and 51% (204) were females. The age distribution of the children indicates 37.8% (151) children were between ages 24-59 months, eleven percent (44) were aged 18-23 months, about 21% (82) were within 12-17 months, 20% (80) were between 6-11 months and 10.5% (42) had not yet attained 6 months. Out of the 400 children sampled, only seventeen percent (68) children had started schooling. These comprised of children above the age of 2 years.

Table 4.1: DISTRIBUTION OF DIARRHOEA AMONG CHILDREN UNDER-FIVE YEARS, ASUOGYAMAN DISTRICT,JUNE 2008 BY CHILDREN'S SOCIO-DEMOGRAPHIC CHARACTERISTICS

Characteristics	Number of Children	Number of diarrhoea	Percent diarrhoea	P-value
Age of Child (Months):				
0-5	42	12	28.6	
6-11	80	34	42.5	
12-17	82	37	45.1	0.07
18-23	44	14	31.8	
24+	151	44	29.1	
Sex of Child:				
Male	196	77	39.3	
Female	204	65	31.9	0.12
Schooling:				
Not Started	332	126	38.0	
Started	68	16	23.5	0.02
Breastfeeding practices:				
Non- exclusive	190	86	45.3	
Exclusive	210	56	26.7	<0.0001

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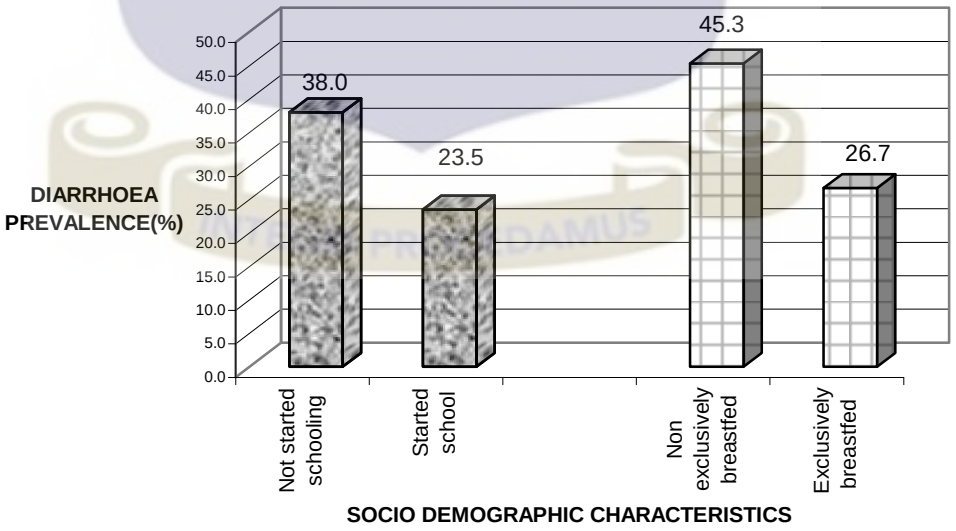
Out of the 400 children, 52.5% (210) had been exclusively breastfed or were still exclusively breastfeeding, while 47.5% (190) had not been fed exclusively on breast milk.

Of all the background characteristics listed above, schooling and breastfeeding practices were significantly associated with diarrhoea rates. Diarrhoea prevalence among children who had started schooling was 23.5% which was lower than those children who had not started schooling (38%). A Pearson chi-square test gave p-value of 0.02 indicating that schooling in Asuogyaman district significantly reduces the risk of diarrhoea among children below 59 months of age. The most significant risk factor associated with diarrhoea among the children's background characteristics was non exclusive breastfeeding. Diarrhoea rate among those who were not exclusively breastfed was 45.3% compared to 26.7% in those who were exclusively breastfed. In a simple logistic regression analysis, a p-value of <0.0001 (Pearson chi-square test) indicates that breastfeeding practices is significantly associated with diarrhoea. Figure 4.1 presents the prevalence of diarrhoea by children's background characteristics.

FIGURE 4.1: DIARRHOEA PREVALENCE IN CHILDREN 0-5 YEARS IN ASUOGYAMAN DISTRICT,JUNE 2008 BY CHILD'S SOCIO-DEMOGRAPHIC CHARACTERISTICS



4.1.2 Caregivers socio-demographic characteristics

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Four hundred caregivers comprising of 380 mothers, 9 fathers, 8 grandmothers and 3 guardians were interviewed during the survey. The caregivers' educational background indicates that 16.8% (67) had never attended school, 34.3% (137) had attained primary education as their highest level of education, and 38.5% (154) had completed Junior Secondary School/Middle School. Only 10.5% (42) had attained education up to or above Senior Secondary School. Table 4.2 shows the distribution of diarrhoea according to caregiver's socio-demographic characteristics.

Table 4.2:DISTRIBUTION OF DIARRHOEA IN CHILDREN UNDER-FIVE YEARS IN ASUOGYAMAN DISTRICT,JUNE 2008, BY CAREGIVERS'S SOCIO-DEMOGRAPHIC CHARACTERISTICS

Factors	Number of Caregivers	Number of diarrhoea	Percent diarrhoea	P-value
Caregiver's education:				
None	67	28	41.8	0.03
Primary	137	55	40.2	
JSS/Middle	154	52	33.8	
Secondary+	42	7	16.7	
Caregiver's age (Years):				
17-19	29	8	27.6	0.10
20-24	94	37	39.4	
25-29	106	44	41.5	
30-34	76	18	23.7	
35-39	63	20	31.8	
40+	32	14	43.8	
Caregiver's Marital Status:				
Single	68	21	30.9	0.38
Married	332	121	36.5	
Caregiver's employment status:				
Not employed	83	26	31.3	0.37
Employed	317	116	36.6	
Caregivers access to news:				
No access	98	42	42.9	0.07
Access	302	99	32.8	
TOTAL	400			

The care givers were between 17 to 69 years old. Of this, 7.3 % (29) care givers were less than 20 years of age. About twenty three percent (93) caregivers were 20-24 years of age. The largest group of caregivers were between 25-29 years of age (26.5%). Nineteen percent (76) caregivers were between 30-34 years, 15.8% (63) fell between the age bracket of 35 -39 years. Only 8% (32) caregivers were above 40 years of age. On marital status, 17% (68) caregivers

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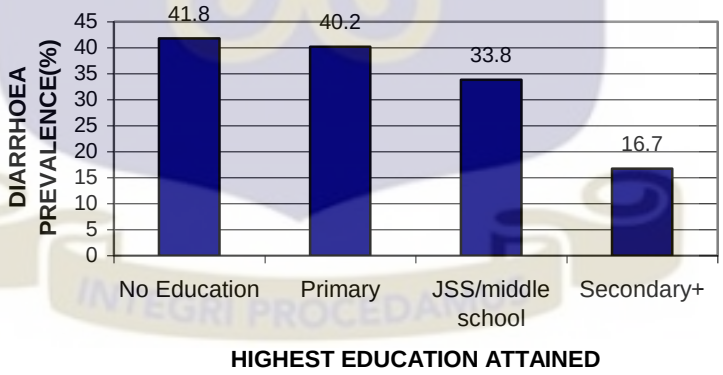
lived without partners while 83% (332) were living with their partners. About seventy five percent (302) caregivers had access to news through a radio set or television set they possessed while 24.5 % (98) of caregivers had no means of assessing news.

Of all the caregivers' socio- demographic characteristics, caregiver's education was significantly associated with the risk of diarrhoea (Pearson chi-square test gave a p-value of 0.03 in a simple logistic regression analysis). The trend remarkably show a decline in diarrhoea rate with an increase in caregiver's level of education attained. Diarrhoea prevalence were highest among children of caregivers with no formal education(41.8%) followed by those who had attained primary education(40.2%), then those who had completed JSS/ Middle School (33.8%). The least rates were found in children whose parents had completed secondary school (16.7%). Figure 4.2 shows variations of diarrhoea prevalence in children with caregiver's highest education.

FIGURE 4.2: DIARRHOEA PREVALENCE IN UNDER-FIVES ,ASUOGYAMAN DISTRICT,JUNE 2008, BY HIGHEST LEVEL OF EDUCATION ATTAINED BY CAREGIVERS



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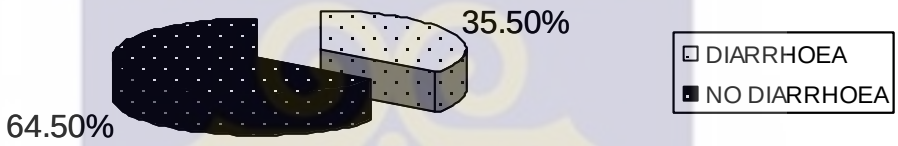
4.2 PREVALENCE OF DIARRHOEA AMONG CHILDREN UNDER 5 YEARS

Out of 400 children sampled, 142 had had at least 1 diarrhoea episode within the 2 weeks before the survey. Figure 4.3 shows the prevalence of diarrhoea in children under -five years in Asuogyaman district.

FIGURE 4.3:PREVALENCE OF DIARRHOEA AMONG CHILDREN UNDER FIVE YEARS IN ASUOGYAMAN DISTRICT-JUNE 2008



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4.3SAFETY OF DRINKING WATER AND DIARRHOEA

The sources of drinking water for children under-five years of age in Asuogyaman district comprised of improved drinking water sources (bore holes, bottled or bagged water, household connection, protected wells and public stand pipes)and unimproved sources (river/ponds and unprotected wells as well as rain water). Only 3.3%(13) caregivers treated their household drinking water after collection from the above drinking water sources . Five caregivers treated their drinking water by boiling and eight by filtering. The highest rate of diarrhoea was among those who did not treat their drinking water (36.6%). The rate among those who filtered their drinking water was 25%. There was no child with diarrhoea when caregivers boiled their household drinking water. Examination of storage vessels showed that 15.5 % (62) caregivers stored their drinking water in earthenware pots while 84.5 % (338) stored their water in storage containers other than earthenware pots.

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Table 4. 3: DISTRIBUTION OF DIARRHOEA AMONG CHILDREN UNDER FIVE YEARS,ASUOGYAMAN DISTRICT,JUNE 2008, IN RELATION TO DRINKING WATER SUPPLY

Factors	Number of children	Number of children who had diarrhoea	Percent of diarrhoea	P-value
Household water treatment:				0.20
No treatment	386	140	36.3	
Boil	5	0	0.0	
Filter	8	2	25.0	
Kind of storage vessel in household:				0.25
Earthernware	62	26	41.9	
Others	338	116	34.3	
Covering of household drinking water:				0.05
Uncovered	31	17	54.8	
Covered	369	125	34	
Days of storage of household drinking water:				0.08
1-3 days	210	83	39.5	
>3 days	190	59	31.1	
Sources of drinking water for child:				0.01
Unimproved sources	116	54	46.6	
River/pond	79	44		
Rain water	1	0		
Unprotected well	36	10		
Improved sources	262	87	33.3	
Bore hole	85	34		
Bottle/Pure water	9	2		
Household connection	39	12		
Protected well	8	3		
Public Standpipe	121	39		
Not applicable*	22			
TOTAL	400			

not applicable*=child is still exclusively breastfeeding

Table 4.3 presents factors considered under drinking water supply in relation to diarrhoea.

The rate of diarrhoea in children among caregivers who stored their drinking water in earthenware pots was higher (41.9%) compared to those who used other containing vessels to store their drinking water (34.3%). About eight percent (31) caregivers left their storage vessel uncovered while 90.3 %(361) had their vessels covered. The rates of diarrhoea amongst those who left their drinking water uncovered was higher (54.8%) compared to those

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who covered their drinking water (34%). About fifty three percent of caregivers (210) stored their drinking water for less than 3 days while 47.5 %(190) stored their drinking water over 3 days. Contrary to expectations, storing water for more than 3 days was associated with less diarrhoea episodes (31.1%) compared to those who stored their drinking water for more than 3 days (39.5%). However a simple logistic regression analysis showed that, none of the variables examined above had a significant p-value (Pearson chi-square test gave a p-value more than 0.05) apart from sources of drinking water. Covering of drinking water vessel had a p-value of 0.05 indicating that it contributed neither significantly nor insignificantly to the risk of diarrhoea.

The sources of drinking water for the child were grouped into improved and unimproved sources as shown above. Out of the 400 caregivers, 5.5 % (22) of caregivers were still exclusively breastfeeding their babies and had not yet started giving water to their children. These children were exempted. Of the caregivers whose children were being given water, 69.3% (262) caregivers gave improved sources of drinking water to their children while 30.7% (116) gave unimproved sources of drinking water to their children. Forty seven percent of children who used unimproved sources had had at least 1 diarrhoea episode 2 weeks preceding the survey compared to a reduced rate of 33.3% in those who used improved sources of drinking water. Figure 4.4 below shows the distribution of diarrhoea in children under-five years by child's drinking water source.

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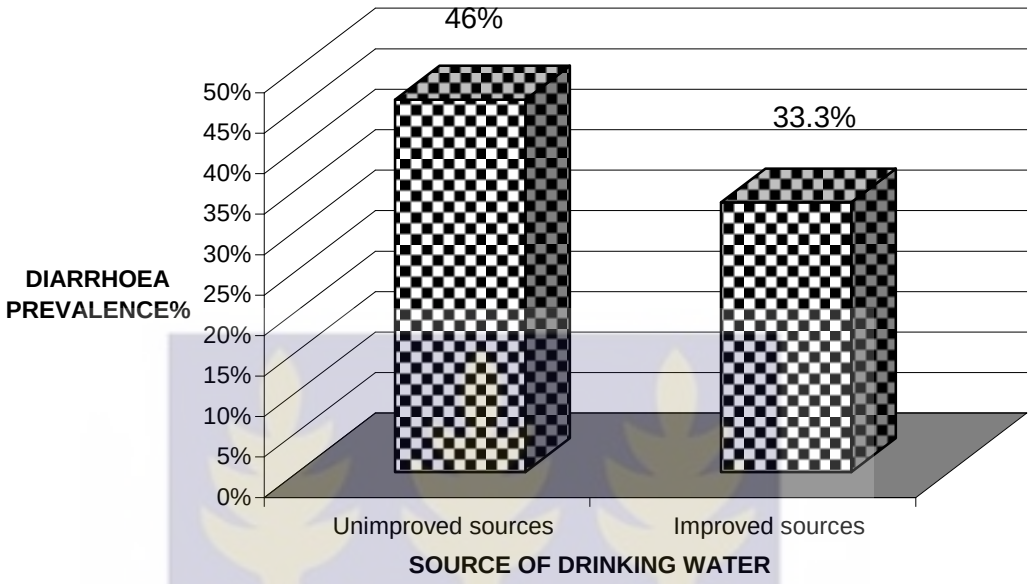
FIGURE 4.4:DISTRIBUTION OF DIARRHOEA IN CHILDREN UNDER-5 YEARS IN ASUOGYAMAN DISTRICT, JUNE 2008 BY CHILD'S DRINKING WATER SOURCE



4.4 SANITATION FACILITIES AND DIARRHOEA.

One of the main factors investigated under sanitation were the kinds of facility used by the caregiver. Type of sanitation facilities used by caregivers was grouped into improved sanitation facilities and unimproved sanitation facilities based on the design of the facilities. Improved sanitation facilities include water closet/pour- flash latrines simple pit latrines and ventilated improved latrines. An unimproved sanitation facility refers to the absence of sanitation facilities, the use of bucket latrines, or open pit latrines. Fifteen percent of caregivers used unimproved sanitation facilities themselves and 85% (340) used improved facilities. Diarrhoea in children of care givers using unimproved sanitation facilities was lower (33.3%) compared to 35.9% for caregivers who used improved facilities. Child's excreta disposal shows that though most caregivers use improved sanitation facilities, the children's excreta is disposed of in unimproved facilities. Fifty eight percent of caregivers used unimproved facilities in disposing off their children's excreta while only 41.5 %(166)

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caregivers disposed of athe children's excreta into improved facilities. Diarrhoea rate was higher (37.5%) in children of caregivers who used unimproved facilities in disposing of their children's excrement than in caregivers who used improved facilities (33.1%).However, the type of sanitation facilities used by caregivers as well as the means of child's excreta disposal had a Pearson's chi–square p-values greater than 0.05 (simple logistic regression analysis) , thus indicating that they are not significantly associated with the risk of diarrhoea in children below the age of five years in Asuogyaman district. Table 4.4 summarizes sanitation facilities used by care givers and diarrhoea rates.

Table 4.4: DISTRIBUTION OF DIARRHOEA AMONG CHILDREN UNDER-FIVE YEARS,ASUOGYAMAN DISTRICT, JUNE 2008 BY SANITATION FACILITIES USED BY CARE GIVERS

Factors	Number of caregivers	Number of children who had diarrhoea	Percent of diarrhoea	P-value
Kind of sanitation facility:				
Community facility	220	92	42.0	
Household facility	169	47	27.8	0.01
No facility	11	3	27.3	
Type of sanitary facility				
Unimproved	60	20	33.3	0.70
Improved	340	122	35.9	
Child excretal disposal:				
Unimproved	232	87	37.5	0.37
Improved	166	55	33.1	
TOTAL	400	142	35.5	

A total percentage of 55% (220) caregivers used community/public facilities, forty two percent used household facilities, while 2.8%(11) used open fields. (Illustrated in table 4.4 above) Diarrhoea rate among children whose parents use community or public facilities was 42%. This was relatively higher than those who used household facilities (27.8%). The least rate of diarrhoea was in caregivers who used open fields (27.3%).

A simple logistic regression analysis gave a p-value of 0.01(Pearson's chi-square test). This demonstrates that the kind of sanitation facility used by the caregivers is significantly associated with diarrhoea rates in children under-five years in Asuogyaman district. This is

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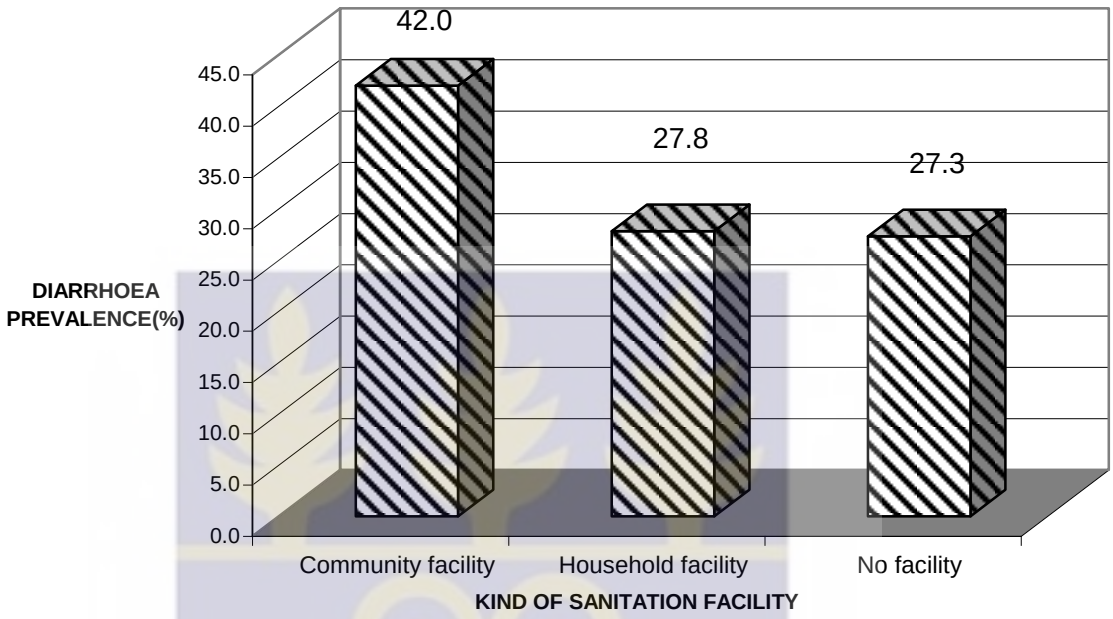
demonstrated in figure 4.5 below.

FIGURE 4.5:DISTRIBUTION OF DIARRHOEA IN CHILDREN UNDER-5 YEARS IN ASUOGYAMAN DISTRICT,JULY 2008 BY KIND OF SANITATION FACILITIES UESD BY CAREGIVERS



4.5 HAND WASHING AND DIARRHOEA

The practice of hand washing with soap and water was asked after verifying the presence of soap in the house. All the 400 caregivers had some soap of some sort in the house. A caregiver remembering and mentioning the use of soap in the household for washing hands without being prompted was considered to have been practicing hand washing with soap and water. Out of the 400 care givers, only 19.8% (79) mentioned washing their hands with soap and water without being prompted. A simple logistic regression analysis showed that risk of diarrhoea in children was significantly associated with hand washing $p < 0.0001$ (Pearson's chi-square test). Diarrhoea rates among those who did not wash their hands with soap and water was significantly higher 40.2% compared to those who wash their hands 16.5%. (Illustrated in Fig 4.5 below)

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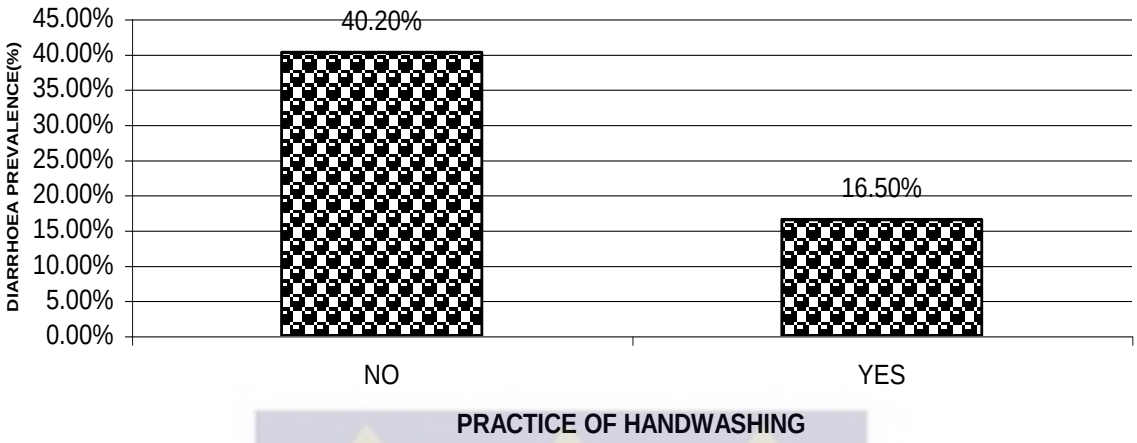
FIGURE 4.6: DIARRHOEA PREVALENCE AMONG CHILDREN UNDER-5 YEARS IN ASUOGYAMAN,JUNE 2006 BY CAREGIVERS HAND WASHING PRACTICES



Circumstances under which caregivers hands usually washed their hands was also probed. Those who mentioned any of the three critical occasions for washing hands, that is: washing hands before eating, after visiting the toilet, and before the preparation of food were recorded. Sixty one of the 79 mentioned after visiting the toilet. Fifty five out of the 79 mentioned before eating and 24 mentioned before preparing food. Other circumstances mentioned were after child's excreta disposal and before feeding child (See table 4.5 below).

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Table 4. 5: DISTRIBUTION OF DIARRHOEA AMONG CHILDREN UNDER-FIVE YEARS,ASUOGYAMAN DISTRICT, JUNE 2008, IN RELATION TO CARE GIVERS HAND WASHING

Factors	Number of caregivers	Number of children who had diarrhoea	Percent of diarrhoea	P-value
Hand washing with soap and water:				
No	321	129	40.2	<0.0001
Yes	79	13	16.5	
TOTAL	400			
Circumstances for washing hands				
After defeacating	61	10	16.4	
Before preparing food	24	5	20.8	
Before eating	55	10	18.2	
TOTAL	79			

4.6 CAREGIVER'S KNOWLEDGE ABOUT CAUSES OF DIARRHOEA

Causes of diarrhoea were listed as attributable to contaminated food, contaminated water, dirty hands, and poor environmental sanitation. These expected responses were graded and scored. The caregivers were graded as having poor knowledge when none of the above was mentioned. When only one of the above was mentioned the caregiver was graded as having a fair knowledge, caregivers were graded as having good knowledge when 2 or more of the above was mentioned. Table 4.6 below shows diarrhoea prevalence in children in relation to caregiver's knowledge about causes of diarrhoea.

Table 4.6: DISTRIBUTION OF DIARRHOEA AMONG CHILDREN UNDER-FIVE YEARS,ASUOGYAMAN DISTRICT, JUNE 2008 BY CAREGIVER'S KNOWLEDGE ABOUT CAUSES OF DIARRHOEA

Factors	Number of Caregivers	Number of diarrhoea	Percent diarrhoea	P-value
Knowledge about causes of diarrhoea:				
Poor knowldege (none)	133	77	57.9	<0.0001
Fair knowledge (only one cause identified)	116	30	25.9	
Good knowledge (at least 2 causes identified)	151	35	23.2	

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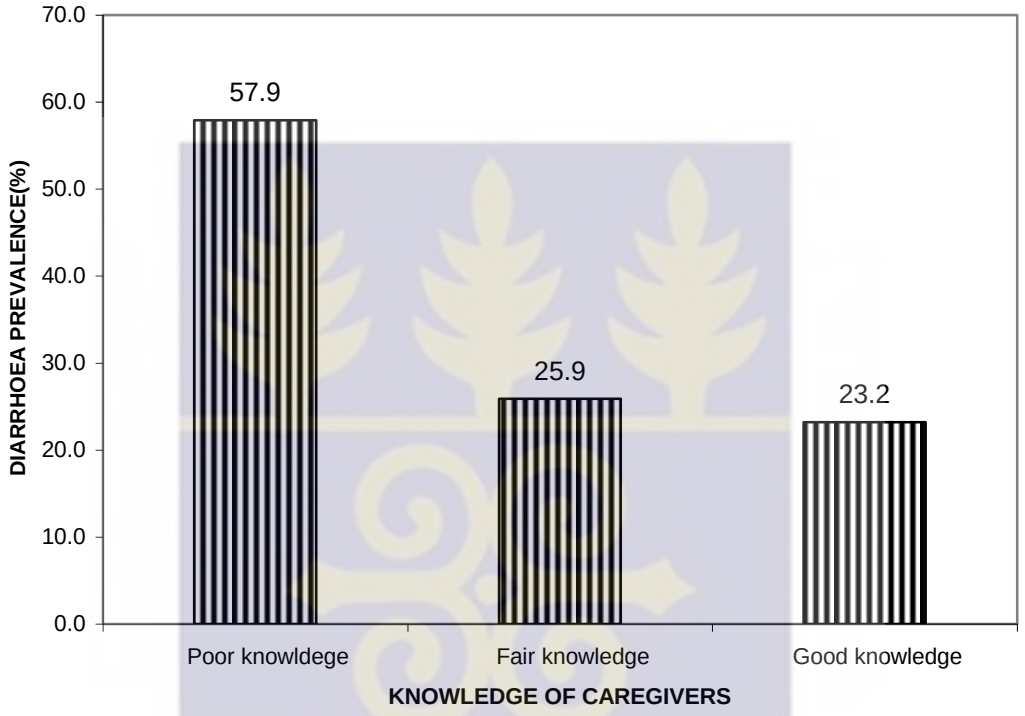
Thirty three percent of caregivers had a poor knowledge about causes of diarrhoea. Forty two percent (116 caregivers) had a fair knowledge about causes of diarrhoea and 37.8% (151) had a good knowledge about causes of diarrhoea.

FIGURE 4.7:DIARRHOEA PREVALENCE AMONG CHILDREN BELOW 5 YEARS IN ASUOGYAMAN DISTRICT ,JUNE 2008 BY CAREGIVERS KNOWLEDGE ABOUT DIARRHOEA CAUSES



Diarrhoea rates was highest among children of caregivers with a poor knowledge about diarrhoea causes (57.9%), followed by children of caregivers with a fair knowledge about causes of diarrhoea (25.9%). The least rate of diarrhoea was among children of caregivers with a good knowledge about causes of diarrhoea (23.2%). (See figure 4.6 above) A simple logistic regression analysis showed that knowledge of caregivers about causes of diarrhoea was the most significant factor associated with risk of diarrhoea episodes in children under-five years ($P<0.0001$).

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4.7 LOGISTIC REGRESSION OF FACTORS FOR DIARRHOEA IN ASUOGYAMAN DISTRICT.

A simple logistic regression analysis showed that exclusive breastfeeding, hand washing with soap and water and caregivers knowledge about causes of diarrhoea had strong crude association with reduced risk of diarrhoea among children under-five years of age. Higher levels of caregiver's education, private/household sanitation facility as well as improved sources of drinking water also had crude associations with reduced risk of diarrhoea. After adjusting for the independent effects of these potential factors in the multivariable logistic model, non exclusive breastfeeding, mother's poor knowledge about causes of diarrhoea and poor hand washing practices remained significant risk factors for diarrhoea.

Children who were exclusively breastfed had a 54% reduced risk of diarrhoea compared with counterparts who were not exclusively breastfed (Adjusted Odds ratio=0.46, 95% CI= [0.29, 0.72], p-value<0.01). Children whose caregivers wash their hands with soap and water before feeding them had a 63% reduced risk of diarrhoea (Adjusted Odds ratio=0.37, 95% CI=[0.19, 0.72], p-value<0.01). Furthermore, caregivers knowledge about causes of diarrhoea was the most significant risk factor associated with diarrhoea in the children (p-value<0.0001) children whose caregivers had a good knowledge about causes of diarrhoea had a 75% reduced risk of diarrhoea compared to children of caregivers who had a poor knowledge about causes of diarrhoea (Adjusted Odds ratio=0.25, 95% CI= [0.015, 0.44], p-value<0.0001). Children whose caregivers had a fair knowledge about causes of diarrhoea had a 72% reduced risk of diarrhoea compared to children of caregivers who had a poor knowledge about causes of diarrhoea (Adjusted Odds ratio=0.28, 95% CI= [0.16, 0.47], p-value<0.0001).

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Table 4.7: Factors affecting prevalence of diarrhoea among children aged 0-59 months, Asuogyaman District, 2008

	Unadjusted Odds Ratio		Adjusted Odds Ratio	
Factors	**OR (95% CI)**	**p-value**	**OR (95% CI)**	**p-value**
Mother's education:				
None	1			
Primary	0.93 (0.52, 1.69)	0.02		
JSS/Middle	0.71 (0.39, 1.28)			
SSS and above	0.28 (0.11, 0.72)			
Breastfeeding Practices:				
Not exclusive	1		1	
Exclusive	0.44 (0.29, 0.67)	<0.0001	0.46 (0.29, 0.72)	<0.01
Hand washing with soap and water:				
No	1		1	
Yes	0.29 (0.16, 0.55)	<0.0001	0.37 (0.19, 0.72)	<0.01
Knowledge about causes of diarrhoea:				
Poor knowldege (none)	1		1	
Fair knowledge (only one cause identified)	0.25 (0.15, 0.44)	<0.0001	0.28 (0.16, 0.47)	<0.0001
Good knowledge (at least 2 causes identified)	0.22 (0.13, 0.37)		0.25 (0.15, 0.44)	
Schooling:				
Not Started	1			
Started	0.50 (0.28, 0.92)	0.03		
Type of Toilet facility:				
Community facility	1			
Household facility	0.54 (0.35, 0.82)	0.01		
No facility	0.52(0.13,2.02)			
Child's drinking water source:				
Unimproved	1			
Improved	0.56 (0.32,0.85)	0.01		

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CHAPTER 5

DISCUSSIONS

BACKGROUND CHARACTERISTICS

Of all the child's background characteristics investigated, the risk of diarrhoea was not significantly affected by the age of the child or the sex of the child. Significant associations found were in relation to schooling as well as the practice of exclusive breastfeeding. Both were associated with a reduced risk of diarrhoea.

Children at school are more likely to be trained by caregivers who have attained at least an education up to the Junior Secondary School level. Such educated caregivers are more likely to have a good knowledge about causes of diarrhoea than un-educated caregivers, and are more likely to impart good hygiene behaviour to the child, considering their position as teachers compared to uneducated caregivers. The caregiver's educational status re affirmed this. Increase in educational status of caregivers was associated with a decrease in the risk of diarrhoea episodes in children (p-value=0.03). Of all the caregivers, about 51% of caregivers did not attain education above primary level. A prospective follow-up study by Gorter and Sandiford (1998) in rural Nicaragua came out with a conclusion that, schooling (> 3 years of primary education by caregivers) had a positive influence on general hygiene behaviour. Another retrospective study by Gutierrez and Reyes (1999), came out with a conclusion that parental factors such as illiteracy were linked to morbidity in children as a whole. Also, observation confirmed that 80% of kindergarten schools had a designated place with materials: stand, bowls, water and soap for washing hands compared to homes visited (less than 15%).

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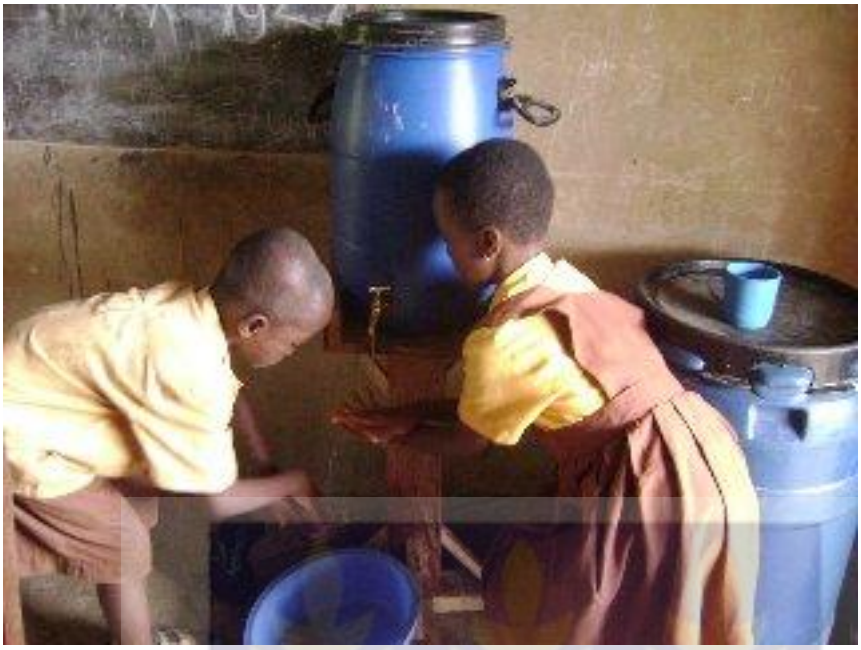

Picture 5.1 KINDERGARTEN PUPILS WASHING THEIR HANDS AT DESIGNATED PLACES FOR HAND WASHING AT SCHOOL

Source: A pre-school at Mangoase, Asuogyaman District.

The prevalence of exclusive breastfeeding was found to be 52% in Asuogyaman district. Exclusive Breastfeeding for the first six months has been proven to protect children from infection (Ghana Statistical Services, 2006). A rate of 54% of children who were exclusively breastfed was reported in Ghana by the Ghana Statistical Service during a Multi-Indicator Cluster Survey 2006 (Ghana Statistical Services, 2006). Exclusive breastfeeding rate is slightly lower in Asuogyaman district compared to the national prevalence.

Though breastfeeding practices was a part of the child's background characteristics, non-exclusive breastfeeding was one of the most significant risk factors associated with diarrhoea in the children (p-value<0.0001) After adjusting for the independent effects of all potential factors in the multivariable logistic model, non-exclusive breastfeeding remain a significant risk factor for diarrhoea. Children who were exclusively breastfed had a 54%

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reduced risk of diarrhoea compared to their counterparts who were not exclusively breastfed (Adjusted Odds ratio=0.46, 95% CI= (0.29, 0.72), p-value<0.01). This is consistent with a WHO systematic review of 2 small controlled trails and 17 observational studies that came out with a finding demonstrating a relatively reduced risk of gastro intestinal infections and all cause mortality for exclusively breastfed infants compared to partially breastfed infants from 4 to 6 months regardless of when the latter stopped exclusive breastfeeding (WHO, 2002). Another cross sectional study that assessed breastfeeding practices in Sri Lanka reported that breastfeeding was associated with significantly less diarrhoeal diseases even after infants had attained six months (Agampodi et al,2006).

DIARRHOEA PREVALENCE IN UNDER- FIVES IN ASUOGYAMAN

According to the Ghana Demographic and Health survey, prevalence of diarrhoea in the eastern region is 15.7%. In the entire nation, it is 15.2 % (GDHS, 2003).However, though there is no district-wide survey of diarrhoea to compare with, compared to the entire region, the rate of diarrhoea in Asuogyaman is more than twice the regional figure. This is exceptionally high. This may be due to seasonal variation in the diarrhoea prevalence. This survey was conducted during a peak rainy season (June, 2008) in Asuogyaman while the Ghana Demographic and Health Survey (GDHS) were conducted from late July to October, 2003. In a meta-analysis, some writers concluded that diarrhoeal pathogens in the domestic domain can only result if stools are inadequately disposed off or if hands are inadequately washed (Curtis et al., 2000). The peak rainy season may be associated with increased rates of diarrhoea compared to the other seasons where excreta in the environment has the least tendency of being washed off by rain water to contaminate the land and water bodies. This could account for the differences observed.

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In a longitudinal study that assessed the risk of enteric diseases among children living in Mexico City, the conclusion drawn was that, endemic pattern of diarrhoea reflects poor housing, sanitation and water related practices (Cifuentes & Suarez, 2002). The rural setting of most of the towns in Asuogyaman district, coupled with the availability of rivers may be associated with inadequate housing, sanitation and water related practices that may relate to the high prevalence of diarrhoea in such a setting (Acquah et al,2008).

WATER SUPPLY AND DIARRHOEA

The variables investigated under water supply were the sources of drinking water for the child, household drinking water treatment, days of storage of drinking water and vessels for drinking water storage. All the factors listed above showed a relationship between water supply and diarrhoea. However, the differences found were not statistically significant. The only significant association was between the source of drinking water for the child and diarrhoea. Sixty nine percent of the caregivers used improved sources of drinking water while 33.3% used unimproved sources (Pearson chi-square test presented a P- value of 0.01). The predominant source of water supply was the public standpipe (32%). The Multiple Indicator Cluster Survey, 2006, reported 78% of the entire population of Ghana as having access to improved sources of drinking water (Ghana Statistical Services, 2006). The 69% in Asuogyaman district falls far below the national rate, despite the presence of three main pipe borne water systems available in the district: One at Kpong, another at Akosombo and the last at Dodi Asantekrom (Acquah et al, 2008).

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Use of unimproved sources of drinking water has proven to increase the risk of diarrhoea in children under-five years. Addy and Antepim (2004), during a study on prevalence of pathogenic Escherichia coli and parasites in infants at Kumasi-Ghana, drew a conclusion that diarrhoea pathogens could be reduced in infants with the provision of potable water and good sanitation. This is similar to what this study came out with. However, the results above is different from the conclusion drawn by a meta analysis done by Clasten and Bastable (2003),who concluded that improved water quality at household level are more effective than at the source. In this study a more significant reduced risk of diarrhoea was associated with an improved source of drinking water for the child (P-value 0.01), compared to improved quality at household level (P-value 0.2).

5.4 SANITARY FACILITIES AND DIARRHOEA

Factors examined under sanitary facilities include the type/ design of sanitation facility (i.e. improved or unimproved facilities) used by caregivers, means of child's excreta disposal, as well as whether the facility used was for public or household use. Contrary to expectations, Caregivers who used unimproved facilities had a reduced risk of diarrhoea compared to those who used improved facilities. Caregivers who used unimproved facilities in disposing off their child's excrements had a greater risk of diarrhoea among their children compared to those who used improved facilities. However, though these relationships above existed, they were of no statistical significance.

The most significant association was found between the number of people who used a facility and diarrhoea rates. Those who used a public/community facility were at a greater risk of having diarrhoea episodes in their children than those who used private/household facilities. Interestingly, care givers who had no facility and used the bushes or the 'free range'

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had the least diarrhoea episodes among their children. This proved statistically significant with a p-value of 0.01(Pearson chi-square test).

Use of latrines by a number of people predisposes all the users to cross-contamination of faecal-oral germs from all users of the facility, especially with the failure to wash hands after using the facility (Fewtrell & Colford, 2004).Thus, when one uses a public facility, he/she is at a greater risk of contamination compared to when a household facility is used. Use of "free range" though poses minimum risk of cross contamination to individuals who employ it; members of the community are at a greater risk of developing faecal-orally transmitted diseases if such excreta are washed off into the environment. Those in the environment who drink water from unimproved sources (unprotected wells, and rivers) will be at the greatest risk of ingesting faecal-oral organisms. Sanitation is particularly important in isolation of water supply system from sewage discharge (United Nations, 2003). Care givers who have not developed the habit of washing their hands with soap and water are most likely to transmit faecal-oral germs. Improved sanitation has been described as a system in which excreta is disposed off in such a way that they reduce the risk of faecal oral transmission to its users and the environment (United Nations, 2003). The Global Water Supply and Sanitation Assessment 2000 defined the following systems as improved: private and public sewerage system, septic flush latrines and simple pit latrines. Open pit, service/bucket latrines were described as unimproved (Ash, 2005). The above systems are described according to the design of the facility. This protects the environment and not the users from faecal oral transmission. This cross-sectional study clearly shows a rather significant relationship between the number of people who use a sanitation facility and risk of diarrhoea other than the design of the facility. The protection of individuals is worth considering in defining the design of an improved facility. Community facilities are not worth considering as improved facilities since they do not protect users from faecal contamination, especially in communities with low awareness for personal and environmental hygiene.

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A study by Prado and Strina (2003), came out with a finding that children living in houses with toilet facilities are about 50% less likely to contract diarrhoea than in a household with no such facility. This finding is similar to the results obtained in this study.

HAND WASHING AND DIARRHOEA

The practice of hand washing is important at some critical points in stopping the transfer of faecal-oral micro organisms. These critical points are before preparation of food, before eating and after visiting the wash room, or changing a child's napkin (Mara, 2003).

Enquiries about hand washing revealed that only 19.8% mentioned washing their hands with soap without being prompted, though in all the 400 households visited, the presence of soap was verified by observation. This finding is similar to the conclusion drawn in 'The Economist', (2000) that in developing countries, most households have soap, but only 15% - 20% of caregivers routinely use it to wash their hands. The practice of hand washing with soap remained significant by contributing to a 63 percent reduced risk of diarrhoea in children (Adjusted Odds ratio=0.37, 95% CI= (0.19, 0.72), p-value<0.01). This was after adjusting for confounders using a multivariable logistic regression model. In most studies on hygiene, poor hand washing practices have come out as one of the key risk factors for diarrhoea (Curtis et al,2000), (Carncross et al,2006)

Upon investigating the critical circumstances for washing hands, 77.2% of the 79 caregivers mentioned washing their hands after defecating. Diarrhoea prevalence among their children was 16.4%. Sixty seven percent (out of the 79 caregivers) mentioned washing of hands before eating. The diarrhoea rate was 18.2% among their children. Out of the 79 caregivers, only 30.4% mentioned washing hands before preparing food, diarrhoea rates among their children

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was 20.8%. From above it is indicative that a greater proportion of care givers washed their hands after defecating. From above it can also be deduced that washing hands right after defecating is associated with a much more decreased risk of diarrhoea, followed by washing hands before eating then washing hands before preparing food.

5.6 KNOWLEDGE OF CAREGIVERS ABOUT CAUSES OF DIARRHOEA

Caregivers' knowledge about causes of diarrhoea is an important determinant of the hygiene practices that will protect their children against diarrhoea. It turned out that 33.3% of caregivers had a poor knowledge about causes of diarrhoea (did not attribute diarrhoea either to poor environmental sanitation, contaminated food or water or hand washing practices). Twenty nine percent had a fair knowledge about causes of diarrhoea (attributed diarrhoea to only one of the causes listed above). About thirty eight percent had a good knowledge about causes of diarrhoea (mentioned at least 2 of the above causes).

Risk of diarrhoea in their children increased significantly with a decrease in the knowledge about causes of diarrhoea. Knowledge about cause of diarrhoea is important in preventing diarrhoea in children. In a longitudinal study by UNICEF (2004), only 4% of those surveyed in 2004 did not know what caused diarrhoea. In 2002, this was 12%. Measures to prevent diarrhoea also improved with an increase in caregiver's knowledge about causes of diarrhoea, hygiene practices such as keeping food covered increased from 56% to 82%. Safe Water Supply increased from 19% to 24%. Garbage left lying around decreased from 69% to 41% (UNICEF, 2004).

Knowledge and level of education are closely related. More education provides knowledge concerning hygiene rules as well as feeding practices (Gorter & Sandiford, 1998). The survey above indicates that only 16.8% of caregivers had not been in school before or had

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not completed primary school, yet, 33.3% of caregivers had poor knowledge about causes of diarrhoea. This implies that educational status may not necessarily reflect the care givers knowledge about causes of diarrhoea.

Though low educational levels of care givers, as well as poor knowledge of caregivers about causes of diarrhoea were both crudely associated with an increased risk of diarrhoea, after adjusting for the independent effects of all potential factors in the multivariable logistic model, only exclusive breastfeeding, mothers knowledge about causes of diarrhoea and hand washing practices remain significant risk factors for diarrhoea. Caregivers knowledge about causes of diarrhoea was the most significant risk factor associated with diarrhoea in the children (p-value<0.0001). Even after adjusting for the independent effects of all other factors , children whose caregivers had a good knowledge about causes of diarrhoea had a 75% reduced risk of diarrhoea compared to children of caregivers who had a poor knowledge about causes of diarrhoea (Adjusted Odds ratio=0.25, 95% CI=(0.015, 0.44), p-value<0.0001).

The above buttresses the fact that educational status may not necessarily reflect the knowledge of caregivers about causes of diarrhoea. Knowledge of caregivers about causes of diarrhoea is major factor that determine risk of diarrhoea in children in Asuogyaman district.

5.7 STUDY LIMITATION

A cross sectional study offers the opportunity to examine the patterns and determinants of diarrhoea during 2 weeks prior of the survey. This may be relevant. However, due to limited time as well as logistics constraint, a longitudinal study which, could have been used to

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determine consistency of individual differences and seasonal differences over a long period of time was not considered.

There was no district-wide baseline data on diarrhoea for comparison. Also, there may be loss of memory or recall bias by caregivers, for some of the background characteristics of the children.

Due to time and logistics constraint, communities which could only be reached by boat were excluded in the survey.

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CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

6.1 CONCLUSION

This household based cross – sectional study was carried out to determine the association between diarrhoea in children under- five (5) years, water supply, hygiene practice and sanitation facilities in Asuogyaman District.

The prevalence of diarrhoea in children under-five years in Asuogyaman district is 35.5%. Exclusive breastfeeding, caregiver's knowledge about causes of diarrhoea and the practice of hand washing with soap by caregivers remain significant risk factors for diarrhoea in children under-5 years in the district. There is the need to re-emphasise dangers children are exposed to when they are not exclusively breastfed and when inappropriate hygiene behaviour is practiced in households and in communities in Asuogyaman.

6.2 RECOMMENDATIONS

6.2.1 ASUOGYAMAN DISTRICT HEALTH MANAGEMENT TEAM

There is the need for a targeted intensive health education programmes by the district health directorate and health facilities to;

a) Increase campaign on exclusive breastfeeding with particular emphasis on protective effects of exclusive breastfeeding between the ages of six months to five years of a child's life.

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b) Increase mothers' knowledge on causes and prevention of diarrhoea through education.

c) To collaborate with the media (nation-wide and in Asuogyaman district) to increase advertisement on the practice of hand washing with soap and water.

6.2.2 ASUOGYAMAN DISTRICT ASSEMBLY

a) In order to encourage hand washing with soap and water after defecation, it is recommended that: the environmental unit of the Assembly should be assisted to provide materials for hand washing at all community or public toilet facilities to encourage hand washing with soap and water by community members after defecation.

b) In order to deter members of the community from indiscriminate disposal of waste, bye-laws should be promulgated by the Asuogyaman District Assembly to ensure this.

6.2.3 FURTHER RESEARCH

There is the need to measure the existing approaches to hand washing promotion. Basic research needs to be carried out to clarify when hands should be washed, whose hands must be washed and how often hands must be washed in order to prevent diarrhoea in children under-five years old.

Though this study suggests hand washing with soap as a measure against diarrhoea, intervention trails need to be conducted in Asuogyaman district to assess the impact of hand washing in different settings in the District.

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APPENDIX 1- CONSENT FORM FOR PARTICIPANTS IN DIARRHOEA SURVEY IN ASUOGYAMAN DISTRICT.

Ruth Abban, a student from the College of Health Sciences, School of Public Health, University of Ghana, Legon, is conducting a research in your community to find out about some factors contributing to diarrhoea in children under-five years. I hope that knowledge from this study will help us understand some of the factors that cause diarrhoea, to enable us implement strategies that will help decrease the occurrence of diarrhoea in children under-five years in Asuogyaman District. I will appreciate it if you participate in this study.

If you agree to participate in the discussion, you will be answering some few questions about diarrhoea, water and sanitation. This will take about 30 minutes of your time. I assure you that all answers you give will be treated as confidential. Your personal information will not be mentioned in any report that comes out of this study. You can decide whether or not you will want to participate in the study. If in the course of the study, you decide you do not want to continue, you are free to opt out.

Would you like to participate in this discussion?

Signature or thumbprint of participant_____

Date_____

If you have any question or comments concerning this study, you may contact the following: or Mrs Irina Offei

Mrs. Ruth Abban District Director of Health Servies

Phone number; 0243655100 Asuogyaman District

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APPENDIX 2-COLLEGE OF HEALTH SCIENCES, SCHOOL OF PUBLIC HEALTH, LEGON-GHANA

QUESTIONNAIRE ON WATER, SANITATION AND DIARRHOEA IN ASUOGYAMAN DISTRICT

VARIABLES	IDENTIFICATION	
1.	Interviewers ID: Interviewer's name_____	
Q2Id 2.	Questionnaire ID number -	
Q3Area 3.	Programme Area: 1._____ 2._____	code

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Instructions; circle answers given by respondents and write the answers in the boxes provided beside the question.

4. House number:

Q5Date

5. Date of interview (day-month-year)

DEMOGRAPHY

6. Number of children below 5 years found in the household

7. Name of selected child below 5 years

1._____

8CHsex

8. Sex of selected child

1. Male.....1
2. Female.....2

9. What is your name?

Care giver's name

2._____

10. Sex of caregiver to be interviewed

Q10SCARx

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1. Male 1

2. Female.....2

11. **Q11relC**	What is your relationship with (---child's name-----)? 1. Mother .....1 2. Father .....2 3. Grandmother.....3 4. Guardian.....4	
12. **Q12 NCh**	How many children do you have?	
13. **Q13NChU**	How many children do you have under five years?	
14a.	What is the Age of (---child's name-----)? Fill in Years_____	
	Q14ChAge	
14b.	When was (--child's name--) born? Day-month-year VERIFY FROM WEIGHING CARDS	

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BREAST FEEDING PRACTICES

Q15BrPr

15. When did you start giving water to (--child's name--) after Months

he /she was borne?

.

16. Does (… child name ..) go to school?

Q16CHsch

1. yes……1
2. no……2

17. How many people do you have in your household?

Q17peopH

18. How old are you(care giver's age)?

Q18CareA

Fill in Years_____

19. Have you ever attended school?

1. Yes……1

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2. No……2

20. If yes, what was your highest level of education?

Q20LOE

1. Primary School……1

2. Middle/JSS ……2

3. Secondary/SSS/Voc…….3

4. University/Polytechnic ...4

21a. Did you **drop out** of school? 1. Yes……1

2. No……2

21b. If yes, at what class were you when you dropped out? .

Fill in space provided 1. Class_____

2. Form_____

22. What is your marital status?

1. Single ……1

Q22M status

2. Married ……2

3. Separated……3

4. Divorced……4

. .

5. Widowed……5 .

6. Cohabit with man….6

7.0ther_____

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23. Where do you worship?

1. Christian……1

Q23REL

2. Islam……..2

3. Traditional Religion……..3

4. Atheist……4

5. Jehovah's witness……. 5

6. Buddhist…….. 6

7. Other (SPECIFY)_____

24. Who do you work for?

1. Government employed ……..1

Q24TEmp

2. Works for Private employer……..2

3. Unemployed …… ……3

4. Self employed……4

25. What is your main occupation?

1 Trading……1

Q25OCCU

2. Farming……2

3. Fishing……3

4. Labourer……4

5. Technician……5

6. Teacher……6

7. Fish monger……7

8. Capenter……8

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9. Seamsterss……9

10. Hair dresser……10

11. Baker……..11

12. Other_____

26. How do you get news in this house?

(Could be more than 1)

1. Radio ……1 **Q26Info** ☐

2. T.V……2

3. News papers……3 ☐

4. No access……4 ☐

5. Other (SPECIFY) _____

26b. Is the radio /tape yours? 1. Yes……..1 ☐

2. No……..2

WATER SUPPLY

27a What are the sources of water used for the household activities?

Q27Wsour

Improved

Household connection……1 ☐

Public stand pipe……..2

Bore hole……3 ☐

Protected spring……4 ☐

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Protected well……..5

Rain water harvesting system……6

Unimproved

River or ponds……..…..7

Unprotected wells……..8

Vendor –provided water (tanker)…..9

Bottled water/pure water……..10

Unprotected spring……..11

27b From the above which water source do you mostly depend on during the entire year (**main water supply**)? ☐

28. What is the **main** source of drinking water for the child?
Q28SWchi

Improved

Household connection……..1

Public stand pipe……..2

Bore hole……..3

Protected spring……..4 ☐

Protected well……..5

Bottled water/pure water……..6

Unimproved

River or ponds……..7

Unprotected wells……..8

Vendor –provided water(tanker)…..9

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Rain water harvesting system.....10

Unprotected spring.....11

29. How is the main source of drinking **water treated**
Q29Wtrea

before given to the Child?

1. Not treated.....1
2. Filtered.....2
3. Boiled for at least 5 minutes...3
4. Treated with alum.....4

WATER STORAGE PRACTICES

30. Where do you keep your drinking water?
Q30Wstor

1. Bottle (fridge).....1
2. Bottle (not in a fridge).....2
3. Pure Water.....3
4. Gallons (small).....4
5. Gallons (large).....5

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6. Earthenware pot (small).....6

7. Earthenware pot(large).....7

8. Bucket(small).....8

9. Bucket (large).....9

10. Basin.....10

11. Barrel.....11

12. Poly tank.....12

13. Other (SPECIFY)_____

---

31. Check to see if water is covered.

Q31 Wcov

1. Covered.....1
2. Uncovered.....2

---

32. When did you fill the container?

Q33WstoT

Today.....1

Yesterday 2

3 days ago.....3

1 week ago.....4

2 weeks ago.....5

A month ago.....6

More than a month ago.....7

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33a.	When does the water usually get finished? 1. Everyday……1 2. By tomorrow……..2 3. In three day's time……..3 4. In a week's time……..4 5. In two weeks' time……5 7. In a months time……7. 8. More than a month's time ……8	☐
33b. **33BRefill**	When is refilling done? 1. Refilled when empty……1 2. Refilled continuously……2	☐
	TOILET FACILITIES	
34. **Q34ToiFa**	Is the **toilet facility** used by Household 1. A community facility? …….1 2. A house hold facility?……..2	☐

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3. No facility……3

35. What is the main design of the toilet facility used by household?
Q35ToiD

Improved sewage facility

Water closet……..1

Simple Pit latrine ……..2

KVIP/VIP……3

Unimproved sewage facility

Open field……4

Public dump……5

Pan latrine……6

Open Pit latrine ……7

Along river banks……8

36. Where is (---child's name--) faeces usually disposed off?
Q36FeaDis

Improved sewage facility

Water closet……1

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Simple Pit latrine 2

KVIP/VIP.....3

Unimproved sewage facility

Open field.....4

Public dump.....5

Pan latrine.....6

Open Pit latrine.....7

Along river banks.....8

HAND WASHING PRACTICES

37. a) What soap do you have in the house?

VERIFY (Is there soap?) 1. Yes.....1

2. No.....2

b) Do you have a designated place for washing hands?

VERIFY 1. Yes.....1

2. No.....2.

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38. **Q38HanW**

Can you give me a list of what you use each kind of soap for?

(Circle All the answers the mother gives)

1. Washing cloths……1
2. Cleaning house……2
3. Cleaning utensils……3
4. Washing my hands……4
5. Washing down……5
6. Bathing baby/children……6
7. Washing child's hand……7

If respondent included **4** for above, then proceed to Q 39 and tick where applicable. If not, tick this box N/A then skip Question to Q40

39. **Q39GradH**

Under what circumstance do you use the soap to wash your hands? **(Circle Any of the answers below given by the mother)**

1. After defecating……1
2. After child's faeces disposal……2
3. Before preparation of food……3
4. Before feeding child……4
5. Before eating……5

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GRADING

3 or more of above V. GOOD……1

1 or 2 of above GOOD……2

None of above POOR ……3

DIARRHOEA EPISODE

40. Has there been a day over the past two weeks that

Q40Diarh

(… child's name--) has passed more than three watery stools in 24 hours?

1. Yes ……1

2. No……2

MOTHERS KNOWLEDGE ABOUT DIARRHOEA.

41a. What do you think are some of the causes of diarrhoea?

Q41MKno

Contaminated food ……1

Contaminated water……2

Dirty hands……3

Dirty environment……4

Others 1._____

2._____

41b.

KNOWLEDGE

2 or more of above V.GOOD……2

1 of above GOOD……1

None of the above POOR……0

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42. What do you do when (----child's name--) has diarrhoea?

_____

_____

_____