UNIVERSITY FOR DEVELOPMENT STUDIES

CONTRIBUTION OF COMMUNITY – LED TOTAL SANITATION (CLTS) IN REDUCING SANITATION RELATED DISEASES IN THE KUMBUNGU DISTRICT

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A THESIS SUBMITTED TO THE DEPARTMENT OF COMMUNITY HEALTH AND FAMILY MEDICINE, SCHOOL OF MEDICINE, UNIVERSITY FOR DEVELOPMENTSTUDIES, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF PUBLIC HEALTH DEGREE

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DECLARATION

Student:

I hereby declare that this submission is my own work towards the award of Master's degree in Public Health and that, to the best of my knowledge it contains no materials previously published by another person nor material which has been presented for the award of any degree of the University, except where due acknowledgement has been made in the text.

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ABSTRACT

Introduction: Open defecation is a major problem to health status of people. Cholera is particularly a potential epidemic disease known to be associated with eating another person's fecal matter containing vibrio cholerae. This disease in addition to diarrhea, dysentery, worm infestations, typhoid fever and malaria among others are sanitation-related and they pose severe threat to child and adult survival in Sub-Saharan Africa as a whole and Ghana in particular.

Objective: This study determined the effectiveness of community-led total sanitation in reducing the prevalence of sanitation-related diseases like the aforementioned.

Methods: a cross-sectional study design was adopted with both quantitative and qualitative approaches to triangulate responses. Five communities in the Kumbungu District were studied. 150 randomly selected household heads were surveyed on CLTS programme and its impacts on their households using a structured questionnaire. Focus group discussions and key informant interviews were added to add substance to numerical descriptive statistics. Findings were presented as descriptive statistics in the form of counts and proportions, frequency tables, cross- tables for odd ratios.

Results: the proportion of sanitation-related diseases were high, 91.1% of people had malaria, 71.9% had diarrhea and 15.8% had typhoid. Through CLTS, the latrine coverage was 68% but handwashing facilities were woefully inadequate both before (4.2%) and after (7%) CLTS. The odds of occurrence of sanitation-related diseases was found to be associated with unavailability of household latrines (OR=1.25, 95% CI: 0.8-1.9, $p<0.05$), poor hand washing facilities (2.5, 95% CI: 1.5-3.2, $p < 0.05$) and inadequate provision of clean and safe water-sources (OR=1.2, 95% CI: 0.6-1.8, $P < 0.05$). It is believed that this accounted for the continued prevalence of open defecation post-CLTS relative to pre-CLTS (OR=2.12, 95% CI: 1.8-2.7, $P<0.05$).

Community attitude towards CLTS was nonchalant since there was no statistical difference in attitude scores before and after CLTS (t-value is 0.12319, 95% confidence, p= .904401).

Recommendation: Communities need to adopt positive attitudes towards CLTS and build proper latrines to prevent deterioration over time. The government should combine CLTS with health education to build up not only knowledge but positive attitudes towards the CLTS process.

ACKNOWLEDGEMENTS

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I am grateful to Mr. Herrick Bapula Sulemana for his unflinching support in carrying out this study. I also wish to express my sincere gratitude to my study participants for taking part of their busy schedule to respond to my questions. My special thanks go to the staff of the Kumbungu District assemble especially the environmental health unit for guiding me to conduct this study. To all those who might have contributed in one or the other in carrying out this study, May Almighty Allah bless you all. I also want to thank all the respondents who participated in the study voluntarily during the course of the study. I am indebted to my friends for helping me throughout the course of this thesis.

DEDICATION

This thesis is dedicated to my Husband and children. I also dedicate it to my late mother.

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LIST OF ACRONYMS

SDGs	Sustainable Development Goals
CLTS	Community-Led Total Sanitation
UNICEF	United Nations Children‘s Fund
CLTSH	Community-Led Total Sanitation and Hygiene
MGDs	Millenium Development Goals
SANMARK	Sanitation Marketing Project
WHO	World Health Organization
WASH	Water, Sanitation and Hygiene
ODF	Open Defecation Free
OD	Open Defecation
NGOs	Non-Governmental Organizations
CWSA	Community Water and Sanitation Agency
PHAST	Participatory Hygiene and Sanitation Transformation
USAID	United States Agency for International Development
DFID	Danish International Development Agency
ORS	Oral Rehydration Salt
UNDP	United Nations Development Programme
ARTI	Acute Respiratory Tract Infection

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Sanitation remains one of the major development challenges in developing countries including Ghana. It is estimated that about 8,000 people, commonly among children under five, die every day due to poor sanitation, hygiene and water in the developing world. Sanitation-related morbidities such as diarrhoea and cholera continue to seriously affect the health of the population and socio-economic development. Improving sanitation is therefore a key component to achieving the health-related Sustainable Development Goals (SDGs) (Bongartz, 2010). Globally, 2.5 billion people do not use improved sanitation and out of this 1.2 billion people practice open defecation (WHO, 2010). Moreover, having better water and sanitation is essential to breaking the cycle of poverty since it improves people's health; through increase work productivity and school attendance (Critchley, 2008). Since 2000, several programs from outside imposed on the local context have failed in addressing poor sanitation practices in most developing countries including Ghana. The question that people try to ask is were those programs difficult to understand and adopt? Or were there implementation challenge? For this and other reasons the concept of the Community Led Total Sanitation was introduced and implemented in some selected countries including Ghana. The concept of Community Led Total Sanitation (CLTS) emerged from Bangladesh by Dr Kamal Kar in early 200. This has been found to be an innovative way of achieving open defecation free communities, especially in the rural and sub- urban areas. It is meant to change people‘s behaviour by shifting mind-sets to focus on their desire for, and triggering them to build a

sanitation system themselves. It is a participatory approach to traditionally subsidized sanitation programs that have not succeeded in getting people to want, build, pay for, and use latrines (Kamal, 2005). The approach promotes 100% open defecation free communities to minimize the risk of contamination for all, breaking the cycle of feco-oral contamination. Contrary to most conventional sanitation approaches which aim simply at only providing toilets (Otien, 2010), CLTS aims to promote collective behaviour change as the key to sustainable, improved sanitation (UNICEF, 2017).

Each year, 200 million tons of human waste goes uncollected and untreated around the world and an estimated 1.5 million death of children under the age of five, 5 billion productive days lost, 443 million school days lost are attributed to diarrheal disease globally (UNICEF, 2009).

Considering the devastating consequences of poor sanitation, in recent years sanitation programs including Community-Led Total Sanitation and Hygiene (CLTSH) have evolved dramatically most of them focused on engaging communities, creating demand for sanitation, and supporting the development of sustainable systems and appropriate technologies which are rooted in catalyzing community behaviour and social change (Kar and Pasteur, 2005). Sanitation has been at the bottom of the pile in international development concerns despite its pivotal importance in human health and wellbeing.

About 40% of the population in the global South live without improved access to sanitation – that is about 2.6 billion people around the world.

The Human Development Report (UNDP 2006) says no act of terrorism generates devastation on the scale of the crisis as compare the generation done by poor sanitation and quality water supply, yet global achievements to sanitation targets have not been very

impressive. In the 1970s and 1980s, water grabbed more attention globally. Rarely sanitation and hygiene practices were separated out from water. Sanitation was not even explicitly mentioned as a Millennium Development Goal (MDG) in 2000 It was only through intense political pressure that it was added to the MDG at the Earth Summit in Johannesburg in 2002 (WHO/UNICEF, 2015).

As sanitation remains one of the biggest development challenges in developing countries, it is estimated that around 6,000 people, mainly children under five, die every day due to poor sanitation, hygiene and water. Sanitation-related diseases such as diarrhoea and cholera continue to seriously undermine human health and well-being. Hence improving sanitation is fundamental to achieving the health-related Sustainable Development Goals (SDGs) of reducing child mortality and combating disease (Peterson, 2018).

Decades of large-scale programs from outside imposed on the local context have failed to change poor sanitation practices. The concept of community led total sanitation (CLTS) emerged from Bangladesh by Dr kamal Kar in early 2000s (Sanan, 2010). This has been found to be an innovative way of achieving open defecation free communities. It is meant to change people‘s behaviour by shifting mind-sets to focus on their desire for, and triggering them to build a sanitation system themselves. It is a participatory approach to traditionally subsidized sanitation programs that have not succeeded in getting people to want, build, pay for, and use latrines (Sanan, 2010). The approach promotes 100% open defecation free communities to minimize the risk of contamination for all, breaking the cycle of faecal-oral contamination. Contrary to most conventional sanitation approaches which aim simply at only providing toilets facilities (Mara et al., 2010). CLTS aims to

promote collective behaviour change as the key to sustainable, improved sanitation (Sanan, 2010).

Community led total sanitation (CLTS) is a concept that revisits all the past approaches, particularly the promotion of household sanitation within the context of basic human dignity. CLTS emphasizes community facilitation to assess their sanitation situation and promotes natural leaders. CLTS supports community action plans developed under their leadership (Gebremariam and Tsehaye, 2019).

SANMARK uses a range of interventions to raise householders' demand for improved sanitation (Jenkins and Scott, 2007). SANMARK involves understanding householders' motivations and constraints to sanitation adoption and use. These are used to develop both demand- and supply- side interventions to ensure that appropriate sanitation products and services are available to match the demand (Mara et al., 2010; Peal et al., 2010). Research reveals that, people are well aware of the need for basic hygiene practices, and do not need criticisms and harassments to change as is the case in Ghana (Peal et al., 2010). However, as earlier noted, previous conventional approaches in Ghana had failed to trigger sustainable behaviour change, until the introduction of the CLTS.

The premise of CLTS is community self-help or the –determination to do by community members themselves. That is, it builds communal self-helping spirit where CMs rely on themselves to solve communal problems (Kar and Chambers, 2008). The CLTS is a human centred approach with focus on the active participation of the people or the end users and more importantly it adopts local technical know-how in addressing sanitation related challenges. The implementation of this strategy bemoans with some teething challenges which this study tries to investigate.

Improved sanitation is important not only to human health but also for economic and social wellbeing of the population. Sanitation situation in developing countries including Ghana faces a lot of challenges which could be link to human behaviour and leads to high prevalence of sanitation related diseases in the developing world, (Smith and Asante, 2011).

Adequate sanitation, good hygiene and safe water, are fundamental to health and social economic development (Mara, Lane, Scott and Trouba, 2010) meanwhile, providing adequate sanitation to households in rural areas remains a challenge throughout the 21st century. Prior sanitation approaches have not succeeded in bridging this gap. Rather than empowering people these subsidies driven approaches induced dependency and reliance on external actors (Mara, Lane, Scott and Trouba, 2010).

Having access to improved sanitation results into, lower health system costs, fewer days lost at work/school through illness and care for the sick, reduced queue time at shared sanitation facilities, and eliminating open defecation (Mara et al., 2010). With approximately 215 million people practicing open defecation, Sub-Saharan Africa shoulders the greatest water and sanitation challenges (Galan, Kim and Graham, 2013).

Diarrhoeal diseases have been on increased in recent decades (Murray and Lopez 1996; WHO 2002, 2004). Inadequate drinking water, sanitation and hygiene (WASH) are important risk factors, particularly in low income settings. In 2011, an estimated 768 million people relied on poor water supplies (as defined by the WHO/UNICEF Joint Monitoring Program for Water and Sanitation – JMP), which are thought to have high levels of pathogen contamination (WHO and UNICEF 2013a). Many more use sources that are classified as improved but are still unsafe for consumption (Bain et al. 2014). More than 2.5 billion people lack access to an improved

sanitation facility (WHO and UNICEF 2013a). Inadequate hand hygiene practices have been estimated to affect 80% of the population globally (Freeman et al. 2014b).

1.2 Problem Statement

One billion people in the world still practice open defecation and of the 2·5 billion people without access to an improved sanitation facility, 70% live in rural areas. It is estimated that 2.4 billion people still lack access to improved sanitation and 946 million still practice open defecation (UNICEF and WHO, 2015). A further understanding of how sanitation interventions and sanitation characteristics impact latrine coverage and use is essential in order to more efficiently work towards the Sustainable Development Goal of ensuring access to sanitation for all by 2030 (2015). Securing high coverage and use of latrines is the foundation of an effective sanitation strategy. It is not clear however, which sanitation interventions will best increase latrine coverage and use, or which sanitation characteristic are most likely to lead to existing latrines being used. There is both long-standing biological plausibility and general acceptance in the health and development community that sanitation is important for health (Ferriman, 2007; Wagner and Lanoix, 1958). However, a number of recent rigorous sanitation trials have found either no impact or a mixed impact of the sanitation interventions on various health outcomes (Arnold et al., 2010; Bricenoet al., 2015; Clasen et al., 2014; Fenn et al., 2012; Patil et al., 2014;Pickering et al., 2015). One possibility for the mixed success of the trials is that they may not have adequately increased latrine coverage and/or latrine use to the necessary thresholds required to reduce exposure to fecal pathogens and improve health. Previous interventions have varied in their emphasis of hardware (e.g. latrine construction or subsidies for construction), software (e.g. human-centered sanitation

training, promotion, or marketing), or of unique combinations of hardware and software together. However, it is not clear which types of interventions will best improve coverage and use, or how to better implement interventions in order to reach the coverage thresholds required to improve health. Even when high latrine coverage levels are achieved, open defecation is often still practiced (Barnard et al., 2013). Users may still choose to openly defecate, and that decision is likely influenced by a number of technological and behavioural factors (Coffey et al., 2014; Hulland et al., 2015; Routray et al., 2015). Only one report so far has reviewed factors associated with sanitation adoption (Hulland et al., 2015). That systematic review was primarily descriptive (no meta- analysis) and focused primarily on sustained adoption (e.g. whether latrine coverage persisted over time) and not on the initial increases in coverage due to the implementation of a specific intervention. The focus was also primarily on behavioural factors and strategies that impact behaviour. No studies characterizing the impact of different sanitation interventions on coverage, or characterizing how structural and design characteristics of sanitation are associated with latrine use. As part of its effort to develop guidelines on sanitation and health, the World Health Organization (WHO) commissioned this systematic review to assess the impact of sanitation on coverage and use. Other WHO- commissioned reviews address the impact of sanitation on exposure pathways (Sclar et al., 2016), infectious disease and malnutrition (Freeman et al., submitted) and other out-comes that impact human wellbeing (Sclar et al., unpublished). Our study relates to the other reviews in that it forms the starting-point—sanitation interventions must increase coverage and use in order to decrease exposure and subsequently achieve health and well-being gains. Our review has several aims.

Inadequate drinking water, sanitation and hygiene (WASH) are important risk factors, particularly in low income settings. In 2011, an estimated 768 million people relied on unimproved water supplies (as defined by the WHO/UNICEF Joint Monitoring Program for Water and Sanitation), which are thought to have high levels of pathogen contamination (WHO and UNICEF 2013a). Many more use sources that are classified as improved but are still unsafe for consumption (Bain et al. 2014). More than 2.5 billion people lack access to an improved sanitation facility (WHO and UNICEF 2013a). Inadequate hand hygiene practices have been estimated to affect 80% of the population globally (Freeman et al., 2014b).

Ghana is ranked second in Africa in open defecation after Sudan with 19 percent of its population resorting to sanitation practices considered as worst of all (WHO/UNICEF,2015). The Northern region is also last but second in the practice of open defecation in the whole country. Only 5percent out of the total population also have toilet facilities in their homes whereas 13 percent are committed to the use of such facilities. Meanwhile, so far, one thousand communities out of 4,412 communities in the northern region have verified and certified as open defecation free which represents 23 percent of coverage in the region from an earlier 11.4 percent in January 2017. This is a 50% jump of the previous coverage thus if stakeholders remain committed and work assiduously they can achieve their goal of ending open defecation by December 2017 (Richard, 2017).

Open defecation has its health and social implications. Faecal- oral diseases represent the largest health burden associated with lack of proper sanitation. Diarrhoea being the most burdensome which accounted for over 1.6 million child death each year in the Sub Saharan Africa, (Hurt, 2001). Human faeces left in the open and in the bushes generate

millions of bacteria's, viruses, as well as parasites. House flies which are agents of disease, which flies on the faeces and settle on uncovered foods, water and fruits which are consumed by human being. This can lead to outbreak of diseases and the end result is death, Freeman, 2010).

The Northern region is also eight among the ten regions of Ghana in the practice of open defecation in the whole country. Only 5 percent out of the total population also have toilet facilities in their homes whereas 13 percent are committed to the use of such facilities. The Kumbungu District has 126 communities but has only 13 communities being open defecation free (ODF).

This study explores the sanitation and health experiences as demonstrated by the Kumbungu District's communities and examines the variations in the what, how and where such vulnerable communities draw the motivation from to stay healthy. The District has a relatively good access to clean water but generally lack of basic sanitary facilities and practices, and the high costs of health care, all contributing to a high toll of infection-related illnesses. Despite enjoying various sources of support from different actors, the district's populations especially those living in rural and peril urban centres continue to succumb to various preventable diseases due to poor sanitary practises, inadequate healthcare and water shortages.

Despite investment in CLTS in the districts the success chocked is still minimal, majority of the population still practice open defecation this study therefore try to assess the role of CLTS in controlling sanitation related diseases in the Kumbungu district and beyond.

1.3 Research Questions

1. What are the attitudes of the people in the area towards the CLTS approach?
2. How effective is CLTS model in addressing sanitation challenges of the people in the area?
3. What is the situation of the prevalence of sanitation related diseases in the area?
4. What are the mechanisms CLTS is putting in place to mitigate sanitation related diseases?

1.4 Objectives

The main objective of the study is to examine the contribution of community led total sanitation in reducing sanitation related diseases in the kumbungu district in the northern region of Ghana.

1.4.1 Specific Objectives

1. To ascertain the attitude of the people in the Kumbungu district towards CLTS approach
2. To examine the effectiveness or otherwise of the CLTS model in addressing sanitation related challenges
3. To assess the prevalence of sanitation related morbidity in the area
4. To examine the mechanisms put in place in mitigating sanitation related morbidities in the area.

1.5 Justification

The relevance of this study cannot be underestimated. This study would generate information to ensure the successful implementation of CLTS in the districts as a lot of funds are sunk in the implementation of the CLTS program. This study will aid in the understanding of sanitation issues in the area and help in if not completely eliminated but reduce sanitation related morbidity in the area. It will also help the people in the district and beyond to understand and appreciate the need for good sanitary practice. The study will accelerate the development of knowledge in planning and other fields like social sciences. The study will again open new research possibilities and a better understanding of facts that will allow a more appropriate course of action. It will also go a long way to provide inputs into environmental sanitation policy formulation in the country in general and the study district in particular. The study will add to the existing body of knowledge or database both in academic and professional fields on water and sanitation sector.

1.6 Scope of the Study

Contextually, the study covered concept of CLTS, the implementation of CLTS, the district administration and the District Environmental Health and Sanitation department and District Health Directorate and all its facilities in the various communities. It focuses on the key objective of the CLTS model thus eliminating open defecation.

Geographically, the study focused on the Kumbungu District in the northern region. The focus is on communities where there CLTS strategy is been implemented. For this reason six communities are selected for the study.

1.7 Organisation of Dissertation

This dissertation is made up of six chapters. Chapter one is devoted to the background of the study, problem statement, objectives of the study, significance of the study, the scope of the study and the outline of the dissertation. Chapter two of the dissertation is devoted to the review of related literature on the topic under investigation it also the theoretical and conceptual framework that underpin the study. Chapter three focuses on the study setting and the research methodology used to conduct the study. Chapter four of the dissertation was devoted to the presentation of the result of the study. The result was presented in line with the study objectives. Chapter five of the study focuses on the discussion of the result presented and relate to other studies. Finally, chapter six presented the summary, conclusion and recommendation of the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter focuses on the review of relevant literature related to Community Led Total Sanitation (CLTS) and how it aid in reducing or eliminating open defecation and also aid in the reduction of sanitation related diseases. The review will focus on the objective sets for this study that will guide the research to achieve the objectives of the study. The literature will also help to ties out the knowledge gap of the area.

Sanitation remains one of the major development challenge in developing countries including Ghana, it is estimated that about 8,000 people, commonly among children under five, die every day due to poor sanitation, hygiene and water in the developing world. Sanitation-related morbidities such as diarrhea and cholera continue to seriously affect the health of the population and socio-economic development. Improving sanitation is therefore a key component to achieving the health-related Sustainable Development Goals (SDGs) related to health and development (Bongartz P. 2008,).

Decades of large-scale programs from outside imposed on the local context have failed to change poor sanitation practices. The concept of CLTS emerged from Bangladesh by Dr kamal Kar in early 2000s Kar, K. and Chambers, R. (2008). This has been found to be an innovative way of achieving open defecation free communities. It is meant to change people‘s behavior by shifting mindsets to focus on their desire for, and triggering them to build a sanitation system themselves. It is a participatory approach to traditionally subsidized sanitation programs that have not succeeded in getting people to want, build, pay for, and use latrines (Kamal Kar 2003). The approach promotes 100% open

defecation free communities to minimize the risk of contamination for all, breaking the cycle of fecal-oral contamination. Contrary to most conventional sanitation approaches which aim simply at only providing toilets (Otieno, P.V. 2010a), CLTS aims to promote collective behavior change as the key to sustainable, improved sanitation (water and sanitation, 2012).

In Kenya, it was introduced in May 2007, following two training workshops in Tanzania and Ethiopia which three of Plan Kenya WATSAN staff attended and has now been rolled out in all 8 Development Areas (comprising 14 districts) where Plan operates Musyoki, S. M. (2007). The first Open Defecation Free (ODF) village was Jaribuni in Kilifi District in November 2007 while others include Homa Bay (Manera village), Nyando (Kochogo village). In Nyando the concept was introduced in September, 2008 but it had a slow start due to lack of funds for training the master trainers who could trigger the community into implementing CLTS. That notwithstanding Kalwande village of Kochogo Location went ahead to attain ODF status and celebrated on 19th April 2010. However, no study has been done to show the association between Community Led Total Sanitation (CLTS) and the Reduced Household Morbidity in the whole of Nyando District. Hence this study only looked at open defecation as a behavior with shame and disgust as an intervention, it was only limited to the rural population. It is estimated that 30% of Kenya‘s disease burden is sanitation-related. Improved hygiene practices by communities, including the use of sanitary toilets, can effectively break this cycle of disease transmission and reduce the disease burden by as much as 50 percent (water and sanitation 2007).

Community –led total sanitation is widely applied rural behavioural change approaches for ending open defecation. It was reported that over 946 million people world over are still practicing open defecation in 2015. Majority constituted 92% of these people are said to be residing in rural areas (UNIFEF and WHO, 2015). Open defecation has a great effect on human health which has contributed to diarrheal and childhood morbidity and stunting, (Clasen, 2014). Poor sanitation has also contributed to adversely economic hardship as those affected by sanitation related morbidity cannot contributed to economic growth and development (DeFrancis, 2011), and this equally affect the safety and dignity of women, (Hulland el.al 2015, Jadhav el.al,2016).

For several years, government, non-Governmental Organisations (NGOs), other benevolent organizations have been providing free or subsidizing household latrines to households in rural areas and most deprived areas in the developing world but users have realized and believes that this strategy has not been sustainable in adopting or in the utilization of household latrines. This thinking and believe system has led to direct the attention of donnors and sanitation health practitioners to focus more on hygiene, health education and promotion, which includes; hand washing, latrine subsidies, as well as enforcing participatory hygiene and sanitation transformation approach (WHO 1997).

Lessons learnt from this approach has led to a call on sanitation professional that provisions of sanitation infrastructure is not the way to go but rather more focus and efforts should focus on the education and sensitization of the people towards to use of the facility and that the people should be made to accept and understand that the project is part of them and help coming out with their own idea and local innovations that will enhance the utilization and sustaining the facility (Jakins, 2006).

In an attempt to adopt this approach, the Community Led Total Sanitation strategy was adopted with the main aim of seeing to it that communities are able to achieve open defecation free (ODF) communities (Kar and Chambers 2008). This strategy tried to detail the fundamental drift from a focus on individual household sanitation practice to a community base approach concern for open defecation. Community Led Total Sanitation trainers tried to encourage collective behavior change by inculcating and motivating people to adopt and confront the effects of community wide open defecation.

Community Led Total Sanitation (CLTS) is a proven intervention for modifying communities into sanitized societies. A lot of preventable diseases of children and adults alike are sanitation related. Thus this study would examine the impact CLTS have on the mitigation of diseases affiliated with compromised sanitation. This chapter is the review of literature section and it is divided into subsections labelled as follows; introduction, conceptual framework of CLTS, overview of the CLTS methodology, attitude of people towards CLTS programmes, measurement of the effectiveness of CLTS programme, sanitation-related diseases as well as existing programmes and mechanisms to combat sanitation-related diseases.

2.2 Overview of Water, Sanitation and Hygiene Sector of Development

Water Sanitation and Hygiene conditions are the leading cause of public health problems in Ghana as a unit and the world as a whole. Approximately a quarter of the world‘s population lack improved sanitation facilities (WHO/UNICEF, 2015). Nine hundred and forty six million people practice open defecation (OD) (WHO and UNICEF, 2015) and deplorable water, sanitation and hygiene conditions are associated with close to a million child deaths as well as high diarrheal prevalence rates and stunting (Checkley et al, 2008;

Prüss-Ustün et al, 2014). 577,000 deaths are attributed to the combined impacts of poor hand washing and bad sanitation. According to (Clasen et al, 2014; Vyas et al, 2016), open defecation contribute to diarrheal disease and is also indirectly associated with childhood stunting. Diarrhea and cholera are diseases popularly attributed to undue exposure to human excreta (Prss-Ust n et al, 2014; Mara, Lane and Scott, 2010). In addition to this (Spears and Lamba, 2016) observed that stunting among children (low height for age) is linked indirectly to children growing up in environments of poor sanitation.

The problem is, open defecation by a selected household does not only compromised their health status through susceptibility to infections, the practice exposes all other households in the surrounding site of open defecation as well (Eisenberg and Fuller, 2016; Jung et al, 2017; Jung, Lou and Chen, 2017). According to (Pattanayak and Pfaff, 2009), insufficient local capacity, poor institutional capacities and dysfunctional markets for the improvement of sanitation are the factors that contribute to inability to sustain behaviour in the area of sanitation.

The Sustainable Development Goal Six which covers the area of WASH aims –to achieve equitable sanitation and hygiene for all and to end open defecation by 2030 while paying special attention to women, girls and persons in vulnerable situations‖ (David and Macharia, 2015). Water concerns aside, the targets of this goal relating to CLTS objectives are equitable access to sanitation and hygiene facilities as well as ending open defecation.

In Ghana, CLTS has been merged with existing sanitation, water and hygiene operational frameworks of Government agencies such as Community Water and Sanitation Agency

(CSWA) of the Ministry of Water Resource and Sanitation. CLTS is also enshrined in the supporting policy framework of the health sector (Ampadu-Boakye et al, 2011).

2.3 Conceptual framework

Water, sanitation and hygiene conditions have been shown to be significant risk factors of diarrheal disease and other communicable diseases (Degebasa, Weldemichael and Marama, 2018). The conceptual framework that would be adopted to guide this work is the F-diagram framework (Ausel et al, 2014) commonly used in Community Led Total Sanitation (CLTS) models to portray relationship between unsanitary exposures and the appropriate WASH facility or interventions to block the chain reaction to malaise. In this model, the exposure or risk of infection is contact with faecal matter or human excreta. There are four routes of transmission of fecal matter and dirt into the human body commonly referred to as the four Fs; through fluids (contaminated water and liquid foods), through fields (fecal exposure in open spaces), through flies (vector-mediated contamination) and through fingers (contaminated hands).

Appropriate Water, sanitation and hygiene interventions associated with CLTS can securely block the various routes of transmission. These are called the four blocks and they are the toilet barrier, the safe water barrier and the hygiene cum hand washing barrier.

Access to improved latrines and their usage might be able to block-off;

1. Fecal contamination of water sources
2. Faeces in the fields and
3. Vector transmission of faeces through flies to food.

Provided toilets are sited greater than 40 meters from water sources, the possibility of fecal contamination of water sources is low. In resource poor regions like Ghana, it is seldom feasible for all households to construct improved and functional household latrines. As a result, the ODF status certification provided a standard deviation of at most 20% of households not having household latrines (Kar, 2008).

Availability of safe water facilities like boreholes, stand pipes and properly treated water from unsafe water sources minimizes risks of infections through the use of contaminated water sources. Water is either ingested directly to quell thirst or use in the preparation of meals. Thus, safe water not only prevent direct intake of germs in drinking water but it also prevents one-part of food contamination. The safe water block reduces the incidence of water borne diseases like dysentery, diarrhea, cholera as well as a fraction of food poisoning.

Finally hand washing facilities together with appropriate hand washing with soap under running water is especially vital because this –block‖ prevents risk of infection from contaminated fluids, fields/floors, houseflies and contaminated fingers (in eating). This block is also referred to as the hygiene barrier. Hygienic practices together with proper hand washing ensure the avoidance of food infestation by houseflies, eating with filthy fingers, drinking untreated water and other unhygienic practices. This is the only barrier that wholly blocks-off the odds of infection from all the four Fs i.e fluids, field, flies and fingers.

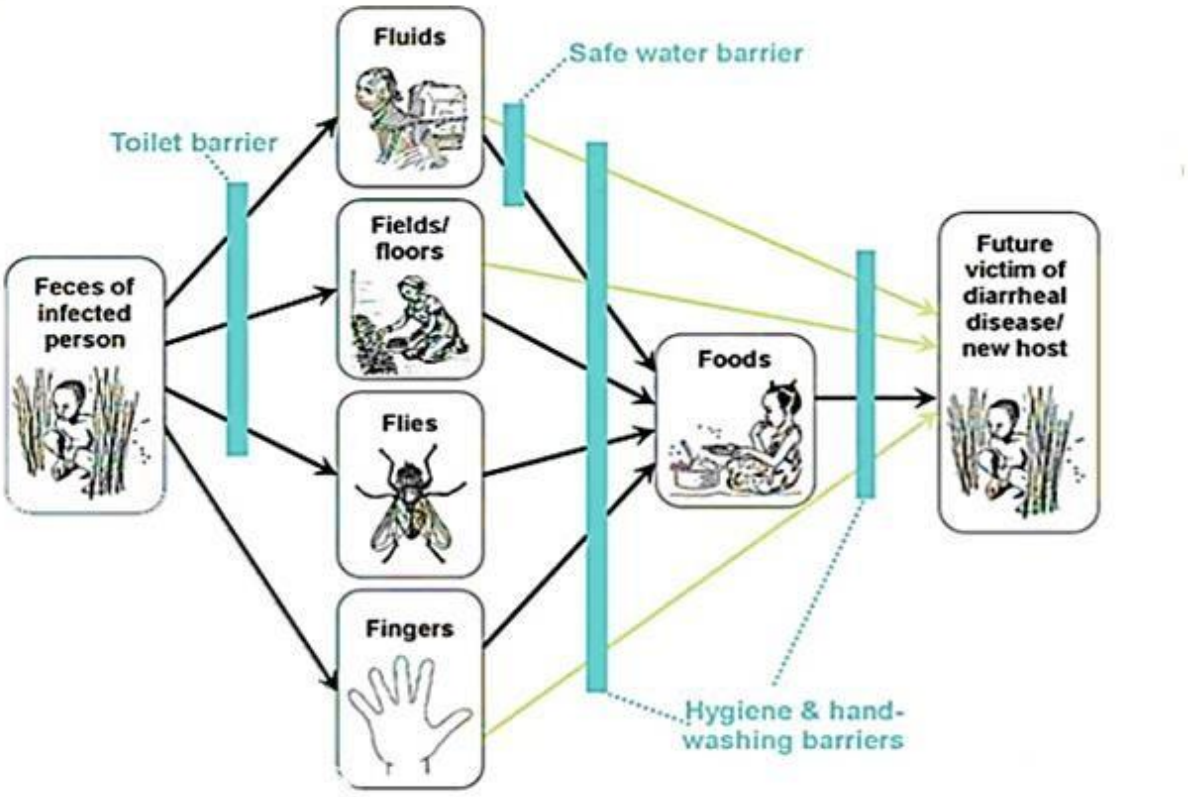

Figure 2.1: The F-diagram showing risks of faecal exposures and WASH interventions
Source: Adopted from Ausel, J. (2014).

The health consequence of the failure of all the interventions or some of the interventions of the F-diagram is ill-health through diarrhea, cholera, worm infections, trachoma, dysentery or any other water-borne or water-WASH diseases. The F-diagrams aims to portray the different feco- oral routes of transmission of infections and how they can be prevented.

Figure 2 is a detailed version of the F-diagram categorizing intervention blocks into primary and secondary blocks. The primary blocks inhibit the exposure of fluids, fingers,

fields, drains and flies to physical contact with faeces. Examples of these primary blocks are:

- ✓ On Fluids; separate faeces from water sources through improved latrines
- ✓ On Fluids; Protect water sources from faecal contamination
- ✓ On Fingers: Wash hands after defecation
- ✓ On Flies, Fields and Floods (Open water sources); Separate faeces from the environment through improved latrines or dig and Bury method

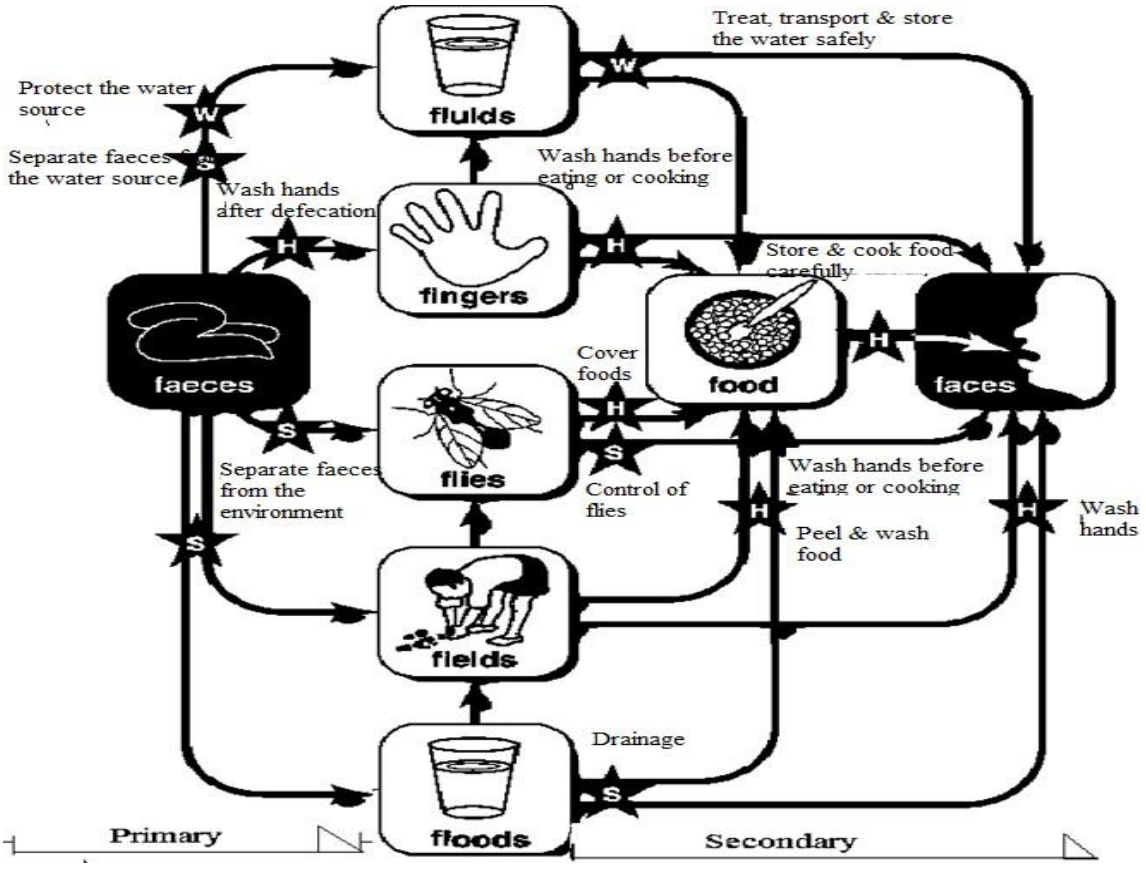

Figure 2.2: Illustration of the primary and secondary prevention of sanitation-related diseases using the F-diagram

Source: https://wedc nowledge.lboro.ac.uk/resources/factsheets/FS009_FDI_A3_Poster.pdf

The secondary block interventions ensure that already contaminated fingers, fluids, foods, flies and drains are inaccessible to the mouths of people to prevent infection. Some of these interventions are:

- On contaminated Fluids: Treat, transport and store water safely
- On Flies: Cover foods and kill the flies through fumigation
- On contact with contaminated Fields: Wash hands after farm work or wash fallen fruits before eating or food stuff before cooking
- On contact with contaminated open water sources (drains) or floods: Wash hands after contact with them.
- On Food: store and cook food properly to kill germs, wash hands before cooking or eating

These primary and secondary interventions fall under the various aspects of WASH such as water safety and quality, proper sanitation and Hygiene. Once the feco-oral chain of transmission is not blocked either completely or partially, disease causing pathogens such as bacteria, protozoa, fungi and viruses can enter into the human body causing infections and ill-health in the form of diarrhea, cholera, dysentery, malaria etc.

2.4 Overview of community led total sanitation

Community Led Total Sanitation (CLTS) is a Water, Sanitation and Hygiene (WASH) intervention model that empowers communities to take charge of their own sanitation needs and solve the problem of sanitation through self-help participatory efforts (Kar, 2008). In the past, the burden of ensuring sanitation was solely the responsibility of government institutions backed Non-governmental Organizations, philanthropist etc. These bodies built latrines for selected individual households at subsidized prices.

However, it was later gathered that this method was incapable of guaranteeing use of latrines. This revolutionized into subsidized latrine construction with sanitation and hygiene education approach. This was called the Participatory Hygiene and Sanitation Transformation (PHST) model (WHO, 1997 as cited by (Venkataramanan et al, 2018)). The subsidy approach (supply-led sanitation provision), a spin-off of the hygiene and sanitation transformation strategy was infrastructure centred (Potter et al as cited by Wood, Dwumfour-Asare et al, 2018). Latrines (both public and household-based) were built but the overall sanitation behaviour of people was still negative. People still practiced open defecation. Thus, sanitation friendly behaviour was not particularly imbibed in the people benefitting from these approaches (Venkataramanan et al, 2018). It was also found out that the hope of a subsidy reduces people‘s motivation to work on their sanitation problems since someone else will pay for it (Kar and Pasteur as cited by (Cameron, Olivia and Shah, 2019). This minimizes community ownership of the sanitation improvement actions.

Community Led Total Sanitation programme was created from the ashes of the subsidy approach. The CLTS methodology was developed by Kamal Kar in the year 1999 in Bangladesh. Due to its effectiveness against open defecation and poor sanitation, it is now accepted and practiced globally as a best practice aunder WASH (Wells and Siibesma, 2012]. CLTS is aimed at empowering entire communities instead of individual households to accept poor sanitation and hygiene as their own collective challenge and work together to provide community-resourced solutions. (Cameron, Olivia and Shah, 2015), observed that social capital (community participation) had effects on the course of the CLTS process. This underpins the essence of the community-led component of

the sanitation programme. Open-defecation is a major nuisance in the efforts to ensure sanitized communities. CLTS focuses on eliminating open defecation through increasing hygiene and sanitation problem awareness through the use of the feeling of shame as a motivator (Kar and Chambers, 2008). External facilitators (NGOs, local Government Agencies, Civil Society Organizations etc) start with creating awareness of its dangers and using community-level cultural and subjective norms to trigger a strong feeling of disgust for open defecation and exposed faecal matter in the environment. This is the first stage of CLTS termed triggering stage. The stages of CLTS are outlined in details as shown in the table below.

Table 2.1: The stages of CLTS methodology

Stage of CLTS	Explanation	Benchmarks
Pre-triggering	Recruiting and training community based facilitators, base-line profiling of the community and initiating community entry procedures.	✓ Community entry and profiling
Triggering	Liaising with community leadership to organize a community-wide forum and leading a discussion geared at eliciting strong feeling of disgust at unsanitary living and open defecation. This is achieved by adopting subtle- questioning approach in the desired direction of why? When? Who? How? Of open defecation. At the end, the feeling of disgust generated will act as a driver to change sanitation behaviour in the whole community. Solutions such as dig-bury and latrine building will be sought and collectively deliberated on.	✓ Triggering of disgust ✓ Suggesting, deliberating and agreeing on immediate and long-term solutions
Post-triggering	Routine visits to ensure compliance with suggested immediate and long term solutions to Open Defecation. Exceptional performance is awarded by declaring communities ODF and ensuring it is celebrated.	Routine monitoring and assessing performance on agreed-on solutions.

As part of post-triggering, communities with exceptional performance in terms of eliminating open defecation and cleaning their surroundings are awarded Open Defecation Free Status (ODF status). This landmark in the process is so significant that facilitators and sponsors ensure that it is celebrated by the entire community. According to Kar (2008), a community is said to be open defecation free when the entire community or every individual in the community uses a latrine and at least 80% of the households owns a latrine. ODF status is also an indicator in a grand scheme of events to make communities totally sanitized. The table below illustrates the checklist for awarding ODF status and sanitized community status.

Table 2.2: ODF and sanitized communities award checklists

ODF checklist	Totally sanitized communities checklist
Use of latrines in households	Use of hygienic latrines in households
Proper maintenance of household latrines	Proper maintenance of latrines in households
Availability of hand washing facilities by the Latrines?	Availability of latrines with handwashing facilities and urinals in schools
	Availability of latrines and hand washing facilities in healthcare centres
Safe disposal of anal cleaning materials	Availability of latrines in markets
Safe disposal of children‘s faeces	Hand washing facilities close to household latrines
Presence of faeces in former open defecation sites	Food always covered
Faecal deposits anywhere in the community	Drinking water always covered
Availability of latrines with hand washing facilities in schools	Surroundings of community water points always clean
Availability of latrines in healthcare centres	Proper disposal of solid waste
	Proper disposal of liquid waste
	Proper disposal of animal waste
	Location of water points at least 30m from nearest latrine

The CLTS model of holistic sanitation improvement has been widely accepted and implemented by Government agencies, Non-governmental Organizations and Faith based organizations alike.

2.5 Impact of the Community Led Total Sanitation programme

The impact of CLTS depicts its ability to directly lower the incidence of open defecation by fostering active participatory latrine construction and also its indirect relationship in reducing the prevalence of sanitation related diseases.

2.5.1 Direct impact of CLTS

India, (Orgill-Meyer *et al*, 2019) uncovered that CLTS had significant impact on beneficiary communities. It increased latrine ownership by 29.3 percentage points (29.3, 95% CI: 17.5-41.2) and reduced the prevalence of open defecation (-6.8%, 95% CI: -13.0 to -1.0) by four years after implementation. In the course of ten years, latrine ownership was still higher, however the deterioration of existing latrines and the building of new latrines by control groups resulted in little differences in latrine ownership between selected CLTS households and control groups. Orgill-Meyer *et al*, (2019), recommended that the sustainability of latrines and other CLTS outputs be factored into the programme. On the rate of latrine ownership; (Zeleke, Gelaye and Mekonnen, 2019) also reported that CLTS intervention in a community was approximately two times more likely to increase the rate of latrine ownership. CLTS is shown to significantly contribute to eradication of open defecation and enhancement of household latrine coverage in accordance with its primary mandate (USAID, 2018; Crocker, Saywell and Bartram, 2017; Pickering *et al*, 2015; Venkataramanan *et al*, 2018) A community sanitation programme akin to CLTS

approach was organized in Assam of India. This programme was shown to increase awareness of environment sustainability (Gebremariam and Tsehaye, 2019).

Latrine coverage is one of the most significant indicators of the effectiveness of CLTS. A study in Mali assessing the impact of CLTS reported an increase in latrine coverage and reduction in the prevalence of sanitation related infections as a consequence of CLTS (Pickering *et al*, 2015b). A similar work in Tanzania reported an increase in latrine coverage but no significant influence on health status of the natives (Briceno, Coville and Martinez, 2015). In a study in Zambia, (Yeboah-Antwi *et al*, 2019) reported that the Zambian sanitation and hygiene programme which incorporates CLTS improved access to sanitation facilities, reduced open defecation and enhanced hand washing practice.

Also, in the diretiyara district of Ethiopia, CLTS remarkably increased latrine coverage above 80% and reduced the incidences of open defecation (Tessema, 2017). However, there was intermittent use of the latrines as a result of bad smell. In the same country, (Gebremariam, Hagos and Abbay, 2018) showed that a modified version of CLTS titled community Led Total Sanitation and Hygiene Approach (CLTSH) improved both latrine availability and latrine utilization in beneficiary communities compared to controls. The selfsame author pointed out that the odds of finding fresh fecal matter was 11.5 times higher among households not enrolled in the CLTSH programme.

Furthermore, (Cameron, Olivia and Shah, 2019) discovered that CLTS contributed to a modest increase in latrine construction in Indonesia. It was also reported to dampen community tolerance of open defecation and curb roundworm infection among children.

Diarrheal prevalence in the Yaya Gulele District of Ethiopia is shown to be associated with CLTS and hygiene promotion programme in selected communities (Degebasa,

Weldemichael and Marama, 2018). This selfsame author revealed that WASH-related factors such as unclean water storage, presence of faeces in surroundings, lack of hand washing facilities and bad attitude of mother towards diarrheal disease posed as risk factors for the prevalence of diarrhea.

In a study to assess the combined impact of CLTS, Health education and prophylactic chemotherapy on helminthes infection in La Cote D'voire (Raso et al, 2017), the intervention package significantly reduced open defecation (pre-intervention: 75.0%, post-intervention: 16.7%), boosted latrine use (pre-intervention: 15.5%, post-intervention: 94.6%) and increased awareness of environmental contamination by open defecation pre-intervention: (20.4%, post- intervention: 52.2%)

2.5.2 Indirect Impact of CLTS

CLTS indirectly impacts on sanitation friendly behaviours and eventually contributes to reduction in the incidences of sanitation-related diseases.

On sanitation behaviours, CLTS is known to reduce open defecation according to (Orgill-Meyer, et al, 2019). The primary goal of CLTS is to prevent open defecation and cut-off feco-oral transmission of infections. Other studies such as that of (USAID, 2018; Crocker, Saywell and Bartram, 2017; Pickering *et al*, 2015; Venkataramanan *et al*, 2018) all demonstrated the potency of CLTS and related WASH programmes in combating open defecation amidst other benefits such as latrine coverage. In the Diretiyara district of Ethiopia CLTS was found to reduce the incidences of open defecation (Tessema, 2017). In Zambia, (Yeboah-Antwi et al, 2019) pin- pointed that a programme that is a fusion of CLTS and hygiene promotion, contributed to a reduction in open defecation among other benefits. According to Gebremariam, Hagos and Abbay (2018), the odds of

finding fresh fecal matter was 11.5 times higher among households not enrolled in a CLTS cum Hygiene joint programme. Cameron, Olivia and Shah (2019) in a similar vein, discovered that CLTS does not only prevent open defecation but it also dampens community tolerance of the practice.

Gebremariam, Hagos and Abbay (2018) showed that CLTS or its its related family of WASH Approaches (CLTSH) does not only improve latrine availability but latrine utilization in beneficiary communities as well.

Apart from its impact on open defecation practice, CLTS is also known to influence the best practice of handwashing with soap and under running water (Yeboah-Antwi et al, 2019). Handwashing prevents the transfer of dirt and germs into the human body through the fingers as shown in *Figure 1*.

Another indirect result of CLTS is its impact on the incidence or prevalences of sanitation- related diseases. According to Pickering et al (2015b), CLTS programme resulted in a reduction in the prevalence of sanitation related infections. Diarrheal prevalence in the Yaya Gulele District of Ethiopia was shown to be associated with CLTS and hygiene promotion programme in selected communities (Degebasa, Weldemichael and Marama, 2018). This selfsame author revealed that WASH-related factors such as unclean water storage, presence of faeces in surroundings, lack of hand washing facilities and bad attitude of mother towards diarrheal disease posed as risk factors for the prevalence of diarrhea. According to Cameron, Olivia and Shah (2019), CLTS contributed to curbing round worm infection among children. On the contrary Coville and Martinez (2015) observed high increase in latrine coverage but little impact of CLTS on the health status of natives of rural Tanzania.

2.6 Effectiveness of community led total sanitation programme

Progress in gaining access to improved sanitation has been the slowest in sub-Saharan Africa, where sanitation coverage has only increased by 5% between 1990 and 2012 (Pickering *et al*., 2015). (Venkataramanan *et al*, 2018) Concluded that the availability of CLTS effectiveness evidence-base to stakeholders such as program managers, practitioners and policy makers has been poor.

In a study to assess the effectiveness of latrine construction intervention in Nyando District of Kenya, (Babb *et al*, 2018) found out that non-ODF communities were at 16% more risk of contracting diarrheal disease than selected ODF communities. Also, unsafe disposal of child excreta was associated with diarrheal disease prevalence. However, the selfsame author discovered that the effectiveness of the intervention in ODF communities was being compromised by the exposure of the water supply to fecal contamination. As a consequence, the proportion of *Escherichia coli* was higher in the water supply of ODF communities relative to non-ODF communities (76.7% against 60%).

Community participation (social capital) affects the effectiveness of CLTS according to the findings of (Cameron, Olivia and Shah, 2015). Sustainability of CLTS rides on the concept of community ownership which in turn is affected by the level of community participation in activities of CLTS. Also, Kar (2008) outlines the indispensable influences of community based natural leaders on the effectiveness of CLTS. There is little information on the role definition of natural leaders.

Crocker *et al*, (2016) adopted the behavioural theory of diffusion of innovation to explain the effectiveness of CLTS to achieve predesigned objectives in communities. According to this theory, any new thing to a community goes through defined classes of people

namely: early adopters, late adopters and laggards (Rogers as cited by Crocker *et al*, 2016). This theory like CLTS depends exclusively on the characteristics of the people in the targeted community. Therefore, CLTS is easily implemented successfully when community opinion leaders and natural leaders are enticed to easily own the process, other natives follow their lead to stop open defecation and build latrines among other activities.

According to (Cameron, Olivia and Shah, 2019), the effectiveness of CLTS in improving latrine construction is affected by certain factors. Chief among them is poverty; poor households lack economic access to improved sanitation. Although CLTS is a community led approach, members still are required to purchase the items needed to build a latrine and proceed to build it. Also, CLTS was found to be counter-productive in communities with poor social capital (community participation) at baseline. Communities with high social capital at baseline of CLTS implementation end up building more toilets. (Cameron, Olivia and Shah, 2019) pointed out that there is a potential problem with scale up; local government agencies would take over CLTS activities after external funders project closure. However, communities triggered by local government agencies had the worst results compared to NGOs and international organizations. Thus the author envisions that CLTS effectiveness would plummet when transferred to local government agencies' monitoring.

Limitations of the CLTS programme

Recent evaluations of the CLTS programme are revealing certain weak points that need to be considered for integration or modification of the sanitation intervention. (Delea *et al*, 2019) assessed current demand-side WASH intervention (CLTS) on sustained

behaviour. The author (s) observed that although there are vast significances of CLTS to sanitation and hygiene practices through latrine construction, holistic hand washing and the like, there are evidences of behavioural slippage back to previous conditions of unsanitary living and open defecation among communities hitherto declared as Open Defecation Free (ODF). This was supported by (Orgill- Meyer *et al*, 2019) who reported that after a decade, latrines deteriorated creating no significant difference between households empowered with CLTS and those without. Other limitations reported by (Delea *et al*, 2019) were; poor triggering of communities, over-saturation of extension workers in CLTS activities and the sole focus on disgust compared to other potentially powerful drivers.

Venkataramanan *et al*, (2018) expressed concern on the adaptability, structuring of post triggering activities, appropriate selection of communities and sequencing of CLTS with other sanitation interventions.

2.7 Sanitation-related diseases

Unsanitary and unhygienic living is attributed to a litany of health related states such as diarrhea, dysentery, cholera, soil transmitted helminth infections (Freeman *et al*., 2015), schistosomiasis and trachoma (Clasen *et al*., 2014). Among these conditions diarrhea alone causes approximately 1.6 to 2.5 million deaths per annum including a fifth of children under five years in developing countries (Clasen *et al*., 2014). Globally, diarrhea is the second leading cause of child deaths (DFID, 2013) and in Africa, it accounts for the major part of child deaths (Tessema, 2017). Unsanitary and unhygienic living is also indicated in the occurrence of Neglected Tropical Diseases such as Trachoma, dracunculiasis and visceral leishmaniasis (WHO, 2015).

Worm infestation is another problem associated with poor sanitation and hygiene conditions (Hürlimann *et al*, 2018). These parasites are believed to be the underlining mediator between sanitation and the prevalence of sanitation-related stunting in children. If untreated for extended periods, they turn to feed on the nutrients children take in compromising the nutritional status of children. In the past mass drug administration's (AMA) were used to combat helminthes infections with respect to children (WHO, 2006; Freeman *et al*., 2015). However, it was discovered children get re-infected too quickly afterwards demanding more sustainable measures geared towards eliminating the risk factors (Melville *et al*, 2012; WHO, 2012).

Pathophysiology of diarrheal disease

Diarrheal disease is the 2nd top cause of death in children younger than 5 years. About 760,000 children die from diarrheal diseases each year out of a total of 1.7 billion cases (Degebasa, Weldemichael and Marama, 2018). Diarrhea is the condition associated with having loose watery stools as a gastrointestinal infection. The World Health Organization (Diouf, Tabatabai et al, 2014 and Farthing, Salam et al, 2013) defined diarrhea as the occurrence of three or more watery stools per day. If your diarrhea lasts more than a few days, your body loses too much water and salt. This causes dehydration, which compromises water and electrolyte balance and can lead to death. Diarrhea is usually caused by an intestinal virus or bacteria transmitted through contaminated water or food. It's particularly widespread in developing nations bedeviled with sanitation and waste management problems conditions. Poor hygiene and environmental sanitation accounts for 50,000 to 112,000 child deaths per annum (Crocker, Geremew, Atalie, Yetie and

Bartram, 2016; Sinmegan, Alemie and Shimeka, 2014). Risk factors for diarrheal diseases include:

- living in an area with poor sanitary conditions
- no access to clean water
- age, with children being the most likely to experience severe symptoms of diarrheal diseases
- malnourishment
- a weakened immune system

According to the following sources (Peter and Nkambule, 2012; O'Reilly et al, 2012; Kahabuka, Kvale and Hinderaker, 2012), the severity of diarrheal risk is increased by improper caregiving by mothers, malnutrition, poor personal hygiene, inaccessible water sources, contaminated food and younger age. (Islam et al, 2018) also reasoned that improper management of child fecal matter is a risk factor for the contraction of diarrheal disease by infants.

The best method of prevention is practicing good hygiene. According to (Belachew, Abrha, Gebrezgi and Tekle, 2018), close to 90% of diarrheal disease prevalence is as a result of compromised water, sanitation and hygiene. Good hand washing techniques can reduce the incidence of diarrheal diseases by 40 percent. Improved sanitization and water quality as well as access to early medical intervention can also help prevent diarrheal diseases.

The disease lasts a few days and can result in dehydration without proper care practices. Some of the effects of prolonged diarrhea are oligouria, palor, tachycardia, decreased responsiveness to stimuli.

Pathophysiology of cholera

Cholera is an acute diarrheal disease that can kill within hours if left untreated. Researchers have estimated that each year there are 1.3 million to 4.0 million cases of cholera, and 21 000 to 143 000 deaths worldwide due to cholera (WHO, 2010). The disease is an acute diarrheal infection caused by ingestion of food or water contaminated with the bacterium *Vibrio cholerae*.

Cholera is an extremely virulent disease that can cause severe acute watery diarrhoea. It takes between 12 hours and 5 days for a person to show symptoms after ingesting contaminated food or water (CDC, 2015). Cholera affects both children and adults and can kill within hours if untreated.

Most people infected with *V. cholerae* do not develop any symptoms, although the bacteria are present in their faeces for 1-10 days after infection and are shed back into the environment, potentially infecting other people.

Among people who develop symptoms, the majority have mild or moderate symptoms, while a minority develop acute watery diarrhea with severe dehydration. This can lead to death if left untreated.

Cholera can be endemic or epidemic. A cholera-endemic area is an area where confirmed cholera cases were detected during the last 3 years with evidence of local transmission (meaning the cases are not imported from elsewhere). A cholera outbreak/epidemic can occur in both endemic countries and in countries where cholera does not regularly occur.

In cholera endemic countries an outbreak can be seasonal or sporadic and represents a greater than expected number of cases. In a country where cholera does not regularly

occur, an outbreak is defined by the occurrence of at least 1 confirmed case of cholera with evidence of local transmission in an area where there is not usually cholera.

Cholera transmission is closely linked to inadequate access to clean water and sanitation facilities. Typical at-risk areas include peri-urban slums, and camps for internally displaced persons or refugees, where minimum requirements of clean water and sanitation are not been met.

The consequences of a humanitarian crisis – such as disruption of water and sanitation systems, or the displacement of populations to inadequate and overcrowded camps – can increase the risk of cholera transmission, should the bacteria be present or introduced. Uninfected dead bodies have never been reported as the source of epidemics.

The number of cholera cases reported to WHO has continued to be high over the last few years. During 2017, a million, two hundred and twenty seven thousands cases were notified from 34 countries, including 5654 deaths. The discrepancy between these figures and the estimated burden of the disease is since many cases are not recorded due to limitations in surveillance systems and fear of impact on trade and tourism.

A multifaceted approach is key to control cholera, and to reduce deaths. A combination of surveillance, water, sanitation and hygiene, social mobilization, treatment, and oral cholera vaccines are used. Cholera is an easily treatable disease. The majority of people can be treated successfully through prompt administration of oral rehydration solution (ORS). The WHO/UNICEF ORS standard sachet is dissolved in 1 litre (L) of clean water. Adult patients may require up to 6 L of ORS to treat moderate dehydration on the

first day. Up to 80% of cases can be successfully treated with oral rehydration solution (ORS).

Severely dehydrated patients are at risk of shock and require the rapid administration of intravenous fluids. These patients are also given appropriate antibiotics to diminish the duration of diarrhea, reduce the volume of rehydration fluids needed, and shorten the amount and duration of *V. cholerae* excretion in their stool.

Mass administration of antibiotics is not recommended, as it has no proven effect on the spread of cholera may contribute to antimicrobial resistance. Rapid access to treatment is essential during a cholera outbreak. Oral rehydration should be available in communities, in addition to larger treatment centres that can provide intravenous fluids and 24 hour care. With early and proper treatment, the case fatality rate should remain below 1%.

Zinc is an important adjunctive therapy for children under 5, which also reduces the duration of diarrhoea and may prevent future episodes of other causes of acute watery diarrhoea.

Breastfeeding should also be promoted.

Provision of safe water and sanitation is critical to control the transmission of cholera and other waterborne diseases. Safe oral cholera vaccines should be used in conjunction with improvements in water and sanitation to control cholera outbreaks and for prevention in areas known to be high risk for cholera. A global strategy on cholera control with a target to reduce cholera deaths by 90% was launched in 2017.

Pathophysiology of helminthes infections

Helminths are a broad range of organisms that include intestinal parasitic worms, (roundworms (*Ascaris lumbricoides*), whipworms (*Trichuris trichiura*), or hookworms (*Necator americanus* and *Ancylostoma duodenale*).

Infected people excrete helminth eggs in their faeces, which then contaminate the soil in areas with inadequate sanitation. Other people can then be infected by ingesting eggs or larvae in contaminated food, or through penetration of the skin by infective larvae in the soil (hookworms).

Infestation can cause morbidity, and sometimes death, by compromising nutritional status, affecting cognitive processes, inducing tissue reactions, such as granuloma, and provoking intestinal obstruction or rectal prolapse. Control of helminthiasis is based on drug treatment, improved sanitation and health education. In fact, to eradicate helminthes infestation, integrated approaches consisting of chemotherapy, sanitation, hygiene and education are necessary to break the chain of transmission (Strunz et al, 2014; Knopp, Mohammed, Khamis et al, 2012; Bieri, Gray et al, 2013)

The relationship between sanitation and sanitation-related infections

Unsanitary and unhygienic living is attributed to a litany of health related states such as diarrhea, dysentery, cholera, soil transmitted helminthes infections (Freeman et al., 2015), schistosomiasis and trachoma (Clasen et al., 2014). Among these conditions diarrhea alone causes approximately one million deaths per annum including a fifth of children under five years in developing countries (Clasen et al., 2014). In the past mass drug administration‘s (AMA) were used to combat these diseases with respect to children

(Freeman et al., 2015). However, it was discovered children get re-infected too quickly afterwards demanding more sustainable measures (WHO, 2012). Availability and appropriate utilization of WASH facilities like improved latrines and hand washing stands can reduce infections especially among children (Freeman et al., 2015). Studies show a significant correlation of reduced infections with latrine access and hand washing. In the northern region of Ghana proper hand washing helps to reduce diarrhea and pneumonia prevalence by up to 50% and improved sanitation can reduce diarrhea rates by 36%.

According to the works of (Ravindra and Smith, 2018; Ravindra and Mor, 2013], a host of water borne diseases can be mitigated saving millions of lives by adoption of proper sanitation, hygiene and ensuring water quality. (Hürlimann et al, 2018) reported that CLTS together with health education and preventive chemotherapy created a reduction in hookworm infection and worm-eggs relative to control communities. Also, there was a higher reduction in intestinal protozoans among intervention communities relative to communities without the intervention (8.2% vs. 2.6%).

2.8 Mechanisms and programmes for combating sanitation-related diseases

Global interest in WASH conditions and services informed UNDP's Sustainable Development Goal 6 which states ‒achieve universal and equitable access to safe and affordable drinking water for all by 2030‖ (Brundtland, 2002). It is essential to have information on all indicators on WASH to measure progress towards achieving Global and national goals as well as evaluating ongoing interventions.

Community Led Total Sanitation is a holistic sanitation and hygiene promotion improvement programme. It has used since 1999 to combat bad sanitation through

elimination of open defecation. It is shown in several works that CLTS is effective in eliminating open defecation (USAID, 2018; (Yeboah-Antwi et al, 2019), (Tessema, 2017), (Cameron, Olivia and Shah, 2019), increasing physical access to latrines (Orgill-Meyer et al, 2019), (Zeleke, Gelaye and Mekonnen, 2019; USAID, 2018; Crocker, Saywell and Bartram, 2017; Pickering et al, 2015; Venkataramanan et al, 2018; Briceno, Coville and Martinez, 2015; Pickering et al, 2015b), (Yeboah-Antwi et al, 2019), (Gebremariam, Hagos and Abbay, 2018), improving latrine utilization (Gebremariam, Hagos and Abbay, 2018), (Cameron, Olivia and Shah, 2019), increasing awareness of environmental sustainability (Gebremariam and Tsehaye, 2019) and consequently contributing in no small measure to quelling the prevalence of sanitation-related diseases (Pickering et al, 2015b; (Degebasa, Weldemichael and Marama, 2018), (Cameron, Olivia and Shah, 2019) and chronic malnutrition.

Other programmes that buttress the impact of CLTS include the Rural and Town Water Supply System that works to provide safe and portable drinking water through the drilling of bore-holes and plumbing of homes with stand pipes. The Ghana Health Service School and Health Promotion programme also support with health education for all persons presenting at health facilities as well as community outreach services.

In La Cote d‘voire, (H rlimann et al, 2018) reported the use of a mixed package consisting of CLTS, Health Education and Prophylactic chemotherapy to combat worm infestations and worm infections. The intervention was successful in reducing the prevalence of the various species of helminthes.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter is devoted to the study settings and the research methodology employed in conducting the study. The study settings is necessary because knowing the study area and its attributes will enable the researcher choose the appropriate methodology for the study. Understanding of the study area would give the researcher an ideal on the nature of the subjects and the area there living in. With regards to the topic under investigation knowing the geography of the place would give the researcher an informed idea about the topography and the environment situation of the area.

3.2 Study Area

The District is located in the northern flank of the Northern region and covers a land mass of approximately 1,599 km sq. The District shares boundaries to the North with Mamprugu/Moagduri district, Tolon and North Gonja districts to the West, Sagnerigu District to the South and Savelugu/Nanton Municipal to the East. The district is made up of 126 communities with 24 electoral areas (EAs), One (1) Town council (TC) and Five (5) Area councils (AC). They include; Gupanerigu, Gbullung, Zangbalung, Dalun and Voggu Area councils and the Kumbungu town council being the administrative capital.

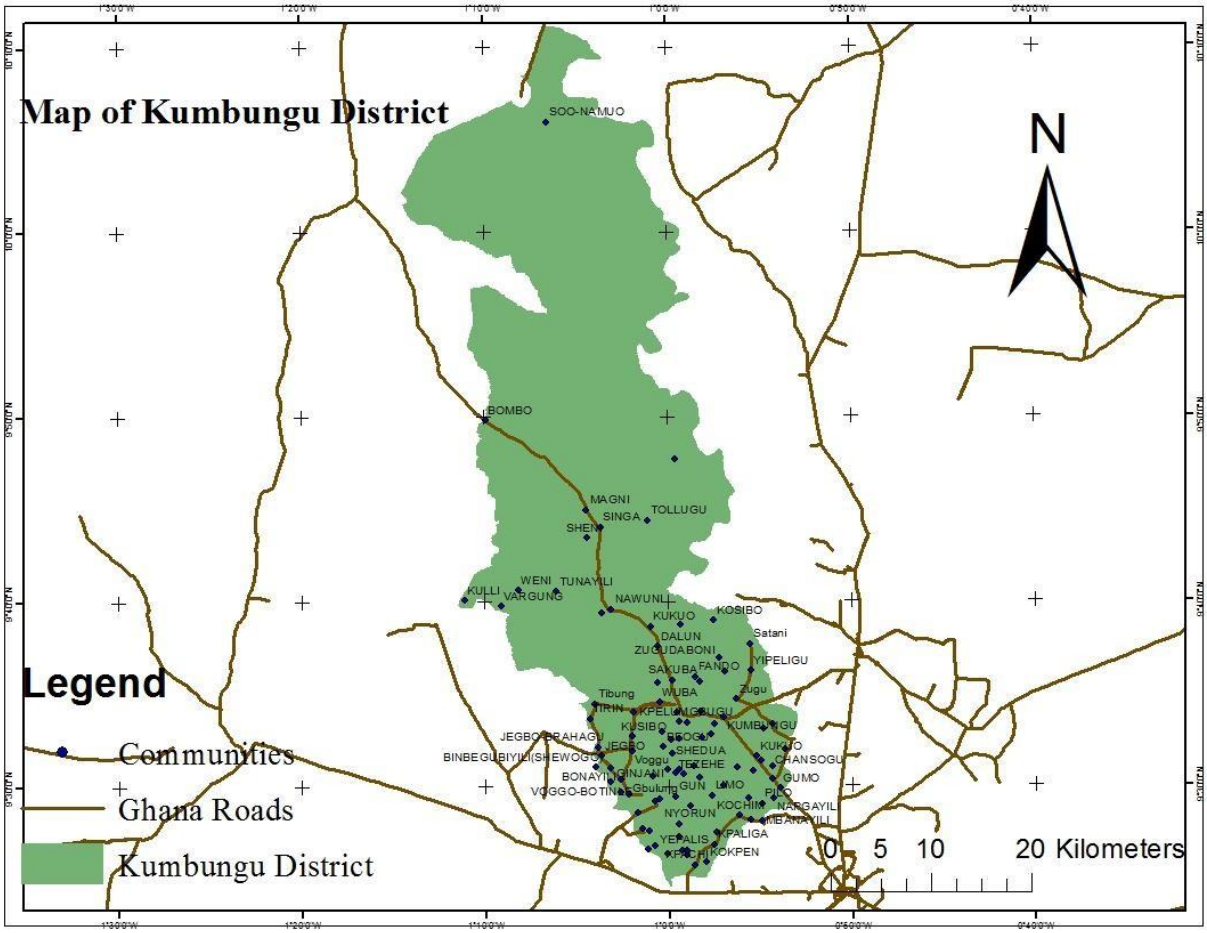

Figure 3: The Map of the of Kumbungu District

3.2.1 Physical and Natural Environmental.

The land is generally undulating with a number of scattered depressions. There are no marked high elevations throughout the district. The District is drained by a number of rivers and streams, most prominent being the White Volta. The major rivers and their tributaries exhibit dendrite drainage patterns. Most of these tributaries dry up during the dry season.

In Kumbungu District, the Rains begin in May and end in the latter part of October. July to September is the peak period and the district experiences floods during the period. The rest of the year is dry. The average annual rainfall is 1000mm (GSS, 2010).

The vegetative cover is basically Guinea Savanna interspersed with short drought resistant trees and grassland. The soil is generally of the sandy loam type except in the low lands where alluvial deposits are found. Major trees species include the shear, dawadawa, mango, which are economic trees and form an integral part of livelihood of the people.

The soils are generally of the sandy loam type except in the low lands where alluvial deposits are found. Apart from the gentle slopes, the soils are highly vulnerable to sheet erosion and in some areas, gully erosion also occurs. This condition occurs primarily because of the perennial burning of the natural vegetation, leaving the soils exposed to the normally high intensity of the sun. The continuous erosion over many years has removed most of the top soils and depleted or destroyed its organic matter content.

3.2.2 Toilet facilities in the area

The district is rural with huge challenges with regards to toilet facilities. The district has a total number of 8 public toilets mostly sited in the big communities like Kumbungu, Zanbgalin and Voggu. Kumbungu which is the district capital has a total of 6 public toilets with one each in the remaining two communities mentioned above. The district has 2960 hand washing facilities, 48 institutional latrines and 40 institutional hand washing facilities (field survey, 2019). Even though the district has some toilet facilities, the inhabitants still resort to open defecation.

3.2.3 Water and sanitation

Water, sanitation and hygiene concerns is on top agenda of the duties of the Ghana Health Service.

Table 3.1 Top Ten OPD Reported Diseases in the Kumbungu District in 2018.

Diseases	Prevalence rates
Malaria	74.5
Acute respiratory infect	68.3
Hypertension	62.8
Skin diseases	60.2
Pneumonia	56.4
Anaemia	52.7
Rheu and joint pain	34.3
Eye infection	21.0
Cholera	18.9

From the table it was clear that sanitation related diseases are dominating in the area.

3.2.4 Health status in the area

The District has one hospital, located in Bontanga, two Health Centres located in Kumbungu and Dalun, ten Community-Based Health Planning and Services (CHPS) Compounds, and twenty-four demarcated CHPS centres/zones located in communities across the District and have about 0.26 OPD attendances per capita. The District also has 101 health staff with about 1 DDHS, 1 DPHN, 2 DCOs (Technical Officer), 2 DCOs (Field Technician), 3 Nutrition Officers, 1 health information officer, 1 administrative staff, 3 Accounts staff, 1 Physician Assistants (MAs), 3 Midwives, 4 Staff Nurses, 25 Community Health Nurses, 52 Enrolled Nurses and 2 Mental Nurses. The District has 45

Environmental Health and Sanitation Officer in the District Environmental Health and Sanitation Unit.

3.2.5 Demographic Characteristics

The total population, according to the 2010 Population and Housing Census, stands at 39,341 with a male population of 19,686 and a female population of 19,655. The district has an estimated growth rate of about (3%). Population density is approximately 50 inhabitants per square Kilometres. About 54% of the total population is under the ages of 20 years which indicate that the population is largely youthful.

3.6 Research Methodology

This section of the chapter is devoted to how the study was conducted. It started with the study design, the sources of data, and tools for data collection, sampling procedure and how the collected data were analysed and interpreted.

3.6.1 Study Design

To achieve the objectives set for this study, this dissertation draws on a wide range of methods in the collection and analysis of the data. According to Bryman (2008), he advised that the use of a combination of research methods enable triangulation that capture different dimensions and the choice of different methods which aid in the provision of this synergy in data capturing. The research therefore employed the mixed method (both qualitative and quantitative) approach with multiple locations of the respondents in the study district.

A mix of quantitative and qualitative methods is ideal because they complement each other and thus provide an enhanced understanding of the issues under investigation. In

engaging in a social science research, its miles deemed essential to the growing recognize that studies concerns within the discipline straddle the dualistic modes of analysis across economic, cultural and physical concerns (Demerrit, 2009). The study therefore employed the survey method as its quantitative method and employed the following as qualitative methods: expert interviews, focus group discussions, personal observation, and individual interviews. Social researchers argue that a hybrid research approach in which a variety of perspectives play a function in dealing with the problem under investigation is most appropriate for research bordering on social issues (Batterbury, 2008; Simon, 2004).

3.7 Sources of Data

This study sourced its data from both primary and secondary sources. Primary data was sourced using the following tools; questionnaire, focus group guide, in-depth interview guide, key informant interview guide as well as observation check list. This was to help the researcher meet with the respondents and get first-hand information on the topic under investigation.

The secondary data was sourced from existing studies on the topic under investigation; Information was sourced from journals periodicals, the annual reports from the Kumbungu district assembly, dissertations and thesis on the subject matter, reports from the environmental health unit of the assembly and other relevant source.

3.8 Techniques for Data Collection

In conducting the study some research techniques were employed. These techniques were the methods employed that enable the researcher to undertake the study. They were framework that guided the study.

3.8.1 The Survey

The survey method was deemed relevant for this study because it was the most convenient and effective way of reaching the target population scattered in six selected area councils in dispersed locations in the study district (Couper, 2000). This allowed for the collection of data using both pre-coded response categories. The survey involved administering a questionnaire with a set of questions and standard responses (appendix 1). In conducting the survey, one hundred and fifty (150) questionnaires were administered respondents in the Kumbungu district.

Six communities were selected for the study. These communities were purposively selected, thus communities where CLTS was practiced at the time of the study. These communities were Jegbo Gbulahigu, Voggu, Gbulin, Tiring, Dalun and Zangbalin.

The themes covered by the questionnaire reflected the objectives of the study. The survey instrument contained questions that focused on the following thematic areas of the study: the socio-demographic characteristics of respondents, CLTS mandate, and diseases prevalence in the study area. The number of respondents selected in the various communities was based on the population of the area as stated in the 2012 population and housing census. This is illustrated in table 3.1

Table 3.2: Sample Communities and Number of Respondents

Selected Communities	Population	Respondents selected
Jegbo Gbulahigu	1642	20
Voggu	3649	36
Gbuli	2897	26
Tiring	1125	14
Dalun	3869	32
Zangbalin	1674	22
Totals	14856	150

Sampling is very important in both quantitative and qualitative research; it is used when it is not possible to include the entire population in research projects (Williamson, 2002). A multi stage sampling technique was employed to select respondents for the survey. Proportional sampling was used to divide the population in strata according the study communities. A simple random sampling technique was adopted in selecting the respondents in the selected communities. This was done by first contacting the leaders of the communities in their various communities. The leadership then led me to have a transect walk in the communities. Through the transect walk I was able to zone the various communities and from each zone I selected the houses randomly by selecting any third house from the eastern direction.

The questionnaire administration was done in the local language Dagbani. This was so because all the selected household head could speak and understand the language every well.

3.8.2 Focus Group Discussions (FGDs)

Focus group discussions were employed to capture the wide range of experiences, which are useful in complementing the data collected through the survey and the individual in-depth interviews (Johnson and Onwuegbuzie, 2004). Focus group discussions allow the individuals in a group context to express their personal views, knowledge and experiences in an informal way. In this study ten (10) focus group discussions were conducted – one each in all the selected areas for the study

3.8.2 Observation

Personal observation was employed to provide perspectives on issues normally not discussed in interviews because they are taken for granted. Observation was used in this study to capture speculations, feelings, ideas, problems, impressions and prejudices (Creswell, 2009). Observation is described as the fundamental base of all research methods in social science. It is essential as it enables the researcher to note the body language of the interviewee to obtain a complete picture of the sanitation situation, especially in studies that are mainly on interview as a basic data collection technique (Alder and Alder, 1994). Social scientists observe human activities and behaviour as well as social settings in which they take place (Angrosino, 2005). Observation was an on-going process that continued throughout the research process. The observation conducted during the fieldwork was to observe the sanitation situation in the study area including open defecation in the area. The nature of their rooms, the nature of the loads they carry,

and their social activities were observed. According to Silverman (2005) observation helps to produce a rich account of the phenomenon being studied. The observation method enabled the researcher triangulate information from the other methods and also clarifies misunderstandings.

3.8.3 Key Informant Interviews

A key informant interview is a standard anthropological method that is widely used in health related research and other social development enquiries. It is one of the methods used in rapid assessment for gathering information from the affected people or community (O'Leary, 2008). The term key informant refers to anyone who can provide detailed information and opinion based on his or her knowledge on a particular issue or subject of investigation. A key informant interview seeks qualitative information that can be narrated and cross-examined with quantitative data. The interviewer has to remain neutral and must refrain from asking biased or leading questions during the interview (Kearn, 2000). In this study six key informants were selected to share their opinions on the subject under investigation. They were four Assembly members of selected areas, the environmental and sanitation officer in the district and the officer in-charge of CLTS in the district.

3.9 Methods of Data Analysis

The analysis started with the organisation of data from audio-recorded interviews, fieldwork notes from observations, interviews, focus group discussions and document from the department of sanitation in the Kumbungu district. Two analytical procedures were used since a mixed-method approach has been employed. The quantitative data

analysis followed the conventional variable identification, entry and manipulation using the SPSS software, while the qualitative data analysis used manual coding procedures. First, the qualitative data were analysed using thematic and content analysis approaches. As recommended by Bryman (2008), procedures for qualitative data analysis should ensure data coding. Data coding involves a systematic examination of the text in order to identify certain ideas, phrases, sentences and quotations that represent certain phenomena and show what the data represents (Kitchen and Tate, 2002). The quotations and sentences identified were then highlighted and a descriptive label was assigned for each phenomenon expressed. The interpretation of results was done by relating these categories to research questions and theoretical ideas underpinning the research.

The quantitative data analysis involved the use of descriptive tables to show patterns, while cross-tabulations enabled relations between various variables. Various theoretical propositions have been subjected to the test by assessing the socio-demographic background of the respondents in relation to the main variables that measure migration dynamics, health, livelihoods and outcomes. Both individual and community-wide variables were used to assess the influence on patterns and relationships.

A chi-square statistical test was employed to examine the statistical association between the dependent variable and the independent variables.

3.10 Ethical Considerations

In this study it was necessary to collect a lot of information of a highly personal nature. For this reason, anonymity was of vital importance to protect the personal identity of the individual respondents. Necessary precautionary measures were taken to protect the

confidentiality of the respondents. Participants were duly informed about the purpose of the study. They were also educated on the main components of the research design. Respondents were assured of confidentiality, though they were told, for instance, in the case of the personal interviews, that their voices would be recorded. No participant was coerced by any means to take part. They willingly accepted to actively participate in the study. Pseudonyms were used in the study report to conceal the identity of all the respondents.

CHAPTER FOUR

ANALYSIS AND PRESENTATION OF RESULTS

4.1 Introduction

This chapter focuses on the presentation and analysis of the results of the study. The presentation and analysis of the results is done in line with the objectives of the study. It starts by presenting the socio-demographic background of the respondents and the presents the results in line with the study objectives.

4.2 Socio-Demographic Characteristics of Respondents

A total of 147 respondents participated in this study, out of which 61.2% (90) were male and 38.8% (57) were female. Most of the participants were within the age group of 31 to 60 years (65.3%, n=96) followed by those that are 61 years and above (23.1%, n=34), and 19 to 30 years (9.5%, n=14) with the least being 18 years or less (2.0%, n=3). The mean age of the respondents was 48.56 years with a SD ± 16.40, a minimum age of 15 years and a maximum of 85 years.

With regards to ethnicity, 99.3% (147) were Dagomba's while 0.7% (1) was Akan. Moslems constituted 85.0% (125), 10.2% (15) Christians and 4.8% (7) Traditionalist.

The majority of respondents (48.3%, n=71) had no formal education, 12.9% (19) had up to primary level, 24.5% (36) up to JHS/middle-school level and 14.3% (21) had up to SHS/vocational/Technical education.

Table 4.1. Socio-Demographic Characteristics of Respondents

Factor		Frequency	Percent
Sex	Male	90	61.2
	Female	57	38.8
	Total	147	100.0
Age (years)	18 or less	3	2.0
	19 to 30	14	9.5
	31 to 60	96	65.3
	61 and above	34	23.1
	Total	147	100.0
Marital status	Never Married	15	10.2
	Married	120	81.6
	Co-habitation	1	0.7
	Divorced	11	7.5
	Total	147	100.0
Number of children	5 or less	85	57.8
	6 to 10	45	30.6
	11 and above	17	11.6
	Total	147	100.0
Total number of people in household	10 or less	47	32.0
	11 to 20	63	42.9
	21 and above	37	25.2
	Total	147	100.0
Level of Education	No formal education	71	48.3
	Primary	19	12.9
	Middle/ JHS	36	24.5
	Vocational/Technical/SHS/O'level/A' Level	21	14.3
	Total	147	100.0
Religious affiliation	Christian	15	10.2
	Moslem	125	85.0
	Traditional	7	4.8
	Total	147	100.0
Ethnicity	Akan	1	0.7
	Dagomba	146	99.3
	Total	147	100.0
Nature/ type of house	Compound House	31	21.1
	Apartments	7	4.8
	Round houses	97	66.0
	L Shape	12	8.2
		147	100.0

Source: Field Survey

4.3 Availability of Basic Amenities

Almost all the households (99.3%, n= 146) had bathhouses, 13.6% (20) had portable water from sources within their residence and the rest (86.4%) obtain water from the Butanga dams. Also, 23.8% (35) had waste collection bins relative to the majority (76.2%) who did not. Furthermore, less than half of households (41.5%, n=61) had electricity in their house. 68% of households had latrines relative to 32% that did not have.

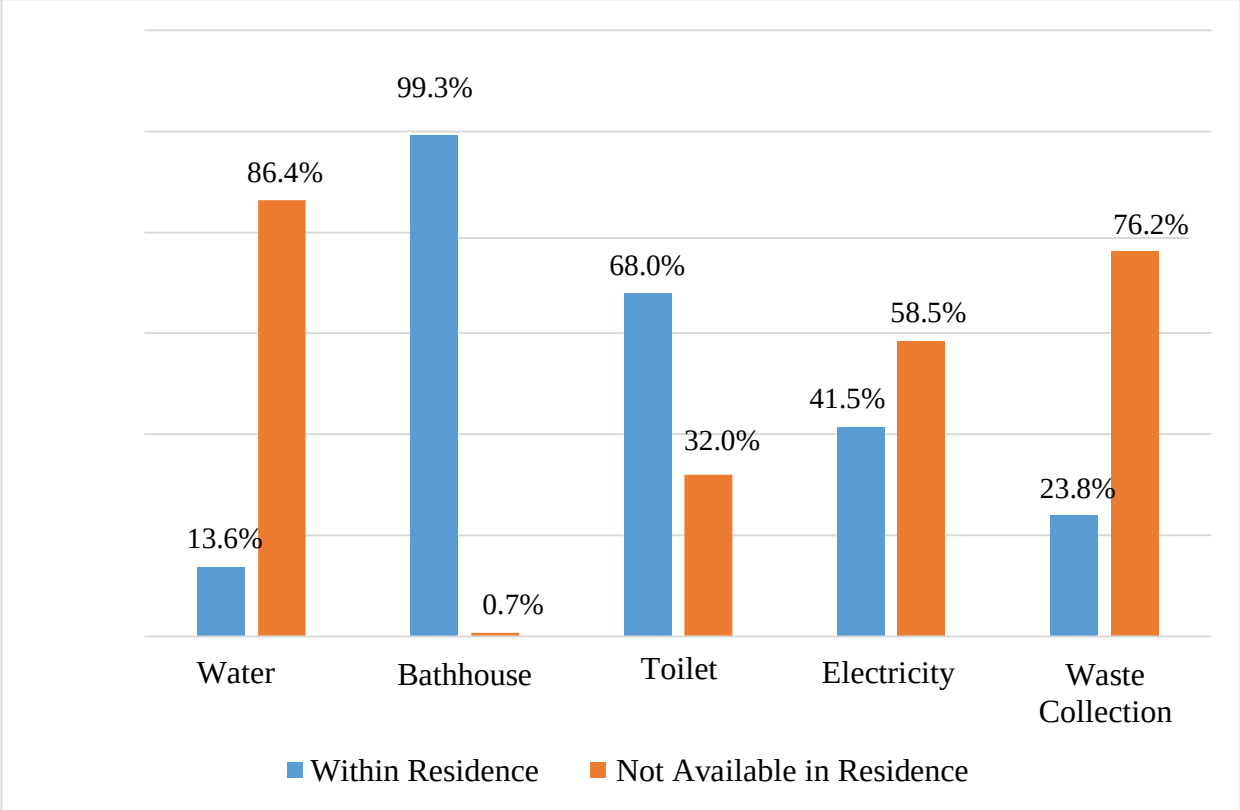

Figure 4: Availability of Basic Amenities in Household

In individual interviews with some of the respondents regarding the availability of certain essential amenities what will help them maintain clean environment.

The Assembly man of the Zanbgalin electoral area reported as follows:

–The major problem in this community is waste bins. The whole community we don't have a single waste bin. Even at the only public toilet that we have we do not have a waste bin. People dump their rubbish anyhow and this according to the environmental health Officer is the main reason why inhabitants near the area are always falling sick"

He added that he wrote several letters to the district assemble but they failed to deliver a single waste bin. And that is when INTERGRAD a local non-governmental organisation operating in the community on sanitation related donated 3 waste bins to the 3 schools in the community.

The women leader (Magazia) leader in the area also reported as indicated below;

"Our problem in this community is lack of toilet facilities in most of our households. We the women are suffering too much. We are going through a lot of ordeal when we want to visit natures call. Since there is no toilet facility in our homes either we go to the bush far from the community or we wake up very early in the morning and do it in a nearby bush by our houses"

When asked about the health implication of open defecation he had this to say.

Hmmm! We know all the health implications of what we are doing but we have no option. At time we go into our bath rooms and defecate inside rubber bags and throw it away. It is all the same because we throw it just within the same environment. The only way to salvage our situation is for our husbands to help

us by building toilet facilities in the houses as the "Samasama" people taught us to do.

With regards to water situation in the area, the youth leader at Voggu illustrated the following:

"Water is our major problem in this community if you drink pipe water then you gets it from Kumbungu or in a different community. Our women are suffering and this community was leading during the era of guinea worm. The only source of drinking water for us is the river. The river water is mixed with chemicals because of the farming activities along the Buntanga farms".

4.4 Sanitation-related factors affecting the wellbeing of Residents

The most severe problems affecting residents were mosquito bites and the presence of houseflies which accounted for 44.9% (66) followed by stagnant water and poor drainage with 40.1% (59) and poor sanitation (22.4%, n=33) as shown in table 4.2.

Table 4.2. Challenges affecting the wellbeing of Residents

	Severity of the problem to indigenes							
	Not Severe		Severe		Extremely Severe		Total	
	n	%	n	%	n	%	n	%
Health conditions	112	76.2	30	20.4	5	3.4	147	100.0
Sanitation	38	25.9	76	51.7	33	22.4	147	100.0
Mosquito bite and the presence of Houseflies	31	21.1	50	34.0	66	44.9	147	100.0
Stagnant water and poor drainage	39	26.5	49	33.3	59	40.1	147	100.0
Bushy surrounding	63	42.9	76	51.7	8	5.4	147	100.0

4.5 The effectiveness of the CLTS model in addressing sanitation related challenges

The study findings showed that 68% (100) households had latrines compared to pre-CLTS period where 50.3% (87) had private latrines. Majority of respondents cited their household latrines a distance of between six (6) to ten (10) meters away from their residence. This is true for the period before the implementation of CLTS (71.2%) and the after CLTS (84.8%).

On hand washing facilities or tippy taps; 95.8% (141) of households do not have hand washing facilities after CLTS implementation and 93.0% (137) did not have before CLTS.

A meta-analysis of the odds of CLTS influencing the construction of sanitation facilities showed that availability of household latrines was 1.2 times more likely post CLTS compared to pre- CLTS period(Odds ratio, OR=1.2, at 95% confidence).

Maintenance of existing latrines was less likely after the CLTS implementation relative to the pre-implementation period (OR=0.97, at 95% confidence). This might suggest a drive to build new latrines of better quality than the previously built ones.

Further, presence of tippy taps or handwashing stands by household latrines was observed to be less probable after CLTS compared to before CLTS (OR=0.77, at 95% confidence). This might be as a consequence of the negligible construction of tippy taps or handwashing stands both before (4.2%) and after CLTS implementation (6.5%).

Table 4.3: Household water and sanitation facilities before and after CLTS implementation

		Post-CLTS		Pre-CLTS		OR	p-value
		Count	%	Count	%		
Household latrine		100	68.0	87	59.3	1.47	0.1158
		47	32.0	60	40.7		
		147	100.0	147	100.0		
Maintenance	Yes	72	49.0	74	50.0	0.9341	
	No	75	51.0	72	49.0		
	Total	147	100.0	147	100.0		
Distance from residence to HH latrine	<6 meters	22	15.2	11	7.8	*****	
	6 to 10 meters	105	71.2	125	84.8		
	>10 meters	20	13.6	11	7.4		
	Total	147	100.0	147	100.0		
Presence of tippy- taps or hand washing stand	Yes	6	4.2	10	6.5	0.5830	
	No	141	95.8	137	93.5		
	Total	147	100.0	147	100.0		

Cross tabulation analysis of sanitation-related behaviours among respondents before and after CLTS showed that use of household latrine to defecate was 1.51 times more likely during post-CLTS relative to pre-CLTS. However, this test was not significant ($p = 0.08$).

Also, use of an improved water source for drinking and cooking was 2.88 times more likely post- CLTS compared to pre-CLTS ($p < 0.05$).

Presence of faecal matter in and around the compound was 3.88 times more likely during post- CLTS compared to Pre-CLTS ($p < 0.05$).

Handwashing with soap and under running water before eating was less 0.4 likely post-CLTS ($p > 0.05$). Also, proper handwashing after handling child faeces was less likely post-CLTS compared to pre- CLTS. This variable was also a significant predictor of the impact of CLTS on behaviour. Lastly, proper handwashing after using the latrine was 0.16 times more associated with post-CLTS than pre-CLTS. This variable was a significant predictor given that $p < 0.05$.

Therefore the significant predictors of the impact of CLTS on sanitation behaviour are improved use of improved water sources, presence of faeces in household surroundings, handwashing after handling child excreta and handwashing with soap under running water after using the toilet (Table 4.4).

Table 4.4: Household water and sanitation behaviour of respondents

Household Sanitation behaviours		Post-CLTS		Pre-CLTS		Odds ratio OR	p-value
		Count	%	Count	%		
Uses an improved water source for drinking and cooking	Yes	44	29.9	19	12.8	2.88	0.0005
	NO	103	70.1	128	87.2		
Uses a HH latrine for defecation	Yes	85	58.1	70	47.7	1.51	0.0803
	No	62	41.9	77	52.3		
Presence of fresh faeces in the compound or surroundings	Yes	133	90.2	106	72.4	3.88	0.0001
	No	14	9.8	41	27.6		
In past 24 hours, washed hands with soap and running before eating	Yea	5	3.4	12	8.1	0.40	0.0897
	No	142	96.6	135	91.9		
In past 24 hours, washed hands after handling child‘s faeces	Yes	20	13.8	33	22.3	0.5440	0.0506
	No	127	86.2	114	77.7		
In past 24 hours, washed hands after defecating	Yes	6	4.3	31	21.1	0.1592	0.0001
	No	141	95.7	116	78.9		

One hundred and thirty-four (91.2%) of respondents indicated that CLTS has helped they and their household in addressing sanitation challenges, also 91.8% (135) said they understood the methodology used in the sensitization through CLTS approach while some 98.0% (144) said the methodology is effective and easy to understand in addressing sanitation problems in the community (Table 4.4). In the qualitative study some of the communities indicated that water was their major challenge and that since water is the driving force of everything, it will be proper if they could be assisted to have easy access to water in that way they can have time to concentrate and understand the CLTS strategy

The water we drink here is not wholesome at all. We struggle with the cattle at the dam here. The dam is the only source of water for us in this community. At time you fetch the water and you feel the urine of cattle in it. But what do we do? All this affect our health. The benevolent organisations should come to our aid by providing us with good drinking water. If not we women in this community are suffering too much. During the dry season our young girls are force to migrate to south to work as Kayayei to escape from walking long distance in search for water which is even contaminated.

Water situation in this community is so bad.

The WASH people when they came to this place educated us to always wash our hands with soap any time we handle child's faeces, or return from natures call but the water itself needs washing. We end up contaminated our hands the more due to the type of water we have here.

The location of our dam which is the only source of water to the community is just close to…….

The above was a case study discussion with the Assembly member of one of the communities.

- *[…] "the CLTS intervention on the construction of soak away has saved our chicks from falling and dying in the dirty stagnant water at the back of our bath houses. Our chicks are saved and we are also saved from flies and other insects who use to breed in the stagnant water." (Man from* Kumbungu*)*

- *[…] "my children now play at the back yard with no worry of them falling in the stagnant water or playing with it as it is not exposed anymore." (Man from Kumbungu)*

- *[…] "even the Environmental Health Officers used to inspect our drinking pots, the entire surroundings and the community as a whole. Every week we used to clean up our pots, utensils and our bath houses expecting officers to come around to inspect. It used to be a competition amongst wives and communities who emerged the neatest. It was really fun.I wish that it will come back to stay." (*Man from Kumbungu*)*

Table 4.5: Effectiveness of CLTS in Addressing Sanitation Challenges

		Frequency	Percent
Does the CLTS help you and members of your household in addressing sanitation challenge?	Yes	134	91.2
	No	13	8.8
	Total	147	100.0
Do you understand the methodology they use in the sensitization of the people through the CLTS approach?	Yes	135	91.8
	No	12	8.2
	Total	147	100.0
Is that methodology effective and easy to understand in addressing sanitation problems in this community?	Yes	144	98.0
	No	3	2.0
	Total	147	100.0

A Chi-square test for association was conducted between CLTS use and effectiveness of its methodology in addressing sanitation challenges in the community, the results revealed there was statistical significance between the variables where $p < 0.05$ (Table 4.5).

"CLTS methodology is good, it is easy to understand and it is cost effective in addressing sanitation challenges in this community".

Table 4.6: CLTS Use and Effectiveness of Methodology in Addressing Sanitation Challenges in the community

		Is that methodology effective and easy to understand in addressing sanitation problems in this community?			
		Yes	No	Total	p-value
Has the CLTS helped you and members of your household in addressing sanitation challenge?	n	134	0	134	0.000
	%	100	0.0	91.2	
	n	10	3	13	
	%	6.8	2.0	8.8	
Total	n	144	3	147	
	%	98.0	2.0	100.0	

In an individual interview with some of the respondents: They narrated as follow;

"The CLTS strategy has helped me and my family a lot. We used to defecate openly but when the officers from CLTS visited this community and started education us on the dangers and harmful effects of open defecation and advised us to stop open deification in this community especially within our surroundings. I have seen a dramatic change in the health status of my family and myself". A woman leader in Voggu

The Assembly member of the area also reported the also reported as follows:

–My sisters, these NGOs are helping us a lot. We use to experience of kind of diseases, but when they came with the concept of CLTS by involving us to make inputs and also suggest how we can use our own local resources to build our own toilet facilities, our diseases burden has changed drastically.

In this area, I used to attend either the police station or the chief palace for arbitration almost every month because people were accusing old ladies in this community as witches, little did we know our problem was as a result of poor sanitation. When we were declare open defecation free almost all the sanitation related diseases has reduced and we are more united than before. No more witches in the area.

The report of the Assembly member revealed that poor sanitation can lead to so many things including accusing people or witches when in actual fact they are not.

An elder in the area collaborated as follows:

–*CLTS people are doing good job. We are now free from sanitation related diseases. Before the implementation of the CLTS strategy every member of my household used to suffer from cholera and other related disease. My children used to have diarrhoea and some of them used to vomit frequently but now we thank God is now thinks of the past. Other aspect of the strategy I love much is the introduction of hand washing. We use to eat food without washing our hands. They have actually helped us a lot. May god bless them".*

Attitude of the people in the Kumbungu district towards CLTS approach

After CLTS implementation, the proportion of people that believed their village was dirty reduced from 44.4% to 36.0%. Others expressed dissatisfaction at the sanitation situation in their community, after CLTS, the proportion of persons dissatisfied with their community sanitation reduced from 72.6% to 61.1%. Before CLTS implementation,

91.8% of respondents believed that open defecation can cause diarrhea and this was almost the same after CLTS.

Table 4.7: Attitudes towards community-led total sanitation programme

HH head's attitude towards sanitation	Pre-CLTS		Post-CLTS	
	Count	%	Count	%
Believes that their village is very dirty	65	44.4	53	36
Completely dissatisfied with current sanitation situation	107	72.6	90	61.1
Believes that open defecation causes diarrhoea	135	91.8	135	91.5
Believes that sanitation and hygiene are the most important improvements needed in the village	18	12.4	29	19.9
Believes that women lack privacy during open defecation	51	34.7	51	34.4
Believes that women are not safe defecating in the open at night	58	39.7	59	40.3

Using the formula

The *t*-value is 0.12319. The *p*-value is 0.904401. The result is *not* significant at $p < 0.05$

From table 2, it was realized that 96.6% (142) of respondents had been educated in CLTS while 3.4% (5) were not. About 84.4% (124) indicated that they had put the education given to them on CLTS into practice; also 83.0% said their behaviour towards open defecation had changed due to this education.

- *[…] "At the time when monitoring of the intervention was frequent, more members had built latrines and soakaways with the hope of receiving gifts not knowing it was for their own good." (Man from Kumbungu)*

- *[…] "before the introduction of CLTS CONCEPT, there were so many strange diseases in this area but today just a few are still troubling us. I cannot tell which disease is not as a result of insanitary conditions or personal hygiene."* (Man from Kumbungu)

With regards to availability of toilet facility in the household, 68% (100) of respondents said they had a toilet facility in the house while 32% (47) had no toilet facility in their household. Of the 32% who had no toilet facility in their household, 73.7% (28) said they defecated in the bush, 13.2% (5) at the Public toilet, 10.5% (4) in the farm while 2.6% (1) defecated at other places.

- *[…] "these days, there are no strong trees which can be used to aid the construction of latrines, the only available one is the nim, which when used will decay and collapse the latrine within a short period of time as it has been happening in other communities." (Man from Kumbungu)*

- […] "As I speak now I constructed a latrine but it was not done well as a result it fell off and I went back to my old practices, that is defecating in the open." (Man from Kumbungu)

"The CLTS have moulded my family behaviour towards open defecating. My family and I now have a local household latrine and we are free from environmental related diseases. My only worried is that those members of the community who has rejected the concept and they still defecate openly can affect us. They need to make sure that all of us in the community buy into the CLTS concept and help in total change of behaviour".

This implies that in adopting the CLTS model, focus holistic be considered instead of an individual perspective. The whole community should accept it so that they will not be the issue of some members are said to be open defecation free (ODF) whiles others are still practicing open defecation. In that way those who are indulge in open defecation will have a trickle down effects on those who are open defecation free. Community Led Total Sanitation (CLTS) is to ensure entire community open defecation free.

Table 4.8: Attitudes of People towards CLTS

		Frequency	Percent
Have you had an education on CLTS?	Yes	143	97.3
	No	4	2.7
	Total	147	100.0
If yes from which organization or institution?	The District Assembly	5	3.5
	Environmental health officials	133	93.0
	NGO's	2	1.4
	Community Environment Committee	2	1.4
	Other	1	0.7
	Total	143	100.0
Have they been educating you on CLTS?	Yes	142	96.6
	No	5	3.4
	Total	147	100.0
Have you put the put the education given to you on CLTS into practice?	Yes	124	84.4
	No	23	15.6
	Total	147	100.0
Has your behaviour towards open defecation changed?	Yes	122	83.0
	No	25	17.0
	Total	147	100.0
Does the behavioral change model of the CLTS feed into your culture	Yes	139	95.9
	No	6	4.1
	Total	145	100.0
Do you have a toilet facility in this household?	Yes	109	74.1
	No	38	25.9
	Total	147	100.0
If No, where do you defecate?	Bush	28	73.7
	Public Toilet	5	13.2
	In the Farm	4	10.5
	If any specify	1	2.6
	Total	38	100.0
Where do members of the household go to defecate?	Bush	33	86.8
	Public Toilet	5	13.2
	Total	38	100.0
Who owns this house?	Own House	114	77.6
	Relative	28	19.0
	Partner	2	1.4
	Rented	2	1.4
	Other Specify	1	0.7
		147	100.0

"The CLTS strategy is very good. Initially I did not want to involve myself with it but later realised that is the best approach in eliminating our sanitation problem here. I got interested in it when I realised that the people are not imposing things on us. They give us the opportunity to think and to come out with the best approach that we think can help solve our problem. What interest me most is for us to come out with our local material and they also incorporate the indigenous knowledge in their approaches‖.

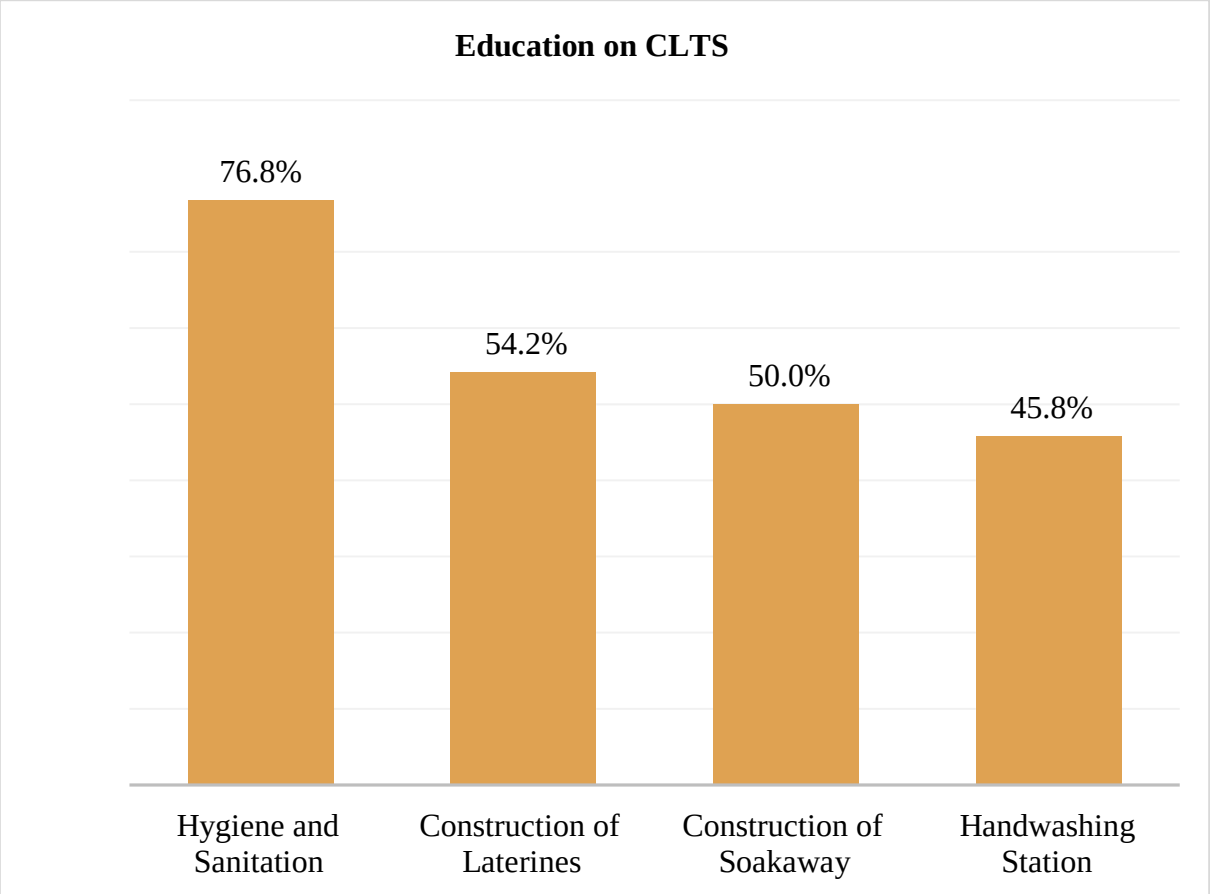

Figure 5: Education on CLTS

- **Education on CLTS**

With regards to education on CLTS, most (76.8%, n=109) of the respondents in the area were Taught Hygiene and Sanitation, 54.2% (77) trained in the construction of latrines, 50.0% (71) in construction of soak away and 45.8% (65) trained in the constructing hand washing station as shown in figure 4.2.

- *[…] "we were taught how to use empty jeri cans to develop a tippy taps or hand washing stations, this really caught the eyes of our children and so it became a habit of them washing their hands under running water after using the toilet and after playing." (Man from Kumbungu)*

4.6 Prevalence of sanitation related morbidity in the area

The prevalence of diarrhea, cholera and malaria were used as proxy variables for all sanitation diseases. Diarrhea is the most common among children, malaria is general and cholera indicates epidemic status. The prevalence of malaria per month was 91.1% given that prevalence is the rate of occurrence of a diseases (both old and new cases) within a specified time per hundred. Also, the prevalence of diarrhea was 71.9% and the prevalence of cholera was 8%.

4.6.1 Common Diseases in the Community

From the illustration in figure 3, the most common disease that residents of the community suffered from was malaria (91.1%, n=133) followed by diarrhea (71.9%, n=105), cough and typhoid fever had 21.9% (32) and 15.8% (23) respectively.

[…] "diarrhea is common in the community. Before the year ends, every member falls sick from malaria especially children. All these are as a result of poor

sanitary conditions or practices. I think that we should sit up and take the CLTS and health education seriously as we are the direct beneficiaries." (Man from Kumbungu)

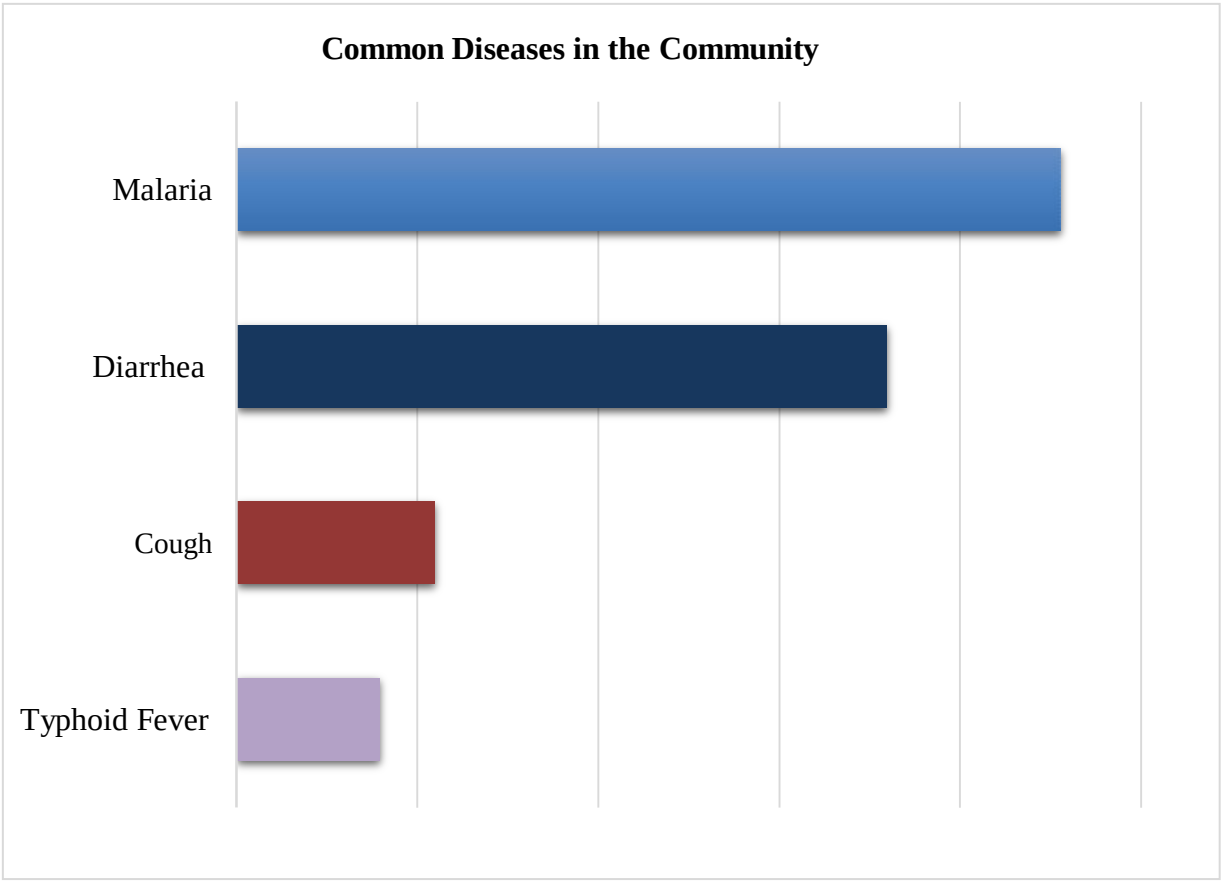

Figure 6: Common diseases in the Community

The data shows that 87.8% (129) respondents knew the cause of some common diseases they suffer from in the area. Some 95.9% (141) believed the cause of the diseases was due to bad sanitation and had taken measure to clean the environment, out of which 81.6% (115) said they did not fall sick after cleaning the environment. As many as 119

respondents (81.0%) believed the prevalence of sanitation related diseases to be very high (Table 6).

Table 4.9: Sanitation Related Diseases in the Area

		Frequency	Percent
Do you know the causes of the diseases?	Yes	129	87.8
	No	18	12.2
	Total	147	100.0
If the cause of the disease is from bad sanitation, have you taken measures to clean your environment?	Yes	141	95.9
	No	6	4.1
	Total	147	100.0
If yes do you fall sick after cleaning your Environment?	Yes	26	18.4
	No	115	81.6
	Total	141	100.0
What was the prevalence of sanitation related diseases in your household before the introduction of CLTS?	Low	1	0.7
	High	27	18.4
	Very High	119	81.0
	Total	147	100.0
What is the sanitation situation now?	Better Than Before	49	33.6
	Has Reduced	84	57.5
	The Same	13	8.9
	Worsened	0	0.0
	Total	146	100.0

"Before the introduction of the concept of CLTS, the sanitation situation here was very bad. Everywhere in this community were human excreta but with the introduction of CLTS and the kind of education given us our surroundings are now very clean. Though, some people are still practising open defecation but the situation is better than before".

Respondents revealed the cause of sanitation related diseases

[…] *"Poor sanitation practices are the causes of these diseases. For example, during the raining season, where by the environment is moist and also a lot of bushes aid in the increasing numbers of mosquitoes and germs these conditions record high cases during this tim**e." (***Woman from Kumbungu***)***

Another woman reported the following during the individual interview with her.

Sanitation diseases are many and almost all the diseases we are battling with in this community are mainly as a result of poor sanitation. For instance, look at my rounding when you move 30 metres away from my house what you will see is human feaces. I look in the open and any time the wind blows it brings polluted particles into my food. Our water in this house is contaminated and my children are always sick. I will have wish the CLTS will have add to their education and sensitisation on water purification and other environmental related issues instead of limiting itself to the elimination of open defecation in our communities.

Residents gave accounts of measures taken by them to clean the environment.

[…] "*When it rains, the plastics and sand will block the pit and we will use our hoes to dig the rubbish out and the water starts flowing well into the pit again." (Woman from Kumbungu)*

[…] "Though some members had built their latrines', soak away and maintained their environment clean, there were some of us who were lagging behind now we have come to know the essence of the CLTS concept.‖ (Man from Kumbungu)

In a focus group discussion one of the participants reported as follows:

"Last year some members of this community were suffering from tiri-kayera (cholera) they we admitted at the Buntanga hospital. The reason was that the place we fetch our drinking water is also close to the place we use as our toilet. Anytime it rains the water washes the feaces into the water and when we drink it we get ill."

Another woman on the same focus group also reported the following:

–the Community Led Total Sanitation (CLTS) has helped us a lot. We never thought we could have our own toilet facilities we were thinking that household toilet is for the rich but when the officials from the CLTS came to this community we realised that we can contract our own toilet with the little that we have. Now in this community we can boost of not less than 28 household latrines and the rate of diseases has drastically declined‖.

The narration of the participant indicated that the people in Voggu a rural community in the kumbungu district has actually accepted the CLST approach and that it has help in the reduction of sanitation related diseases in the area.

A comparison of the availability of a household latrine, improved water source, handwashing stands and waste collectors with the incidence of diarrheal diseases in the last 30 days revealed the following findings.

The odds of diarrhea not occurring in a household over a month period are 1.25 times associated with the presence of a household latrine in the household.

The availability of handwashing facilities like tippy taps and wash basins was 2.5 times more associated with non-occurrence of diarrheal disease.

Also, non-incidence of diarrheal disease was 1.2 times more likely in households with portable drinking water.

However, the presence of waste collecting bins was less likely to be associated with incidence of diarrheal disease.

Table 4.10: Comparison of the effects of various sanitation facilities on the prevalence of diarrheal disease in households

Sanitation categories facility		Diarrheal in the last 30 days				Risk ratio
		Did not Occur		Occurred		RR
		Count	%	Count	%	
HH latrines	Yes	90	61.5	75	51.1	1.25
	No	56	38.4	72	48.9	
Hand washing stand	Yes	110	74.5	48	32.4	2.50
	No	37	25.5	96	65.6	
Portable water source	Yes	102	69.5	56	38.3	1.20
	No	73	49.5	63	43	
Waste bins	Yes	91	61.9	91	62.2	0.97
	No	56	38.1	53	35.8	

The waste bin we have here are locally made is not like the one the city people are using. Ours is made up of a broken rubber bucket or destroyed pan that is not more in good shape to be use by women. The problem here is not the solid waste but the liquid. Because we do not have a proper drains here we pour away the water anyhow which sometime posse problems for our children especially the small one.

It was very clear from the study that what they described as a waste bin some of them were not. Some of them will gather rubbish at one corner in the household and call it a waste bin. It was very clear that most of the houses were practicing dig and burry as a form of waste management. There was also the problem of waste segregation as some of the respondents could not separate the waste and this exposes the residents to ill health especially during the burning of the waste just by their houses.

CHAPTER FIVE

DISCUSSION

5.1 Introduction

This chapter covers the discussion of study findings with respect to relevant literature. The discussion was organized according to the objectives of this study.

5.2 Socio-demographic characteristics of households

The majority of respondents were males (60.1%). This makes households mostly male-headed. This is not an uncommon scenario in Northern Ghana where most often the man is the door-way into the households. However, the most significant users of sanitation services in the households are females, children and other vulnerable groups. Commendably, 39.9% of remnant households were headed by females. This brings to fore the potential gender dynamics to the effectiveness of CLTS implementation and sustainability. Most household heads were also middle aged adults from 31 to 60 years of age. This implies that they were within the active (productive) and youthful cohort of the population pyramid of Ghana. Consequentially, such people were not only gateways in to the household but also have the capacity to work on new innovations approaching the community.

The level of formal education among household heads was found to be appalling in this current study. The majority (48.3%) had no formal education at all. 24.5% had up to Junior High School education and vocational/technical education and primary school level education constituted 14.3% and 12.9% respectively. The acceptance of new innovations like community led total sanitation and its future sustainability depends on

the commitment of educated people in rural communities to spear-head activities. Otherwise, everyone not formally trained might view these things as encroachments on their private lives.

Also, majority of household heads (81.6%) were married and predominantly Muslims in agreement with the GDHS of men above years in Northern Ghana.

Contrary to GSS statistics for Northern Ghana (2014), the majority of households have five or less members followed by those with 6 to ten members. This implies that households are moving away from the typical extended family style in Northern Ghana to more focussed nuclear household containing minimal number of people.

5.3 The effectiveness of CLTS on sanitation-related diseases

CLTS effectiveness is measured in two ways; (1) is its impact on the construction or acquisition of much needed sanitation facilities such as household latrines, handwashing stands or tippy taps, stand pipes and other portable water sources as well as waste collection bins (2) is its impact on sanitation-related best practices and behaviours such as handwashing with soap and clean running water (at least 3 out of the four critical control points), use of a household latrine to pass excreta, proper handling of child faeces, no open defecation and treatment of potentially contaminated water sources.

5.3.1 Direct effects of CLTS on acquisition of sanitation facilities

This current study finding showed that 68% of households had latrines after CLTS implementation relative to baseline 50% before CLTS implementation (Difference=18 points, 95% confidence). According to Raso et al (2017), in a similar study employing a cocktail of CLTS, Health promotion and Prophylactic chemotherapy, latrine coverage was found to increase from 15.5% to 94.6% (pre-intervention: 15.5%, post-intervention: 94.6%). Latrine construction is one of the major contributions of the CLTS programme to holistic water, sanitation and hygiene sector of development. The works of (Orgill-Meyer et al, 2019; Zeleke et al., 2019; USAID, 2018; Crocker et al, 2017, Venkataramanan et al, 2018) showed that latrine construction and latrine coverage are some of the immediate accomplishments of the CLTS programme. According to Orgill-Meyer et al (2019), CLTS significantly increases latrine ownership by beneficiary households by 29.3% (29.3%, 95% CI:17.5 to 41.2). This was higher than the 18 percentage point difference observed in this current study albeit both statistics depicted an increase in latrine coverage attributable to CLTS. Furthermore, it was reported in this present study that availability of improved latrines was 1.5 times more likely after CLTS implementation compared to before CLTS (OR=1.47, 95% CI: 0.6-2.1, $p < 0.05$). (Zeleke, Gelaye and Mekonnen, 2019) supported this finding by reporting that CLTS intervention in a community was approximately two times more likely to increase the rate of latrine ownership. Accoording to Tessema (2017) CLTS programme remarkably increased latrine coverage in Diretyra district of Ethiopia by 80%.

However, the benefit of toilet construction and large coverage are short-lived when the self-same latrines deteriorate over very short periods of time (Orgill-Meyer et al, 2019) or

they begin to give off foul odours (Tessema, 2017) that compromise both use and relative significance of the facilities to the people.

On toilet maintenance, this current study's findings showed that with the advent of CLTS and construction of new latrines, people hardly repaired existing latrines (OR=0.93, p > 0.05). This finding might be as a result of the offer of latrine plans of better quality compared to the latrines constructed in the pre-CLTS period.

Hand washing with soap and under running water is possible with the aid of modern handwashing stands or locally constructed tippy taps. This present study's findings revealed a gross unavailability of handwashing facilities both before CLTS (95.8%) and after CLTS (93%). This implies most households have no hand washing stands to support the practice of proper hand washing. A mediocre number of households had these facilities before (4.3%) and after CLTS (6.5%). Degebasa, Weldemichael and Marama (2018) purpoted that WASH-related factors such as unclean water storage, presence of faeces in surroundings, lack of hand washing facilities and bad attitude of mother towards diarrheal disease posed as risk factors for the prevalence of diarrhea. Inadequate handwashing facilities might translate into poor handwashing practice with potential consequence of contracting infections through eating with dirty hands. Also, the study findings revealed that availability of household handwashing facilities was less likely to be associated with CLTS given odds of exposure to outcome is less than unity (OR=058, p > 0.05). This might be as a result of the negligible number of households that had handwashing facilities both before and after CLTS intervention. According to Yeboah-Antwi *et al*, (2019), CLTS has the tendency to increase the availability of all types of sanitation facilities including handwashing stands and tippy taps where

appropriate. However, it is not out of place to have CLTS programmes implemented with a comprehensive hygiene and health education component. As a result recent CLTS activities are been merged with a litany of other interventions as observed in the works of (Yeboah-Antwi *et al*, 2019; Gebremariam, et al., 2018; and Raso et al, 2017). It is observed that these mixed packages of CLTS and other high value interventions turns to capture impacts on hygiene and handwashing relative to the CLTS programmes only. Therefore household latrines were the only sanitation facilities found in this study to be associated with implementation of CLTS. Latrines are promptly constructed on-demand to arrest the rate of open defecation after the triggering step in the CLTS programme. In more rural communities and areas where resources for toilet construction are constrained, the ‒dig and bury‖ approach is immediately recommended while plans are made for household latrine construction.

5.3.2 Indirect effects on sanitation-behaviour

CLTS approach is aimed at mitigating the harmful influence of exposed human excreta and its concurrent health consequences. The CLTS contributes to this through the promotion of household latrines to annul the deleterious practice of open defecation. However, does availability of sanitation facilities accompany an equivalent change in sanitation behaviour (use of those sanitation facilities), the current study findings portray that use of private household latrines to defecate was 1.51 times more likely in post-CLTS period compared to pre-CLTS in a community. This finding was supported by (Gebremariam et al., 2018) who reported a dual increase in both sanitation latrine coverage and latrine use as a consequence of CLTS. The presence of the household latrine is of no importance compared to the actual use of the latrine. On the F-Diagram

of our conceptual framework, use of a household latrine bars the exposure of fields, open water bodies and houseflies to faecal matter preventing infections through intake of contaminated water, and contaminated fly-infested foods.

Furthermore, latrine usage impacts on the prevalence of the practice of open defecation. According to the findings of this present study, Presence of faecal matter in and around compounds was 3.88 times more likely during post-CLTS compared to Pre-CLTS. This test was significant ($p<0.05$). This implies a contra-indication of CLTS for the elimination of open defecation. According to the following sources (USAID, 2018; Crocker, Saywell and Bartram, 2017; Pickering *et al*, 2015; Venkataramanan *et al*, 2018), CLTS approach impacted on quality sanitation by reducing the practice of open defecation. This fulfils its primary goal of preventing open defecation and cuting-off feco-oral transmission of infections. According to Gebremariam, Hagos and Abbay (2018), the odds of finding faecal matter is 11.5 times higher among households not enrolled in a CLTS cum Hygiene joint programme compared to households enrolled in the programme. However, this present study‘s findings are in contrast to the prevailing findings in literature. The current study findings suggest a fall-back to less than ideal conditions observed in pre-CLTS periods. This could be attributable to incomplete latrine coverage of communities or disuse of constructed latrines or improper management of child faeces. Olivia and Shah (2019) informed that CLTS does not only prevent open defecation but it also dampens community tolerance of the practice. A similar scenario was observed in the work of Orgill-Meyer et al, (2019) where deterioration in constructed latrines threw the people out of balance forcing them back to open defecation.

Furthermore, improved and safe water sources are essential targets in the water, sanitation and hygiene framework of concerns. This current study's findings showed that use of an improved water source for drinking and cooking was 2.88 times more associated with post-CLTS intervention than pre-CLTS conditions. This factor was a significant predictor of the effectiveness of CLTS approach ($p < 0.05$). Water was among the chief concerns of this current study's participants. From FGD results, most communities lack access to portable sources of drinking water. They all depend on the Buntanga dams for water which is not a safe source of water. The only places with clean borehole water sources are kumbungu and Dalung. According to Degebasa, Weldemichael and Marama (2018), unsafe waters sources for drinking and cooking are associated with prevalence of diarrheal disease. This particular district (Tolon Kumbungu district) has been the leading district for the occurrence of the non-tropical disease, guinea worm (Dracunculiasis) in Ghana. This is largely due to the poor access to safe drinking water in the region. However, CLTS is correcting the anomaly through safe water treatment interventions and safe water storage.

Handwashing with soap and under running water is a best practice. The World Health Organization and partners recommends at least a practice of three out four handwashing critical control points. These critical control points are;

1. Before eating or feeding a baby
2. After visiting the toilet
3. Before cooking
4. After handling child's faeces

From this present study's findings, handwashing after visiting the latrine was significantly associated with post-CLTS behaviours. Handwashing prevents the transfer

of dirt and germs into the human body through the fingers as shown in *Figure 1*. According Yeboah-Antwi et al (2019) CLTS increases the practice of handwashing with soap and under running water. Handwashing is not proper unless it is with soap or any detergent and done under running water. In the past, the norm was to wash inside a bowl of water or use soap replacements such as wood ash. However, all these are less effective compared to the use of soap and under running water. This present study's findings also shows that handwashing before eating was more likely and handling a child's excreta was less likely to be associated with CLTS intervention. This demonstrates that CLTS influenced two out of four critical control handwashing points among participants of this current study. This is subpar with recommended standards.

5.4 Attitudes of the people in the area towards the CLTS approach

The mean attitude of this current study's participants before and after CLTS implementation was found not be statistically different as shown in *Table 4.7*. The lack of change in attitude might have contributed to the backsliding back to open defecation after CLTS and poor rates of handwashing. On individual, there are differences in the belief that their communities were dirty, sanitation situation is unsatisfactory and open defecation could cause diarrhea. However, the cumulative difference was not statistically significant. Knowledge informs attitudes and attitudes develop character according to the psycho-social model of behaviour change (Hankonen, 2011). This current study finding showed that participants were aware and know about CLTS (96.6%) and 84.4% professed they had put that knowledge of CLTS to good use. However, this does not explain the high prevalence of open defecation after CLTS implementation. According to some participants

– *[…] "these days, there are no strong trees which can be used to aid the construction of latrines, the only available one is the nim, which when used will decay and collapse the latrine within a short period of time as it has been happening in other communities." (Man from Kumbungu)*

[…] "As I speak now I constructed a latrine but it was not done well as a result it fell off and I went back to my old practices,that is defecating in the open." (Man from Kumbungu)

These responses demonstrate the change in attitude of the communities after CLTS. Apparently deterioration of their existing toilets and inadequacy of raw materials for construction of good toilets made them relapse back to old habits. This begs the question of the potency of the triggering exercise for communities in the CLTS implementation in Kumbungu. According to Orgill-Meyer et al (2019), newly constructed latrines depending on their quality standards begins to deteriorate over time (approximately five years) and this turn to nullify the difference created between CLTS beneficiaries and controls since the two extremes begin to indulge in similar practices like open defecation.

5.5 The impact of CLTS on the prevalence of sanitation related diseases

The present study findings showed that malaria, diarrhea, cough and typhoid were the most common diseases in the study area. These conditions had prevalence of 91.1%, 71.9%, 21.9% and 15.8% respectively. Among these conditions and the numerous that were not mentioned, malaria, diarrhea, cholera, dysentery, typhoid fever and worm infestation are associated with unsanitary conditions. However, each of them have a specific microbial causative organism. According to Freeman et al (2015), diarrhea, dysentery, cholera, soil transmitted helminthes infections are all related to poor

sanitation. Clasen et al (2014), adds trachoma and schistosomiasis to the list of sanitation-related conditions. Comparing these sources to this present study's findings, diarrhea is a common diseases associated with unsanitary conditions. Diarrhea is responsible for most child morbidities especially in rural settings where sanitation is usually compromised. The disease is defined as the passage of three or more watery stools per day. It is caused by a bacteria or virus that infects and inflames the alimentary canal. This compromises normal digestion of food, causes malabsorption of nutrients and releases substances from the body at higher than usual intervals. Poor digestion and absorption of nutrients results in undernutrition and malaise (Checkley, 2008).

From this present study's findings, the availability of a latrine was associated with 1.25 times the odds of not contracting diarrhea. This was supported by (Freeman et al, 2015) who reported that availability and appropriate utilization of WASH facilities like improved latrines can reduce the infection of diarrhea especially among children. Studies show a significant correlation of reduced infections with latrine access and hand washing. In the northern region of Ghana proper hand washing helps to reduce diarrhea and pneumonia prevalence by up to 50% and improved sanitation can reduce diarrhea rates by 36% (Rogers et al, 2007). Also, availability of handwashing facilities or tippy taps was 2.5 times more associated with non- occurrence of diarrheal disease in a household. These structures influence to a greater extent the practice of handwashing with soap and under running water. Handwashing according to the F- Diagram (*Figure 1)* blocks-off the intake of dirt and germs from contaminated hands as the name of the concept implies. Hand washing stands can reduce infections especially among children (Freeman et al., 2015). In Ghana, handwashing is known to reduce the prevalence of pneumonia and

diarrhea by 50% (Rogers et al, 2007). According to the works of Ravindra and Smith, (2018); Ravindra and Mor, (2013), a host of water borne diseases can be mitigated saving millions of lives by adoption of proper hygiene and handwashing.

Furthermore, non-incidence of diarrheal disease in a household was 1.2 times more likely to be due to the presence of a portable drinking water source. In the Nyando District of Kenya, (Babb et al, 2018) found out that exposure of the water supply to fecal contamination compromised the impacts of CLTS by escalating diarrheal prevalences in ODF communities relative to non-ODF communities (76.7% vs. 60%). Therefore clean water is more likely to reduce diarrheal prevalence; this makes people using unsafe water sources very susceptible to diarrhea and other water-borne infections.

Therefore sanitation facilities created through the CLTS programme have the capacity to reduce the incidence of water-borne and sanitation-related infections like diarrhea, cholera, malaria, dysentery and worm infestations among others.

CHAPTER SIX

SUMMARY OF KEY FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

Water, sanitation and hygiene is a pronounced sector in the area of health that underlie a lot of health problems. Community led total sanitation is a modern innovation designed by Dr. Kar to end open defecation and improve sanitation through participatory, community-owned and shame-driven tactics. CLTS has achieved a lot of successes the World over in curtailing hygiene and sanitation challenges. This study assessed the contribution of community led total sanitation in reducing sanitation-related diseases in the Kumbungu District of Northern Region, Ghana.

The findings of the study showed that 60.1% of household heads were male and 39.9% were female suggesting male-dominated community activities on CLTS. Also, most of them were in the age group 31-60 years implying that most household heads were in the active, reproductive and productive category of the population of Ghana. Close to half of household heads lacked any form of formal education.

CLTS was shown to be effective in improving household latrine construction from 50% to 68% (18 percentage point difference). Household latrine availability was 1.5 times more associated with post-CLTS than pre-CLTS. However, the proportion of handwashing facilities before and after CLTS was from 4.2% to 7%. The unavailability of handwashing facilities was less likely to associated with CLTS given odds ratio was less than unity (OR=0.58). This meant the CLTS programme concentrated on latrine construction to the negligence of handwashing. This was not surprising since most CLTS

programmes found in literature are redesigned together with health promotion packages to cater for handwashing education.

Indirectly, CLTS affected the lives of people through its effects on sanitation behaviours: latrine utilization was 1.23 times more associated with post-CLTS than pre-CLTS. Also, improvement in water sources towards more portable and safe drinking water was 2.88 times more associated with post-CLTS than pre-CLTS. CLTS achieved significantly only one out of the four critical control points in handwashing.

Open defecation (in the form of presence of faeces in household surroundings) findings were contrary to CLTS objectives. This practice was found to be 3.88 times more associated with post-CLTS than pre-CLTS period of the study. This could be attributed to poor management of child faeces, relapse to open defecation and inadequate frequency of monitoring by duty bearers.

The attitude of the people CLTS towards hygiene was found not significantly different from their attitude before CLTS. This might have contributed to the reversion back to open defecation and the poor rates of handwashing despite CLTS education activities.

The prevalence of sanitation-related diseases was associated with CLTS: the prevalence of these diseases were found to be 91.1% for malaria, 71.9% for diarrhea and 15.8% typhoid. However, diarrhea was the condition shared with relevant literature so its prevalence was used as a proxy for sanitation-related diseases in meta-analysis. It was found through cross tabulation that latrine availability was 1.25 times more associated with non-occurrence of diarrhea in a household. Also, Hand washing facilities and portable drinking water sources were found to be 2.5 times and 1.2 times more connected to non-occurrence of sanitation-related diseases (using diarrhea as a proxy).

6.2 Conclusions

CLTS was effective in increasing latrine availability compared to other sanction-related facilities like handwashing stands.

CLTS was associated with the beneficial sanitation behaviour of latrine utilization and use of improved water sources. However, CLTS was ineffective in eliminating open defecation since the people relapsed back to the practice.

Also, CLTS was able to improve handwashing with soap and under running water after defecating relative to other critical control points such as before eating, after handling child excreta and before cooking.

Nonchalant attitude of people towards CLTS proved very bad for CLTS implementation when the rate of open defecation before was not statistically different from the rate after implementation. This implied a relapse out to old ways attributable unaffected attitudes in the CLTS behavior change process.

Malaria, diarrhea and typhoid were the predominant sanitation-related diseases in the Kumbungu District. However, CLTS was found to be effective against the prevalence of sanitation-related diseases using diarrheal prevalence as a proxy. Availability of household latrines, handwashing facilities and portable drinking water-sources significantly contributed to the non-occurrence of sanitation-related diseases.

6.3 Recommendations

Based on the study findings, the following recommendations were made to household heads, the ministry of water resource and sanitation and the Government of Ghana.

Recommendations to household heads:

1. Household heads are admonished to adopt favourable attitudes towards CLTS and other- related programmes.
2. Household heads should endeavor to construct durable household latrines with the recommended specifications from the CLTS facilitators to prevent deterioration over short intervals of time.
3. Household heads should buy handwashing basins and create handwashing stands or locally designed tippy taps by their latrines to encourage handwashing.
4. Household heads should adopt positive sanitation behaviours like latrine utilization, handwashing with soap and under running water as well as water treatment, safety and storage to combat sanitation diseases.

Recommendations to the Ministry of water resource and sanitation and other CLTS implementing partners

1. These bodies should recommend the improved latrine structure using durable materials to ensure sustainability of household latrines
2. CLTS should be mixed with a cocktail of other interventions such as health education, prophylactic chemotherapy and water-resource provision to ensure the process is not compromised by any other sector of the WASH framework.

3. Focus should be given to behaviour change and attitudinal changes rather than only latrine construction.

Government of Ghana

1. Create a research and development team on Water, sanitation and hygiene; to continuously assess community improvements on sanitation towards the creation of sustainable communities as prescribed by SDG 6 and 10.
2. Empower local government water and sanitation monitoring teams to ensure regular monitoring of the exercises undertaken by NGOs and post-CLTS monitoring of progress to avoid relapse to old attitudes.

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APPENDICES

Appendix A: Questionnaire for Household Heads

CONTRIBUTION OF COMMUNITY LED TOTAL SANITATION (CLTS) IN CONTROLLING SANITATION RELATED MORBIDITIES IN THE KUMBUNGU DISTRICT

I am a student from the University for Development Studies, Tamale, conducting a study on the contribution of community led total sanitation (CLTS) in controlling sanitation related diseases in the Kumbungu District, Ghana. This study is part of my Masters of Public Health Degree hence I would be most grateful if you could assist me by answering the following questions. All information given would be confidentially treated.

SECTION A: Socio-Demographic Characteristics of Respondents

1. How old are you...
2. What is your current marital status?

   a. Never married b. Married c. Co- habitation d. Divorced/ Widow
3. Parity……
4. Number of children in this household
5. Total number of people in this household ……..……
6. Level of Education:

a. No formal education b. Primary c. Middle/JHS

d. Vocational/Technical/SHS/O‘level/ A‘level e. Tertiary.

7. What is your religious affiliation?

8. Ethnicity? ……...

9. What type of house do you live in?

a. Compound house. b. apartments c. Round houses d. L shape e. Others Please specify

SECTION B: Attitudes of the People Toward CLTS:

10. (1) yes (2) No

11. If yes from which organisation or institution? (1) the District assembly (2) environmental health officials (3) NGOs (4) Community environment committee (5) If any please specify……

12. Have they been educating you on CLTS?

13. If yes what type of education? ……..

14. Have you put the put the education given to you on CLTS into practice?

15. If yes can you please share with me the benefits the education……

16. Can you also share with me the challenges you face in accepting the CLTS education?

……..

17. In your opinion what is the attitude of the people in accepting the CLTS concept?

……

18. Has your behaviour towards open defecation change? (1) Yes (2) No

19. If yes can you share with me how it has changed

20. If no please can you tell me why your behaviour has not change

21. Does the behavioural change model of the CLTS feet into your culture (1) Yes (2) No

22. If no can you suggest ways to improve upon the current model of methodology of CLTS?

……

23. Do you have a toilet facility in this household? (1) Yes (2) No

24. If no where do you defecate? (1) Bush (2) public toilet (3) in the farm (4) if any please specify

25. Where do members of the household go to defecate ? ……..

26. Who owns this house?

a. Own house, b. Relative c. Partner, d. Rented, e. Others, specify

27. If rented how much do you pay for a room monthly? GHc……

28. Using the table below, state whether the following facilities/ services are available for use within your residence? State also the amount you spend on this facility each month

service	**esidence**	**lable in residence**	**ture (GHC)**
Water			
Bathhouse			
Toilet			
Electricity			
Waste collection			

29. Indicate how the following problems affect your wellbeing in this neighbourhood.

Rank: 1 = not severe 2= severe 3 = extremely severe.

Problems/ Challenges	Rank
Health	
Sanitation	
Mosquito bite and the presences of houseflies	
Stagnant water and poor drainage	
Bushy surrounding	

SECTION C: Effectiveness of CLTS in Addressing Sanitation Challenges

30. How the CLTS help you and members of your household in addressing sanitation challenge?

(1) Yes (2) No

31. If yes can you share with me how it helps in addressing sanitation challenges in your household and you in person?

……..

32. Do you understand the methodology they use in the sensitisation of the people through the CLTS approach? (1) Yes (2) No.

33. Is that methodology effective and easy to understand in addressing sanitation problems in this community?

SECTION D: Sanitation Related Diseases in the Area

34. What are the diseases that you often suffer from?

……

35. Do you know the causes of the diseases? (1) yes (2) No)

36. If yes can you tell me the cause of the disease?

……..

37. If the cause of the disease is from bad sanitation, have you taken measure to clean your environment?

38. If yes do you still fall sick after cleaning your environment? (1) yes (2) No

39. What was the prevelenece of sanitation related diseases in your household before the introduction of CLTS ?

……..

40. What is the situation now? …….

41. Do you have any suggestion for better improvement of the sanitation situation in this community……

……
……

……
……

……
……

……

THANK YOU FOR YOUR TIME.

Appendix B: Focus Group Discussion Guide

CONTRIBUTION OF COMMUNITY LED TOTAL SANITATION (CLTS) IN CONTROLLING SANITATION RELATED MORBIDITIES IN THE KUMBUNGU DISTRICT

I am a student from the University for Development Studies, Tamale, conducting a study on the contribution of Community Led Total Sanitation (CLTS) in controlling sanitation related diseases in the Kumbungu District, Ghana. This study is part of my Masters of Public Health Degree hence I would be most grateful if you could assist me by answering the following questions. All information given would be confidentially treated.

1. Can you describe the sanitation situation in this community?
2. How does the sanitation situation affect your health – with emphasis on experiences from group members?
3. What are the common diseases that relate to the sanitation conditions here?
4. Can you describe the nature of your participation in the CLTS strategy?
5. Can you tell us how the CLTS strategy impacted on your behaviour towards open defecation in this community
6. Is the CLTS approach community friendly? Explain how friendly it is
7. What was the prevalence of sanitation related diseases in this community before the introduction of the CLTS concept and how is the situation after the introduction? – Let individuals in group tell their personal experiences.

8. What are the health problems associated with the way you free yourselves and dump waste (both liquid and solid waste)? – pick up individual to describe the how they dumped their waste and relate it to individual health problems.
9. What are the main sources of toilet facility in this community?
10. Can you explain the preference for toilet facility in this community – why the choice?
11. Which of these facilities provide good reliable services and why?
12. Are there any institution educating you on sanitation issues using the CLTS approach? Explain how it is done
13. Are there any groupings among you that serve to support members in sanitation education?
14. What are the roles of friendships and family in your daily sanitation management are these effective
15. What kinds of support do you give each other when a member is sick? Detail different assistance patterns
16. What are the major sanitation related diseases do you face frequently – as mentioned previously?
17. How do you think these can be solved – what are your recommendation

APPENDIX C

KEY INFORMANT INTERVIEW GUIDE

CONTRIBUTION OF COMMUNITY LED TOTAL SANITATION (CLTS) IN CONTROLLING SANITATION RELATED MORBIDITIES IN THE KUMBUNGU DISTRICT

I am a student from the University for Development Studies, Tamale, conducting a study on the contribution of Community Led Total Sanitation (CLTS) in controlling sanitation related diseases in the Kumbungu District, Ghana. This study is part of my Masters of Public Health Degree hence I would be most grateful if you could assist me by answering the following questions. All information given would be confidentially treated

1. Name of respondent……
2. Institution …….
3. Position held……
4. Number of year work in current position
5. Can you briefly explain to me what CLTS is all about?
6. Can you please take me through the approach adopted using the CLTS approach in ensuring open defecation free (ODF)
7. Please take me through the processes of ODF verification protocol
8. Are the community members able to understand and effectivelyadopt and implement the behavioural change communication tool (BCCT) If yes how effective is the tool and how do you measure the acceptance rate……

9. Can you please tell me the acceptance rate of the people in the district?
10. What is attitudes and the behaviour of the people towards CLTC
11. Can you share with me rate of involvement of the people in CLTS concept
12. Are there toilet facilities in the communities where you are implementing CLTS? If no can you share with me how you are implementing it without such facility……
13. How effective is the CLTS concept in addressing open defecation……

……

……

14. What is the prevalence sanitation related diseases situation in the communities that are open defecation free and those that are not?

……

15. What was the situation before the implementation of the CLTS strategy?

……

16. Can you share with me the level of acceptance of the people of the CLTS concept?

……

17. Is the CLTS concept cultural friendly to the people?

18. What are the measures put in place by your outfit to mitigate sanitation related diseases in this district?

……

……

……..

19.What is the level of involvement of traditional rulers and other opinion leaders in the achieving open defecation free (ODF)

20.Please what recommendation do you suggest for better implementation of the CLTS and further elimination or reduction of sanitation related diseases in the area……

……

……

……

……

……

THANK YOU FOR YOU TIME