WATER, SANITATION AND HYGIENE PRACTICES AS PREDICTORS OF DIARRHOEA OCCURRENCE AMONG SCHOOL AGE CHILDREN IN GANZE SUB COUNTY, KENYA

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JOMO KENYATTA UNIVERSITY OF

AGRICULTURE AND TECHNOLOGY

2019

Water, Sanitation and Hygiene Practices as Predictors of Diarrhoea Occurrence among School Age Children in Ganze Sub County, Kenya

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A thesis Submitted in Partial fulfilment for the Degree of Doctor of Philosophy in Public Health of the Jomo Kenyatta University of Agriculture and Technology

2019

DECLARATION

I declare that this thesis is my original work and has not been presented for a degree in any other University.

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DEDICATION

I dedicate this thesis to my family, my husband Martin, daughters Maya and Natalie and son Leone for their love and support during this study. It has been a tough journey, but with their constant re-assurance, I have come this far.

ACKNOWLEDGEMENT

A number of wonderful people have contributed in countless ways in helping me to complete this work. My sincere thanks to my supervisors: Prof Simon Karanja, Dr Joseph Mutai and Prof George Karani for their tireless efforts in advising, guiding and supervising this work.

I am also grateful to the Director Kenya Medical Research Institute for having given me time off for my studies and providing ample time and environment to finalize my work. Many thanks to the scientific committee of Eastern Southern Africa Centre Infectious and Parasitic Control (ESACIPAC) for their technical expertise, constant assistance, advice and encouragement throughout the study.

My gratitude to my family members who encouraged me during this period of study and for financial support they offered me. They made it possible for me to realize my dream. I am indebted to the study participants for having supported me during data collection and for taking their time off to share with me this information. Thanks to the Institute of Tropical Medicine and Infectious Diseases (ITROMID) and Jomo Kenyatta University of Agriculture and Technology (JKUAT) staff for timely updates with the necessary information and provision of documents relevant to this project. Thanks to my classmates and friends for their encouragement and support throughout this period. Finally, I would like to thank God for having brought me this far through guidance.

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ABBREVIATIONS AND ACRONYMS

AEO	Agricultural Extension Officer
AIDS	Acquired Immunodeficiency Syndrome
ASAL	Arid and Semi Arid Land
CHV	Community Health Volunteers
CLTS	Community led total sanitation
CPHR	Centre for Public Health Research
DALYs	Disability-adjusted life years
DFID	Department For International Development
FGDs	Focus group discusions
HBM	Health Belief Model
HIV	Human Immunodeficiency Virus
HGSMP	Home Grown School Meals Programme
ITROMID	Institute of Tropical Medicine and Infectious Diseases
JMP	Joint Monitoring Programme
JKUAT	Jomo Kenyatta University of Agriculture and Technology
KAP	Knowledge Attitude and Practices
KEMRI	Kenya Medical Research Institute
KNBS	Kenya National Bureau of Standards

KIIs	Key informant interviews
LMIC	Low and Middle Income Country
MDGs	Millennium Development Goals
MOA	Ministry of Agriculture
MOE	Ministry of Education
MOH	Ministry of Health
MOPHS	Ministry of Public Health and Sanitation
NGO	Non-Governmental Organization
ODF	Open Defecation Free
ORS	Oral Rehydration Salts
PHAST	Participatory Hygiene and Sanitation Transformation
PCD	Partnership for Child Development
QASO	Quality Assurance Officer
SDG	Sustainable Development Goals
SERU	Scientific Ethical Review Committee
SHN	School Health and Nutrition
SPSS	Statistical Package for Social Sciences
UN	United Nation
UNICEF	United Nations International Children's Emergency Fund

UNESCO	United Nations Educational, Scientific and Cultural Organization
WASH	Water sanitation and hygiene
WATSAN	Water and Sanitation
WFP	World Food Programme
WSSCC	Water Supply and Sanitation Collaborative Council
WHO	World Health Organization

DEFINITION OF USED TERMS

Child-friendly Designs: Technical design provisions that take into account that facilities will be used by children of different ages and adapt the facilities to children's skills and abilities to use them.

Diarrhoea: Diarrhoea is the passage of loose or liquid stools more frequently than is normal for the individual. It is primarily a symptom of gastrointestinal infection. Depending on the type of infection, the diarrhoea may be watery (for example in cholera) or passed with blood (in dysentery for example).

Disability Adjusted Life Years (DALYs): A Population metric (measure). The sum of years of potential life lost due to premature mortality and the years of productive life lost due to disability.

Environmental Sanitation: Interventions to reduce people's exposure to diseases by providing a clean environment in which to live, measures to break the cycle of diseases. This usually includes the hygienic management and/or disposal of human and animal excreta, refuse, and wastewater, the control of disease vectors, and the provision of washing facilities for personal and domestic hygiene including food safety, and housing and workplace sanitation. Sanitation involves appropriate behaviours as well as the availability of suitable facilities, which work together to form a hygienic environment.

Health Outcome: A change in the health status of an individual, group or population which is attributable to a planned intervention or series of interventions, regardless of

whether such an intervention was intended to change health status.

Home Grown School Meals Program: is a school feeding programme that provides food produced and purchased within a county.

Improved Sanitation and Hygiene: ISH encompasses the promotion of skills and practices that enable individuals, families and communities to have a clean and healthy environment. The concept focuses on proper disposal (management)1 of human excreta and keeping drinking water safe to the point of use and adopting high levels of personal, domestic, public and food hygiene. It also focuses on ensuring safe management of solid and liquid wastes, including health care wastes and protecting households against vectors and rodents, especially those of public health importance.

School Sanitation: Proper sanitation infrastructure and behaviors at schools can improve attendance and improve educational outcomes, leading to societal impacts on human productivity and dignity. School sanitation is particularly advantageous for girls when appropriate numbers of girls' only latrines are constructed and maintained. Activities at schools also model sanitation technologies and behaviors that are transferred from schools and School age children to households and community.

Total Sanitation: is where all people or all community members demand, develop and sustain a totally sanitized, hygienic and healthy environment for themselves (in partnership with drivers and stakeholders) by erecting barriers to

prevent the transmission of diseases, primarily from faecal contamination. It is applied at all levels from household, village, parish, Sub County to Ganze Sub County levels. Total sanitation is complete eradication of all indiscriminate and (1) unhygienic practices in the disposal of (2) excreta, (3) drainage and (4) litter.

ABSTRACT

Water, sanitation and health are inseparably linked. Diarrhoea and other water related diseases are the major causes of health problems in developing countries. Although the need for water and sanitation interventions for health promotion has been recognised, these are labeled as costly and are often neglected in the primary healthcare programmes. Since water and sanitation initiatives include both availability of provisions and their effective use, they are technically and socially challenging. The main objective of the study was to determine WASH practices as predictors of diarrhoea occurrence among school age children in primary schools in Ganze Sub County, Kilifi County, Kenya. A comparative school-based cross-sectional study design was employed in which data from both sets were compared. A total of 240 participants from 24 schools were sampled (12 control and 12 intervention), 10 pupils aged 5-15yrs were randomly selected from each school. Guardians/parents of the 240 selected pupils were also paired and interviewed. Quantitative data was collected through a structured questionnaire and data keyed-into the SPSS vers. 23 and was analysed while qualitative data was collected through Focus Group Discussions (FGDS), Key Informant Interviews (KII) guide and observational checklist and was analyzed by use of NVIVO Vers.10.0. Scientific and ethical approval for this study was sought from Scientific Ethical Review Unit (SERU). Study findings registered a significant association between school age children below 15years affected by diarrhoea in the last 3 months ($\chi 2$= 2.098, df = 2, P<0.005). Demographic characteristics like age (p=.000), behavioural (p = .000) and environmental (p = .000) characteristics significantly predicts diarrhea occurrence. A significant relationship was posted between training on health related issues ($\chi 2$= 3.938, df = 1, P<0.005) and diarrhoea occurrence. Children aged 5-15 years old were less likely to experience diarrhoea occurrence in schools implementing Home Grown School Meals Programme (HGSMP) compared to the same age set in non HGSMP schools ($\chi 2$= 1.455, df = 1, P<0.005). Further findings revealed level of significance between the use of a latrine by pupils and their gender (p = .000). At the household level, demographic characteristics such as gender ($\chi 2$= 7.979, df = 1, P<0.005), marital status ($\chi 2$= 12.081, df = 5, P<0.005) and age ($\chi 2$= 17.438, df = 7, P<0.005) revealed significance relationships. Further significance was noted between diarrhoea occurrence and its association with water ($\chi 2$= 235.986, df = 3, P<0.005). A positive significance was also noted between knowledge of diseases associated with WASH (χ^2= 235.986, df = 3, P<0.005) and diarrhoea occurrence. Amount of money incurred per day on water usage at the household level (χ^2= 11.978, df = 4, P>0.005) as well as preferred water treatment methods ($\chi 2$= 11.978, df = 4, P<0.005) also revealed positive significance. However, school provision of handwashing facilities, washing of hands after visiting the toilet and participation in WASH programmes revealed no level of significance (P<0.005).The Study concludes that demographic, behavioral and environmental characteristics significantly predicts diarrhoea occurrence both at school and at home. Other interventions like feeding and WASH programmes are essential component in prevention and control of diarrhoea hence prevention and control programs need to adopt a more synergistic and comprehensive approach at the school and community level. Health education is also imperative in significantly reducing diarrhoea occurrence and morbidity.

CHAPTER ONE

INTRODUCTION

1.1 Background Information

Diarrhoeal diseases remain among the most common causes of mortality and morbidity in children, particularly in low- and middle-income countries (LMICs). In 2013, of the 6.3 million children worldwide who died before they reached their fifth birthday, about half (3.2 million) died from infectious diseases, with diarrhoea killing more than 500,000 children (Liu *et al.,* 2015). By 2030, it is estimated that 4.4 million children under the age of five will die from infectious diseases annually and that 60% of those deaths will occur in sub-Saharan Africa (Liu *et al.,* 2015). Diarrhoea accounts for an estimated 3.6% of the global burden of disease, as expressed in disability-adjusted life years (DALYs) (Murray *et al.,* 2010). Although mortality from diarrhoea has declined considerably over the past 25 years globally, morbidity from diarrhoea in sub-Saharan Africa has not, as risk factors related to inadequate water, sanitation and hygiene (WASH) remain unacceptably high (Okeke, 2009). The rapid growth of African cities and associated overcrowding has been linked to outbreaks of diarrhoea, with children under the age of 15 years as the most affected (Sire *et al.,* 2013).

WHO/UNICEF, 2006 further observes that the regions with the lowest coverage of improved sanitation in 2006 were Sub-Saharan Africa (31%), Southern Asia (33%) and Eastern Asia (65%) (WHO/UNICEF, 2009). Mortality of children below the age of five in Africa is more than 80% (Akinyemi *et al.,* 2013). Of the 15 countries in Africa where the under-five child mortality is 75%, Kenya is ranked at number 10. Causes of childhood mortality differ from one country to another but pneumonia and diarrhea remain the illnesses that are most often associated with child deaths (Mukhtar *et al.,* 2009). In Africa, a child experiences five episodes of diarrhea per year, and 800,000 children die each year from diarrhea related dehydration (Woldemichael, 2001). In Kenya, the mortality rate of children under the age of five

years due to diarrhea is very high about 16% surpassing deaths from HIV and Malaria combined (Njuguna and Muruka, 2011).

The infectious agents associated with diarrhoea disease are transmitted chiefly through the faecal oral route (WHO, 2008). The wide variety of bacteria, viral and protozoa pathogens excreted in the faeces of humans and animal are known to cause diarrhoea. Among the most important of these are Escherichia coli (E. coli), Salmonella sp, Shigella sp, Campylobacter jejuni, Vibrio cholera, Rotavirus, Norovirus, Giandia lamblia, Cryptosporidium sp, and Entamoeba Histolytica (WHO/UNICEF, 2009). Bacteria agents as a group are believed to cause a majority of diarrhoeal diseases in developing countries, while viral and protozoa agents tend to cause more cases in developed countries (Hunter, 1993). Many of the diarrhoeal agents are potentially waterborne transmitted through ingestion of contaminated water (Hunter, 1993). Intervention for the prevention and control of diarrheal diseases not only include enhanced water quality but also steps to improve sanitation, increase the quality and improve access to water supply, and promote hand washing and other hygiene practices within domestic and community settings (World Bank, 2012). Health authorities generally accept that microbiologically safe water plays an important role in preventing outbreaks of waterborne diseases (Hunter, 1993)

In Kenya, 17 million of the country's 40 million inhabitants do not have access to clean drinking water. The most official estimates of access from the Government of Kenya put water supply coverage at 42 percent and sanitation coverage at 31 percent in 2006 (urban and rural areas combined) (MOH, WASH Programme, 2006) and diarrhoeal disease is the major cause of childhood morbidity and mortality (WHO, 2010) . According to the 2010 National Policy Guidelines to redouble diarrhoea disease management and control efforts by the Ministry of Public Health and Sanitation, untreated diarrhoea kills and is the third leading cause of death in children under five years in Kenya. Lack of access to proper sanitation impacts on health and infant mortality with significant increase in diarrhoea cases especially in Coast, Western, Nyanza and Nairobi regions. The diarrhoel cases reported increased from 48,272 in 2009 to 64,107 in 2010 (WHO, 2010). With continued high attack rates, diarrhoeal disease is also an enormous economic burden resulting in significant

direct costs to the health sector and patients for treatment as well as in cost time at school, work and productive activities (Mulligan, 2005). An estimated 94% of the diarrhoea burden of disease is attributable to the environment and associated with risk factor such as unsafe drinking water, lack of sanitation and poor hygiene (Pruss-Ustun & Corvalan, 2008). Sanitation-related diseases such as diarrhoea and cholera continue to undermine human health and well-being. Improving sanitation is therefore key to achieving the health-related Sustainable Development Goals (SDGs) of reducing child mortality and combating disease (Boschi, 2008, UN, 2011). Poor status of water, sanitation and hygiene (WASH) and related interventions can impact growth and development of children in multiple ways (Sire *et al.*, 2013) and there is consensus that improvement in undernutrition would not be possible without improving WASH conditions of underprivileged children around the world.

There is a relationship between WASH practices and the occurrence of diarrhea in children. Such factors include: water quantity, access to improved water sources, availability of toilet facilities, compound hygiene, housing condition, and refuse disposal (Woldemichael, 2001). Globally, more than 125 million children under-five years of age live in households without access to an improved drinking-water source, and more than 280 million of these children live in households without access to improved sanitation facilities (Black *et al.,* 2003). In the developing world, unsafe drinking water, inadequate availability of water for hygiene and lack of access to sanitation together contribute to about 88 % of deaths from diarrheal diseases or more than 1.5 million deaths in children under- five each year (Black *et al.,* 2003). There is need to understand the determinants of diarrhea as it has far reaching consequences on child nutrition, survival and development (Weisz *et al.,* 2011).

In 1980, the Government of Kenya through the Ministry of Education, Science and Technology and the United Nations World Food Programme (WFP) carried out a school meals programme in food insecure regions of Kenya with the objectives of encouraging parents to enrol and keep their children in school, and to encourage pupils to learn (UN, 2011). By 2008, the number of pupils receiving school meals had grown from an initial 240,000 to 1.5 million in 1,850 primary schools in Kenya's arid and semi-arid lands.To pursue greater national ownership and sustainability of

the programme, MoEST established the Home Grown School Meals Programme, which in 2009 took over an initial 540,000 pupils in semi-arid lands, and an additional 50,000 pupils annual in the subsequent years from the WFP-resourced programme. By the end of 2013, HGSMP provided school meals to 760,000 pupils in semi-arid Ganze Sub Countys. Funds approved from Government's own revenues have increased steadily and significantly from Ksh 400 Million in 2009/2010 to 900 million in 2013/2014 (WFP, 2009). Fourty eight schools within Ganze Sub County benefits from Home Grown School Meals Programme. School Feeding Programmes have shown to impact positively on enrollment, nutritional status and community development (World Bank and World Food Prgramme, 2012).

1.2 Statement of the problem

Globally it is estimated that inadequate Water Sanitation & Hygiene (WASH) is responsible for 4% of all deaths and 5.7% of the of the total disease burden (Annete *et al.,* 2004). Diarrhoeal diseases continue to be responsible for childhood mortality and morbidity, primarily in developing countries, although in the last several decades a significant reduction on deaths from diarrhoeal diseases has been observed (Ahmed *et al.,* 2000). Despite advances in case management of diarrhoeal diseases, the diseases are a major cause of morbidity and mortality among young children in developing countries (Murray *et al.,* 2013).

School going children still remain highly affected with sanitation related illnesses due to overcrowding, dirty water, minimal sanitary measures, indiscriminate disposal of faecal matter and poor sewage systems in schools. The burden of illness for children under fifteen years of age that arises from diarrhoeal diseases linked to inadequate water, sanitation and hygiene is up to 240 times higher in Africa than in high income nations (Pruss *et al.,* 2008). School age children who have no access to safe water and sanitation have more chances to suffer from water and sanitation related diseases. Lack of safe water and sanitation facilities turn schools into unsafe places where diseases are transmitted with mutually reinforcing negative impacts on the children, their families, communities and overall development including academic performance.

There are several interventions for improving WASH that have been implemented in varying contexts worldwide, with the evidence evaluated for their impact on health and social outcomes. The evidence so far has been sparse, complex, and not of sufficient quality to propose any conclusive impact of these interventions on broader health and other outcomes. Some of these difficulties relate to endpoints such as environmental enteropathy or developmental outcomes, and in other instances studies are not sufficiently powered to assess mortality outcomes. Diarrhea is a relevant outcome that has been evaluated relatively rigorously and has been used extensively in previous reviews to evaluate the effectiveness of WASH interventions in childhood (Okeke, 2009, Sire *et al.,* 2013).

Sanitation and human health are closely connected as lack of appropriate hygiene policies and disposal of human excreta can lead to transmission and spread of diseases that cause diarrhoea. Contaminated water and indiscriminate disposal of faecal matter account for 5.7% of diarrhoea amongst children (WHO, 2011). The study was conducted in Ganze Sub County, which is classified among the poorest of areas in Kenya. It is estimated that more than 80% of the population living in this area live below the poverty line. Ganze Sub County does not have adequate clean and safe drinking water Kenya (KNA, 2006).

1.3 Justification of the study

Improved access to safe water supply is attributable to reduction of diarrhoea incidences by about one fifth and the number of deaths due to diarrhoea by more than half (Black and Fawcett, 2008). Improvement in environmental sanitation has significant positive impact on environmentally related diseases such as malaria, diarrhoea, skin and eye infections and the overall dignity and well-being of the populations (Hayes, 2003).

Byers (2001) observes that unsafe water, sanitation and hygiene (WASH) risk factor plays a predominant role in the outbreak of Diarrhoea disease whose transmission pathways are influenced by such factors as infrastructure, water availability, inappropriate disposal of faecal wastes and behavioural aspects (Byers 2001). A study by Esrey et al (1996) suggests an important role for each intervention in the

reduction of diarrhoea disease and also notes the health benefits resulting from the reduction in diarrhoea illnesses that relate to improvements in water, sanitation and hygiene (Esrey *et al.*, 1996). The same interventions have been observed to have positive effects on the illnesses such as Schistosomiasis, Ascariasis and respiratory outcome which are also related to poor methods of excreta disposal. Diarrhoea incidence data are also important indicator of the level of hygiene of individuals' sanitation and availability of improved water sources (UN, 2000).

Proper sanitation infrastructure and behaviors at schools can improve attendance and improve educational outcomes, leading to societal impacts on human productivity and dignity. WASH activities at schools also model sanitation technologies and behaviors that are transferred from schools by school age children to households and eventually the community. Improved sanitation and hygiene are critical for improvement of child health through reduction of diarrhoea, worm infestation, fleas, eye and skin infections. Interventions to improve access to clean water, sanitation facilities, and hygiene behaviours (WASH) represent key opportunities to improve child health and well-being by preventing the spread of infectious diseases and improving nutritional status. According to WHO reports, more than three million children die from diarrhoea each year, and over 500 million children are infected with common worms as a result of poor access to safe water, sanitation and hygiene (WHO, 2004). Although School age children around the world have a lower mortality rate than infants, their exposure to the illnesses associated with sanitation can adversely affect their development. Several studies have shown that improved sanitation and hygiene promotion significantly reduce sanitation and hygiene related diseases.

The use of health clubs and community sanitation commitees could enhance and improve on sanitation levels both at home and at schools. The use of school pupils in disseminating sanitation related messages both at home and at school cannot be underscored. Trainings on sanitation related programmes as a means of advocacy and sensitization as well as involvement in WASH programmes would go a long way in enhancing sanitation. The school curriculum could include basic WASH practices as toolkits in management of sanitation related illnesses. It is important for policy

makers to critically assess the progress being made by the School WASH interventions given the role it plays in intellectual growth and development of the learners, improving retention rates and health. Access to safe water and sanitation stimulates changes in hygiene behaviour, hence a key reason for investing in hygiene and sanitation programmes and services. Starting at school and household level, people are most likely at risk of contamination especially where they spend most of their time. Health benefits are accrued to families who have latrines even where neighbours do not, additional benefits then accrue as coverage extends to the whole neighbourhood (WSSCC, 2003).

While HGSMP is seen as a crucial element for, supporting equitable access to education, including supporting learning outcomes and securing healthy behaviours, there is however, dearth of information regarding water sanitation and hygiene in schools benefiting from these programmes, in as much as WASH is an important aspect of any school-feeding programme. Value addition of the study has been geared towards understanding sanitation and hygienic behaviours among pupils and host communities thereby providing an opportunity to understand the correlation between sanitation related illnesses, HGSMP and WASH. The resulting information can be central in informing policy directions in the control of infections in School age children in an effort to ensure universal primary education as well as universal sanitation and further showcase the importance of Government led Home Grown School Meals Programme (HGSM) in relation to WASH and disease occurrence. Policy interventions can be informed through the delivery of sanitation programs in LMIC, promotion of environmental health and community development.

1.4 Research Questions

1. What is the proportion of school age children aged 5-15 years with diarrhoea in the last 3 months in schools implementing HGSMP and Non HGSMP in Ganze Sub County?
2. How does individual level factors influence occurrence of diarrhoea among school age children in schools implementing HGSMP and Non HGSMP in Ganze Sub County?

3. How does school level factors influence occurrence of diarrhoea among school age children in schools implementing HGSMP and Non HGSMP in Ganze Sub County?

4. How does WASH Knowledge, Attitude and Practices influence household diarrhoea occurrence among parents of pupils in Ganze Sub County?

1.5 Objectives

1.5.1 General Objective

To determine WASH practices as predictors of diarrhoea occurrence among school age children in Ganze Sub County.

1.5.2 Specific Objectives

1. To determine the proportion of school age children with diarrhoea in the last 3 months aged 5-15 years in schools implementing HGSMP and Non HGSMP in Ganze Sub County.

2. To determine individual level factors in the occurrence of Diarrhoea among school age children in schools implementing HGSMP and Non HGSMP in Ganze Sub County.

3. To determine school level factors in the occurrence of Diarrhoea among school age children in schools implementing HGSMP and Non HGSMP in Ganze Sub County.

4. To determine WASH Knowledge, Attitude and Practices among parents of pupils in Ganze Sub County.

CHAPTER TWO

LITERATURE REVIEW

2.1 Water, sanitation and hygiene practices among school age children

WASH in Schools aims to support the provision of safe drinking water and improved sanitation facilities, and promotes lifelong health for children and their families. Ensuring access to water, sanitation and hygiene (WASH) in every school for every child can be a huge challenge. Children are also at the greatest risk from life-threatening diseases, such as diarrhoeal disease, which accounts for 25–40 per cent of all childhood deaths during an emergency, as well as acute respiratory infections, malaria, measles, eye infections, worm infestations, cholera and malnutrition. A malnourished or seriously injured child may not recover from an episode of diarrhoea, leading to an unnecessary death. Persistently poor hygiene practices and the absence of adequate drinking water and sanitation significantly contribute to these risks (UNICEF, 1998).

The quality of WASH in schools can help or hinder access to education. Poor hygiene, sanitation and water outside school may mean large numbers of children are too sick to attend school because they suffer persistent episodes of diarrhoea or worm infestations. Older girls may be absent each month because there are no WASH facilities in school for menstrual hygiene management. Children with disabilities may stay away from school because WASH facilities are inaccessible to them. Girls and boys may have too little time for learning because they spend long periods at water collection points (UNICEF/IWSC, 2005). Diseases related to inadequate water, sanitation and hygiene are a huge burden in developing countries. It is estimated that 88% of diarrhoeal disease is caused by unsafe water supply, and inadequate sanitation and hygiene (WHO, 2004c). Many schools serve communities that have a high prevalence of diseases related to inadequate water supply, sanitation and hygiene, and where child malnutrition and other underlying health problems are common. Schools, particularly those in rural areas, often completely lack drinking-water and sanitation and handwashing facilities, alternatively, where such facilities

do exist they are often inadequate in both quality and quantity. Schools with poor water, sanitation and hygiene conditions, and intense levels of person-to-person contact, are high-risk environments for children and staff, and exacerbate children's particular susceptibility to environmental health hazards. Children's ability to learn may be affected by inadequate water, sanitation and hygiene conditions in several ways. These include helminth infections (which affect hundreds of millions of school-age children), long-term exposure to chemical contaminants in water (e.g. lead and arsenic), diarrhoeal diseases and malaria infections, all of which force many schoolchildren to be absent from school (WHO, 2004b). Poor environmental conditions in the classroom can also make both teaching and learning very difficult. Girls and boys are likely to be affected in different ways by inadequate water, sanitation and hygiene conditions in schools, and this may contribute to unequal learning opportunities. Sometimes, girls and female teachers are more affected than boys because the lack of sanitary facilities means that they cannot attend school during menstruation (WHO, 2004c).

2.2. Diarrhea, Pathophysiology, management, control and prevention

The absorption and secretion of water and electrolytes throughout the gastrointestinal tract is a finely balanced, dynamic process and, when there is loss of this balance caused either by decreased absorption or increased secretion, diarrhoea results. Diarrhoea remains a major cause of morbidity and mortality worldwide, accounting for 3 million deaths per year in young children, and it is therefore important for those who care for children to have a clear understanding of the pathophysiology of diarrhoea (Whyte and Jenkins, 2012). Diarrhoea can be considered to be either osmotic or secretory. Osmotic diarrhoea occurs when excessive osmotically active particles are present in the lumen, resulting in more fluid passively moving into the bowel lumen down the osmotic gradient. Secretory diarrhoea occurs when the bowel mucosa secretes excessive amounts of fluid into the gut lumen, either due to activation of a pathway by a toxin or due to inherent abnormalities in the enterocytes (Whyte and Jenkins, 2012).

A number of measures can prevent diarrhoea diseases from manifesting in school age children. They include proper use of water for hygiene and drinking, hand washing, disposal of feaces properly and proper nutrition (Jailson *et al.,* 2010). To implement these strategies, the people must be educated about proper practices and utilize the community health workers and village health workers. For case management, oral rehydration therapy (ORT) is the oral administration of water and electrolytes to replace existing losses, primarily accomplished by giving oral rehydration salt (ORS solutions. According to WHO/UNICEF, 1999, there is evidence that ORT was an ancient traditional practice (WHO/UNICEF, 1999). Research in 1990s demonstrated that the addition of glucose to salt solution resulted in absorption of salt and water across the intestines (WHO, 2005). In the absence of glucose no absorption of salt or water was observed. The same research observed a dramatic decrease in mortality rates from diarrhoea (30% to less that 3%) with the administration of ORT in refugee camps in Bangladeshi war for independence. In addition to ORT, appropriate feeding during episodes of diarrhoea is recommended.

Clinical and laboratory studies show that continued feeding during episodes of diarrhoea leads to improved outcomes in diarrhoeal diseases. They include decrease in stool output, shortened duration of illness, significant weight gain and improved nutritional status (WHO, UNICEF, 1999). Nutritional therapy depends on the age and diet of the child (Bell *et al.,* 2010). Scientific research has suggested a relationship between diarrhoea and specific micronutrients deficiencies. Zinc deficiency may cause diarrhoea. Vitamin A deficiency is associated with risk of diarrhoea while folic acid may be associated with improved recovery time for acute cases of diarrhea (UNICEF, 2005). According to WHO, 2008, drug therapy of diarrhoea should be avoided. This is because some drugs may be potentially toxic to some patients leading to adverse reactions. Non-compliance with therapy may also lead to antibiotic resistance. The WHO therefore recommends that anti-diarrhoea drugs be strictly avoided as they may prolong infection and mask signs of dehydration. Although the standard WHO/UNICEF ORS solution is effective in achieving and maintaining rehydration, it does not reduce stool volume or duration of diarrhoea illness. Super ORS have recently been developed which reduce stool and

increase water absorption in the gut. A vaccine for diarrhoea caused by Rota virus has also been developed (WHO/UNICEF, 2008).

2.3 Diarrhoea burden due to water, hygiene and sanitation

According to WHO (2007), 4 billion cases of diarrhoea occur annually, of which 88% are attribute to unsafe water and inadequate sanitation and hygiene. Diarrhoeal diseases also account for 1.8 million deaths every year with, the vast majority being children under five years. World Health Organisation data on the burden of disease shows that, "approximately 3.1% of deaths (1.7million) and 3.7% of disability adjusted life- years *(DALYs)* or equivalent to 54.2 million sufferings worldwide is attributed to unsafe water and sanitation and hygiene". In Africa and other developing Countries in South East Asia, 4-8% of all disease burdens are attributable to these factors. Over 99.8% of all the deaths occur in developing countries and 90% are deaths of children (WHO, 2004). Systematic reviews have suggested that improved sanitation may reduce these infections by 22% to 36% (Waddington, 2009).

Although infant and child mortality rates have reduced significantly in most nations in the recent decades, 1.5 to 2 million children still die every year from water and sanitation related diseases (Murray *et al.*, 2013). More children are debilitated by illness, pain and discomfort primarily from diarrhoeal diseases, intestinal worms, from various eye and skin diseases and diseases related to insufficient and unsafe water (UNICEF, 2007). Helminthic infections are also important causes of morbidity and mortality in many developing Countries. An estimated 1.5 billion cases of infection with *Ascaris lumbricoides*, 1,200 million cases of infection with hookworm, 1,049 million cases of infection with *Trichuris trichiura*, and 200–300 million cases of *Schistosomiasis* occur worldwide**.** School age children in developing countries bear the greatest health burden due to helminthic infections, accounting for an estimated 20% of the disability-adjusted life years lost due to infectious diseases in children less than 14 years old (Ezeamama *et al.*, 2005).

Despite the biological plausibility that improvements in school WASH conditions will be beneficial for pupil health, results from school-based WASH evaluations have been mixed. There is evidence that WASH in Schools programs have a positive impact on child health, including reductions in diarrhoeal disease and other hygiene-related diseases. Migele *et al.,* (2007) examined the impact of a simple school-based water treatment and hand-washing intervention in a boarding school in Kenya: i.e., clay pots modified with narrow mouths and ceramic lids, taps for drinking water, plastic tanks with taps for hand washing, WaterGuard (i.e., sodium hypochlorite solution) for drinking water, and soap for hand washing. Before-and-after rates of diarrhoea disease (with no control schools) indicated a more than 50% reduction in recorded cases of diarrhoea among students (Migele *et al.,* 2007). An evaluation by Trinies *et al.,* (2016) in Mali found that, as compared with control schools, there were lower odds of students in beneficiary schools reporting diarrhea (OR 0.71, 95% CI 0.60–0.85) or respiratory infection symptoms (OR 0.75, 95% CI 0.65–0.86) in the past week (Trinies *et al.,* 2016).

A study in rural Kenya (Patel *et al.,* 2012) found that school-based water treatment and hygiene programs resulted in a decrease in rates of acute respiratory illness, although no decrease in acute diarrhea was observed. Improving school-based WASH can also reduce other hygiene-related diseases, such as soil-transmitted helminth (STH) infection (Freeman *et al.,* 2012). For example, Bieri *et al.,* (2013) found that among Chinese school-children, the incidence of infection with STHs was 50% lower in the intervention group that received a STH education package than in the control group (4.1% vs. 8.4%, $p < 0.001$). In Mali, Freeman *et al.,* (2013) found that provision of school-based sanitation, water quality, and hygiene improvements reduced reinfection of some STHs after school-based deworming, but the magnitude of the effects were helminth species-specific.

Results, however, are not uniformly clear or positive. In an evaluation of a hand-washing promotion program in Chinese primary schools, rates of diarrhoea were too low in both intervention and control groups to identify attributable differences in prevalence (Bowen *et al.,* 2007). In a multi-country study, Dujister *et al.,* (2017) found that the STH prevalence at baseline and at follow-up did not significantly

differ between intervention schools (that provided deworming and improved handwashing) and control schools. A study by Greene *et al.,* (2012) conducted in schools in western Kenya found that hygiene promotion and water treatment did not reduce the risk of Escherichia coli presence on pupils' hands, further, the addition of new latrines to intervention schools significantly increased E. coli presence among girls (RR = 2.63, 95% CI 1.29–5.34) which was attributed to an absence of sufficient hygiene behaviour change, and lack of soap, water, and anal cleansing materials (Green *et al.,* 2012). It is important to note, however, that presence of E. coli on hands is a variable that is difficult to interpret in terms of disease risk and outcomes.

The Department for International Development-Bangladesh (DFID-B) and CARE Bangladesh North West Baseline Livelihoods Monitoring Project (LMP) noted recently that communities reported over 65 % of their disease burden as water and sanitation related (Upadhyay and Mathai, 2008), due to inadequate sanitation and very poor hygiene practices, high incidence in diarrhoea and other water related diseases cause 115,000 child deaths each year (11% of total deaths) and the loss of 5.75 million disability adjusted life years (DALYS) or 61% of total lost DALYS, of these DALYS, 90% were attributed to environmental causes and 65% of the DALYS (DWSS, 2011) could be averted through improvements in water supply and environmental sanitation, including latrines, drainage, garbage disposal and hygiene (Murray *et al.,* 2013). In addition to the human costs, the economic losses associated with these practices (diseases, treatment, mortality, and morbidity and labor days) have a major impact on the economy (World Bank, 2012). Treatment of hygiene-related disease costs 5 billion Taka (£60 million) each year. A study by World Bank, 2012 indicate significant reductions in monthly medical expenditure (from £12 down to £1.50) following integrated urban water, hygiene and sanitation intervention. Loss of earnings and production are additional handicaps for poor people, whose physical fitness is their main productive asset (Murray *et al.,* 2013).

2.4 Utilization and access to water, sanitation and hygiene in schools

Schools with adequate water, sanitation and hygiene (WASH) facilities have: a reliable water system that provides safe and sufficient water, especially for hand-washing and drinking, sufficient number of toilets for students and teachers that are private, safe, clean, and culturally and gender appropriate, water-use and hand-washing facilities, including some close to toilets, and sustained hygiene promotion (Adams *et al.,* 2009). Facilities should cater to all, including small children, girls of menstruation age, and children with disabilities. WASH conditions in schools in many low-income countries, however, are inadequate with associated detrimental effects on health and school attendance (Jasper *et al.,* 2012). An evaluation by UNICEF 2012 found that in schools in low-income countries, only 51% of schools had access to adequate water sources and only 45% had adequate sanitation.

Globally, school-based WASH interventions variously aim to: (i) reduce the incidence of diarrhoea and other hygiene related diseases, (ii) improve school enrolment, school performance, and attendance, and (iii) influence hygiene practices of parents and siblings whereby children act as agents of change in their households and communities. However, evidence assessing the impact of school-based WASH interventions has been mixed. Two previous reviews of studies of the impact of school-based WASH interventions have shown mixed results on outcome measures such as knowledge, attitudes and practices, school attendance, and health (Jasper *et al.,* 2012, Joshi and Amadi, 2013).

The global effort to achieve sanitation and water for all by 2030 is extending beyond the household to include institutional settings, such as schools, healthcare facilities and workplaces (UNICEF and World Health Organization, 2018). This has been reinforced by global education for all (WHO/UNICEF, Geneva, 2017) strategies highlighting how WASH in schools improves access to education and learning outcomes, particularly for girls, by providing a safe, inclusive and equitable learning environment for all (UNESCO, 2015). Sustainable Development Goals (SDGs) aims to ‘ensure available and sustainable management of water and sanitation for all’ and includes targets for universal access to drinking water, sanitation and hygiene for all

by 2030 (WHO/UNICEF, Geneva, 2017). The term ‘universal’ implies all settings, including households, schools, healthcare facilities, workplaces and public places, and ‘for all’ implies services that are suitable for men, women, girls and boys of all ages, including people living with disabilities (WHO/UNICEF, 2017).

Sustainable Development Goal 4 aims to ‘ensure inclusive and quality education for all and promote lifelong learning’ and includes targets for access to pre-primary, primary and secondary education, improved learning outcomes and the elimination of inequalities at all levels of education (UNICEF and World Health Organization, 2018). The target addresses the means of implementation and aims to build and upgrade education facilities that are child, disability and gender sensitive and provide safe, non-violent, inclusive and effective learning environments for all, including, among other things, providing access to basic drinking water, sanitation and hygiene services in all schools. Access to WASH is widely recognised as an essential foundation for establishing a safe and healthy learning environment (UNESCO, 2000), but in 2016 only 68 countries were able to produce national estimates of the proportion of schools with access to basic WASH services. In countries where microdata are available, it is possible to estimate the proportion meeting the basic service criteria for all three elements of WASH.

As earlier mentioned the target aims to build, upgrade and adapt school infrastructure to ensure it is accessible to all students and teachers, including those with disabilities. This not only implies progressively making sure that school buildings and premises are accessible, but also ensuring that school WASH facilities are accessible to all. To meet the criteria for a basic drinking water service, water from an improved source must be available at the school, but the improved source may either be located on the school premises or elsewhere. While most schools in Uganda and Sierra Leone use water from an improved source, just 60% of schools in Uganda and 42% of schools in Sierra Leone have an improved source located on the school premises. The location of handwashing facilities significantly affects their accessibility and it has been shown that students are more likely to wash their hands at critical times, such as before eating and after using the toilet, when handwashing facilities are located close to the toilet or dining areas (Chittleborough, *et al*, 2012). The location of facilities is

reported in several recent school surveys and shows that while handwashing facilities are often available at school, they are not always available close to the toilets. In 2016, Ethiopia had 8.4 million primary school-age children. One in five primary schools had handwashing facilities but only one in ten had handwashing facilities accessible to young children. Nearly nine out of ten primary schools had toilets but less than half were accessible to young children. National definitions of accessibility for young children vary and may range from latrines, sinks and water fountains that are easier for small children to access and operate to additional safety precautions to reduce the risk of children falling into wells or pit latrines (WHO/UNICEF, 2017).

There is widespread recognition that WASH infrastructure and resources are important foundations for hygiene behaviour change and reduced risk of WASH-related diseases. There is evidence, however, that latrine construction, without other supporting water and hygiene-related interventions, is not effective at reducing diarrhoeal disease (Freeman *et al.*, 2014, Dujister *et al.*, 2017). Possible explanations are that without broader hygiene promotion and latrine maintenance efforts, construction of latrines alone may not result in their use or (conversely) latrines may increase exposure to faecal pathogens if they are poorly maintained, used incorrectly, or if hygiene resources are not available during and after use (Freeman *et al.*, 2014, Caruso *et al.*, 2014). The health benefits of improved WASH infrastructure and resources in schools may depend on consistent availability of soap and water for handwashing and on conditions of the latrines, not only pupil to latrine ratios (Grimes *et al.*, 2017).

Globally, in 2010, 2.6 billion people still did not have access to improved sanitation, of these, 565 million live in sub-Saharan Africa (UN, 2013). Close to two million people die every year and Over 60 per cent of these deaths are attributed to poor hygiene and inadequate sanitation (WHO/UNICEF, 2008), new sanitation policies adopted in recent years throughout the developing world have shown remarkable success and have led to unprecedented increases in sanitation coverage (UN, 2013). Like large parts of Asia, the large majority of countries in sub-Saharan Africa are seriously off-track to meet this goal, and the region has the largest number of countries where less than 50 per cent of the populations have access to improved

sanitation (UNICEF/WHO JMP, 2008). The greatest progress have been made in Eastern Asia, where sanitation coverage increased from 27 per cent in 1990 to 67 percent in 2011(UN, 2013). Despite these accomplishments, more rapid progress is needed, meeting the SDG target will mean extending sanitation services to an average of 660,000 people a day, every day until 2030.

The Kenyan government's sanitation policy calls for strategies to raise sanitation coverage, which is at 43 per cent (MOPHS, 2012) but in some areas of Kenya only three out of 10 households have access to improved sanitation (Kamau, 2009). Inadequate safe water in schools, lack of adequate toilets for boys and girls, lack of appropriate disposal mechanism for sanitary towels in school and lack of effective control of vectors, vermin and rodents are some of the major problems in Kenyan schools (Kamau, 2009). In a study conducted by UNICEF, many schools in Kenya had more than 100 pupils per latrine as compared to the recommended maximum of 30, and that few schools had access to safe water for drinking and washing hands. Additionally, there was no reliable information on the condition and usability of the available facilities. A recent baseline survey for 22 UNICEF WASH Programme districts found that out of the 343 schools sampled in 21 districts, just over a third (37.3%) had safe water sources in the school yard or 200 meters from the school yard, only 32 schools (9.3%) met the minimum hygiene criteria and just over a quarter (27.1%) of schools were found to maintain their latrines correctly (UNICEF, 2000). In 2010, the United Nations General Assembly explicitly recognized the right to safe, clean water and sanitation and acknowledged that they are essential to the realization of all human rights. Improving daily conditions is a key part of the social determinants of health approach (UN, 2010).

The evidence from randomized trials of school-based WASH improvements on health outcomes has been mixed. A multiarm trial of comprehensive school WASH interventions in Kenya found reduction in self-reported diarrhoea among pupils in school that received water supply compared with controls, although no effect was seen among pupils in schools that received only a water treatment, hygiene promotion, and sanitation intervention (Freeman *et al*., 2013). Some evidence exists

on the impact of school WASH on soil-transmitted helminthes (Freeman *et al*., 2013).

Koopman's 1978 epidemiologic study in Colombia reported statistically significant evidence for a causal relationship between the adequacy of toilets (toilet facilities that are not easily broken by students, adequate supply of water, cleanliness, and provision of toilet paper, soap and towels for drying) and diarrhoea and vomiting in the schools observed (Koopman, 1978). Hughes *et al.,* (2004) studied sanitation in the Pacific Islands and reported a decrease in the risk for helminthic infections when children have increased access to water for handwashing and relieving wastes reporting, that, regardless of water quality, children who attend schools without water supply are four times more likely to contract helminthiases than children who attend schools with water supply (Hughes *et al.,* 2004).

The findings of the survey by Lopez-Quintero *et al.,* 2009 in Colombia, indicate that children with access to handwashing materials were three times as likely to consistently wash their hands before eating and after toilet usage. In addition, those who reported proper hand washing (before meals, after toilet use) were statistically significantly less likely to report illness such as gastrointestinal and respiratory symptoms, and 20% less likely to be absent (Lopez-Quintero *et al.,* 2009).These surveys provide some evidence for a potential link between provision of hand washing services and hand washing behavior in school environments.

2.5 School indicators in relation water, sanitation and hygiene practices

Many schools in developing and developed countries lack adequate water and sanitation services, with associated potential detrimental effects on health and school attendance (Mathekgana *et al.,* 2001, Haines and Rogers, 2001). Inadequate water and sanitation facilities in the school environment have been reported as a major hindrance towards achievement of this goal (Haines and Rogers, 2001). It is estimated that the burden of disease for School age children from 5 to 14 years old is 11% of the total global burden of disease (WHO, 2004). Micronutrient deficiencies, common parasitic infections, poor vision and hearing, and disability may have a detrimental effect on school enrollment and attendance as well as on cognition and

educational achievement (Gottfried, 2010).Impaired learning performance is long-term outcome of the negative effects of infections such as diarrhoea, worm infestations, and dehydrations which are largely attributed to poor water, sanitation, and hygiene conditions (Gottfried, 2010).

The school environment represents an important setting because many children's social habits and behaviors are learned at school (Cairncross, 2010). School WASH interventions improve overall sanitation, hygiene and daily water intake in both educational and non-educational environments (Freeman *et al.,* 2011). According to the World Health Organization, many children in both developing and developed nations spend time absent from schools due to diseases contracted within the school environment (WHO, 2004). Blanton *et al.,* (2010) performed interventions at seventeen Kenyan schools, which provided handwashing and drinking water treatment sources and education of teachers. They found a significant increase in household water treatment practices that was sustained over one year and reported a 26% decrease in pupil absenteeism after the implementation of the school-based programs (Blanton *et al.,* 2010). Migele *et al.,* (2007) found a statistically significant decrease in visits to the school nurse for diarrhoeal diseases in response to their interventions in Kenya, which involved providing drinking water treatment, and handwashing stations (Migele *et al.,* 2007). Lopez-Quintero *et al., (*2009), Scott and Vanick, 2007 provided evidence for provision of water for handwashing and handwashing materials such as soap related to decreased absenteeism and reported illnesses as well as to increased handwashing knowledge (Lopez-Quintero *et al.,* 2009, Scott and Vanick, 2007).

Despite these limitations regarding the evidence that educational interventions are effective, it appears that additional investigation is warranted, especially in relation to LMICs. An updated systematic review and meta-analysis of trials assessing the effectiveness of handwashing promotion interventions by Ejemot-Nwadiaro *et al.,* 2015) led to the conclusion that such promotion reduces episodes of diarrhoea. This included a reduction in incidence of around one quarter (incidence rate ratio 0.72, 95% confidence interval 0.62–0.83) identified from pooled results from community-based trials in LMICs (Ejemot-Nwadiaro *et al.,* 2015). The authors

identified 22 trials meeting their inclusion criteria, but these were of variable quality and a high proportion was based in high-income countries. There was only one study from sub-Saharan Africa published over 20 years ago (Haggerty *et al*., 1994).

There is some evidence that interventions with additional components alongside education may have greater impact. In a quasi-experimental study in Ethiopia, for example, tailored interventions including public-commitment with or without handwashing-station-promotion were more effective in terms of self-reported handwashing than education alone (Contzen *et al.,* 2015). In comparing educational community-based handwashing interventions in LMICs, Ejemot-Nwadiaro *et al.,* (2015) identified a greater impact in six trials that provided free soap compared to two that did not. However, to the small number of trials on which this finding was based and the difficulty of determining the relative impact of soap provision and handwashing promotion from the limited evidence available (Ejemot-Nwadiaro *et al.,* 2015). Additional measures within an intervention are likely to have cost implications, in a study in rural Peru aimed at reducing childhood diarrhoea and respiratory disease, which was unable to confirm an impact on health outcomes, an integrated package was provided including water purification bottles, solid fuel stoves and sinks with piped water, in addition to hygiene promotion (Hartinger *et al.,* 2016).

Improved school WASH conditions may reduce student absence by providing services (including, importantly, for girls who are menstruating) and by reducing illness transmission (Pearson and Mcphedran, 2008). There is some evidence that improved hand-washing with soap at school can reduce illness in school-aged children thereby reducing absence from school (Bowen *et al.,* 2007, Talaat *et al.,* 2011). Interventions that deliver hand-washing promotion and point-of-use water treatment have reported reductions in student absence of between 21% (Blanton *et al.,* 2010) and 61% (Hunter *et al.,* 2014) with one study specifically identifying reduced absence among girls (i.e., 58% reduction in the odds of absence for girls) (Freeman, *et al.,* 2012). A school-based water and hygiene intervention in public primary schools in Kenya found a decrease in student absence of 35% relative to baseline as compared to a 5% increase in neighbouring schools (O'Reilly *et al.,*

2008). Talaat *et al.,* (2011) identified a 21% reduction in school absence from all illnesses (e.g., diarrhea, conjunctivitis, influenza) as a result of an intensive hand-washing campaign in Egypt, absences caused by influenza-like illness, diarrhea, conjunctivitis, and laboratory-confirmed influenza were reduced by 40%, 33%, 67%, and 50%, respectively. A small pilot study in Ghana entailed provision of sanitary pads and puberty education to adolescent girls in both intervention and control schools, with the intervention found to significantly improve attendance (Montgomery *et al.,* 2012).

Evaluation of a comprehensive WASH intervention in schools in Bangladesh—using a non-experimental survey design—reported a 9–12% reduction in school absence among girls (varying between schools) (UNICEF,1994). A trial of school-based WASH interventions in Kenya found that cleanliness of latrines was strongly correlated with recent student absence (Dreibelbis *et al,* 2013). And a study of hand-washing intervention in Chinese primary schools found that the expanded intervention (standard government education plus hand-washing program, soap for sinks, and peer hygiene monitors) reported 42% fewer absence episodes and 54% fewer days of absence, and the standard intervention (handwashing program) reported 44% fewer absence episodes and 27% fewer days of absence (Bowen *et al.,* 20017). And a trial in Kenya to assess the impact of a scalable, low-cost, school-level latrine cleaning intervention on pupil absence did not find a reduction in absenteeism, the authors hypothesised that the additional impact of cleaning may not have been sufficient to reduce absence beyond reductions attributable to the original WASH intervention (Caruso *et al.,* 2014).

The interaction between absenteeism and pupil health is complex, it may be that the provision of improved facilities themselves may improve pupil attendance, independent of detectible impacts on pupil-reported diarrhoeal or respiratory outcomes. For instance, WASH provisions might improve attendance by decreasing pupils' responsibility to fetch water, or by improving girls' ability to privately manage their menstrual periods. Similarly, diarrhoeal related health effects may not be significant drivers of absenteeism in all contexts. Trials investigating the effect of school WASH on absenteeism have shown equally mixed results. In Cambodia, a

quasi-experimental study found reductions in absence from provision of safe drinking water, though only in the dry season (Hunter *et al.,* 2010). School-based randomized trials in China and Egypt found lower rates of both absenteeism and absenteeism related to certain illnesses among pupils that participated in handwashing interventions (Bowen *et al*., 2007, Talaat *et al.,* 2011). In Kenya, no overall effect of a comprehensive WASH intervention was found, although a reduction in absence was found among girls (Freeman *et al.,* 2011, Caruso *et al.*, 2014).

A previous study revealed that students who are absent frequently or for long periods are likely to have difficulty mastering the material presented in class, making absenteeism an important education issue (Malawi Demographic & Health Survey, 2002). Therefore, proper hygiene has the simultaneous benefit of improving both education and health (WHO, 2009). Unfortunately, evidence of scientifically sound studies such as randomized controlled trials is inadequate in developing countries (Rabie and Curtis, 2006).

In several cases, trials have found reductions in absenteeism or illness-related absenteeism without seeing commensurate decreases in health-related outcomes (Bowen *et al.,* 2007), whereas other studies have found improvements in health-related outcomes without commensurate decreases in absenteeism (Freeman *et al.,* 2013). A Study by Lau *et al.,* (2012) showed that about 75% of all school absences are sanitation illness related. Information regarding absenteeism from middle and higher income countries has shown that poor academic and social development, high dropout rates, and reduced learning performance are attributed to school absence in children (Bener *et al*., 2007). There have been considerable studies that have examined the effect of water treatment, hygiene, and sanitary practices on reducing absenteeism and sanitation related illnesses prevalence in school-age children (UN, 2013).

2.6 Water, sanitation and hygiene in relation to diarrhoea occurrence

Access to safe drinking water is essential to health. As a basic human right and a component of effective policy for health protection, investments in the water supply

and sanitation can yield a net economic gain (UN, 2013). A report by WHO (2006) indicated that the greatest disease causing microbial risk is associated with ingestion of water contaminated with human or animal (including bird) faeces. Microbial contamination of drinking water contributes to disease outbreaks and to emergence of diseases in developed and developing Countries. Control of waterborne diseases is an important element of public health policy and objective of water supplies (WleChevallier and Kwock-Keug, 2004).

The prevalence of contamination from man-made pollution and waste to naturally occurring toxins and the wide range of ways contaminated water can enter the human body are staggering. Everyday people are put at risk through drinking contaminated water, eating food prepared in bowls or with utensils washed with contaminated water, through poor personal hygiene, bathing and washing in unhygienic water. Over 3 million people die each year nearly all from developing countries with 80% of the total disease burden coming from the poor countries (WHO, 2007). It is estimated that up to half of all hospital beds in the world are occupied by victims of water contamination. The biggest killer is diarrhea contracted from micro-organisms in water contamination by sewage resulting in 1.8million child deaths per year. In places like Sub-Saharan Africa and south Asia, up to half of all cases of malnutrition are caused by diarrhoea. Various studies and outbreak incidences have found an association between poor water quality and diarrhoea. In Togo water that did not meet microbiological standards was associated with increased gastroenteritis while in Philippines increased childhood diarrhea was observed following consumption of water with high levels of Escherichia Coli (Saboori *et al.,* 2013). In developing countries, it is not only water contamination at source or during distribution that is an issue but also water stored within the home which may also become contaminated (WHO/UNICEF, 2007). In the United States, 14 outbreaks of infectious etiology associated with drinking water were reported for the two year period 1997-1998 (Barwick *et al.,* 2006).

In Kenya, the World Bank's 2004 Water and Sanitation Country Assessment had put the coverage at 49% for water supply (urban 86% and rural 31%) and 86% for sanitation (urban 96% and rural 81%). Among the main synergies between the water and sanitation sector (WSS) sector and other SDGs were reduced incidence of water-borne diseases, empowerment of women and girls through savings on time and energy especially in provision of water, improvement in the living conditions in slum areas, business opportunities in the envisaged private sector participation (especially for women entrepreneurs in water and sanitation service delivery), and higher retention of girls in school due to improved provision of water and sanitation facilities (CBS, 2003).

Ganze Sub County has a total of 131waterpans/dams with major sources of water for both livestock and domestic use being the dams/water pans and piped water. Since the short rains failed, water pans/dams and seasonal rivers are drying up leading to increased walking distances. On average the distance to piped water is 2km while to water pans/dams is 6km. It has been noted that in Ganze most water pans are dry. However, 60% of the households have access to piped water and the distances have increased from 4km to 8km between the months of October 2007 and January 2008. In Vitengeni and Bamba division, the average walking distance to water sources, both for livestock and domestic use is 10km to water pans and 15km to piped water. In Kaloleni, the walking distance to water sources has slightly increased from 4km to 6km especially in the dry areas (Tsangatsini, Kayafungo, Mwanamwinga). Bahari, Kikambala and Chonyi Divisions are adequately supplied with piped water (Kenya National Assembly Official Record (Hansard) (2006).

The health consequences of inadequate water and sanitation services include an estimated 4 billion cases of diarrhoea and 1.9 million deaths each year, mostly among young children in developing countries (Waterwiki, 2010). Diarrhoea diseases lead to decreased food intake and nutrient absorption, malnutrition, reduced resistance to infection and impaired physical growth and cognitive development. Water and sanitation interventions to reduce diarrhoea disease incidence in developing countries fall into four general categories: Water provision, household water treatment, hand washing promotion and sanitation. Each of these interventions

is proven to reduce diarrhoeal disease incidence. Survey by the Department of Physical and Health Knowledge and Practice among secondary school children in Zaria & Nigeria and diarrhoea observed that poor knowledge and practice of personal health and environmental health increased prevalence of diarrhoea. Currently, 1.1 billion people worldwide lack access to safe water supplies which include household connections, public standpipes, boreholes and protected dug wells, protected springs and rainwater collection (UNICEF, 2006).

According to a report by WHO/UNICEF, (2008) on global statistics on children, water and hygiene, water supply, sanitation and diarrhoea are closely related. Poor hygiene, inadequate quantities and quality of drinking water and lack of sanitation facilities cause millions of the world's poorest people to die from preventable diseases each year. Women and children are the main victims. The link between water, sanitation and diarrhoea include:- contaminated water that is consumed and may result in waterborne diseases including viral hepatitis, typhoid, cholera, dysentery and other diseases that cause diarrhoea. Without adequate quantities of water for proper hygiene, skin and eye infections for example trachoma spread easily (WB, 2003). In some areas like Turkana, the prevalence rate is 42% (AMREF, 2011). Inadequate water, sanitation and hygiene account for a large part of the burden of illness and health in developing countries. Approximately 4 billion cases of diarrhoea per year cause 2.2 million deaths, most of them children under the age of five with about 15% of deaths in developing countries (UNICEF, 2006). Diarrhoeal diseases account for 4.3% of the total global burden (62.5 million DALYS) WHO/UNICEF, (2008).

An estimated 88% of this burden is attributable to unsafe drinking water supply, inadequate sanitation and poor hygiene. These risk factors are second after malnutrition, in contributing to the burden of the disease. Improving global access to clean water and sanitation is one of the least expensive and most effective means to improve public health and save lives. The concept of clean water and sanitation as essential to health is not a novel idea. Hippocrates in 350 B.C is quoted to have recommended boiling of water to inactivate impurities. A proceeding from the royal society of London on appropriate technologies for environmental health on water,

sanitation and diarrhoea observes that in the developed countries where water and sanitation services are nearly universal, hygiene-related diseases have been significantly reduced (UNICEF, 2006). This has been through the protection of water sources and installing sewerage systems. This however, is not the case in developing countries and as a result, millions suffer and die from preventable illnesses including diarrhoea every year (WHO/UNICEF, 2007). The solution lies on integrating public health into engineering problem solving. The paper recommends partnerships with local communities to implement water and sanitation solutions that consider environmental, cultural and economic conditions.

Research by (Curtis *et. al.*, 2003) on Myanmar experiences in sanitation and hygiene promotion observed that washing hands after defecating was protective while providing safe drinking water and more latrines and promoting hand washing could reduce the burden of illness from bloody diarrhoea while limiting injudicious antimicrobial use. It was also observed that hand washing could reduce diarrhoea risk by 47% while hand washing with soap reduced diarrhoea risk from 42-44%. The current evidence however indicates that hand washing with soap can reduce the risk of diarrhoeal diseases by 42-47% and interventions to promote hand washing might save a million lives. According to a study by (Hoque, 1991) in Bangladesh and elsewhere, hand washing is universally promoted in health interventions. The study has shown a 14-40% reduction of diarrhoeal diseases with hand washing. The study observes that perceptions and methods related to washing of hands vary widely. Socio-economic factors are also associated with methods practiced.

2.7 Knowledge, attitude and practices among parents and school age children

Water, sanitation, and hygiene practices are one of the largest causes of morbidity and mortality in children and Knowledge, Attitudes and Practices (KAP) in relation to any disease are critical in establishing effective control measures. Effective and appropriate hygiene practice for School age children is important in preventing infectious diseases such as diarrhoea, which is the second most common cause of death among school-age children in sub-Saharan Africa **(**Rao *et al.,* 2006). Since lifestyle and behavioural choices are made in childhood, it is important that health

education about hygiene be introduced very early to influence healthy behaviours (Lee *et al.,* 2010). This is possible to achieve in children because their poor hygiene habits are less established, unlike adults, whose habits are firmly grounded and difficult or unlikely to change (Eshuchi, 2016). Well-practiced and consistent hygiene technique/skill can produce significant benefits in reducing incidence of gastro-intestinal and infections like jiggers (Bloomfield *et al.,* 2007). Proper hand washing with soap can reduce the risk of diarrhoea by 42%–48% (Bloomfield *et al.,* 2007). In turn, this can lead to reductions in morbidity and mortality rates, as well as in school absenteeism among children (Cairncross *et al.,* 2010). Consequently, this may lead to an improvement in their school performance, which may in the end have positive implications for development in their countries.

Following a knowledge and awareness campaign in India, for example, there was no observed increase in handwashing with soap (Biran *et al.,* 2009). Even where a statistically significant impact has been shown, this may be very modest, as demonstrated in a school-based study in Kenya promoting safe water, in which there was an increase from 6 to 14% of parents treating their water (O'Reilly *et al.,* 2008). Increased levels of knowledge do not necessarily lead to behaviour change, as recognized in a study, which used emotional drivers such as nurture and disgust (Biran *et al.,* 2014). Even in countries where there are high levels of education, behaviour relating to hygiene is far from optimal, in a UK study, observations suggested that child-carers washed their hands with soap on only 42% of occasions after changing a baby's nappy (Curtis *et al.,*2003).

Simply providing safe and clean water and sanitation facilities in schools is not enough. Behavioral change is also needed to ensure proper use and maintenance of the facilities and better hygienic behavior (Cairncross *et al.,* 2010). Hygiene education is not only important for a healthy school environment and student performance, it also offers opportunities for communicating with and influencing children's families (Ezzati *et al.,* 2003). Health education focuses on developing the knowledge, attitudes, values and life skills needed to make appropriate and positive health-related decisions. An active, child-centred and participatory teaching approach is required in the promotion of life skills (Cairncross *et al.,* 2010). La Con *et al.,*

(2017) found that installation of water and handwashing stations in schools in rural Kenya, coupled with WASH education, enabled student handwashing with stations located closer to latrines (<10m) used much more frequently. One randomized cluster trial in rural Kenya (Saboori *et al.,* 2013) examined the impact of provision of regular soap and latrine cleaning materials and hygiene education, pupil hand-washing rates following toileting was observed to be 32–38% in intervention schools compared to 2% of students in control schools. Another randomized cluster trial in urban Nairobi, Kenya, examined the impact of teacher hygiene training and provision of regular alcohol-based hand sanitizer or liquid soap, pupil hand-washing rates following toileting were observed to be 82% at schools with sanitizer, 38% at schools with soap, and 37% at control schools (Pickering *et al.,* 2013). Hygiene awareness needs to be linked to practical lessons and involve the classroom, school environment, home and wider community (Freeman *et al.,* 2011). The most important way to reduce the spread of infections among children is clean water, basic toilets, and good hygiene practices.

Open defecation is closely associated with extreme poverty and the 892 million people still practicing open defecation are increasingly concentrated in a relatively small number of countries (WHO/UNICEF JMP, 2017). Joint Monitoring Programme (2017) shows that countries with high rates of open defecation schools often lack sanitation facilities. In Niger, for example, nearly three quarters of the population still practice open defecation and the same proportion of schools lack sanitation facilities. In Eritrea, three out of four people practice open defecation and two out of five schools lack sanitation facilities. While in Mauritania, nearly a third of the population practices open defecation and two thirds of schools lack sanitation facilities. WASH in schools programmes provide an entry point for the education, awareness-raising and behaviour change required to achieve the Sustainable Development Goal 6 which targets ending open defecation in these and other countries by 2030. India, for example, has made rapid progress in increasing access to sanitation facilities in schools. A previous study conducted between 2000 and 2016 showed that the proportion of schools without any sanitation facility decreased even faster than the proportion of the population practicing open defecation (WHO/UNICEF JMP, 2017). Based on these trends, the JMP estimates that almost

all schools in India had some type of sanitation facility in 2016, while 10 years earlier half the schools in India reported having no sanitation facility at all. Between 2000 and 2016, the number of school-age children in India increased from 352 million to 378 million. Human waste disposal is a challenge in the rural areas as most households have no latrines and use the nearest bushes. Only 25% of the Ganze Sub County population has access to latrines. This poses a health hazard particularly during the rainy season when human wastes are swept to the water sources. In Kilifi and Kaloleni town only 5% of the population disposes both human and solid waste through septic tanks (Hansad, 2006).

Practices such as open defecation, unhygienic behaviour and haphazard garbage disposal are common in South and South-East Asia, Africa and Latin America, they result in environmental degradation which directly affects the health and quality of life of millions of people, especially the poorest, most vulnerable people are in these regions, (Cairncross *et al*., 2010).The situation is acute and widespread in much of South Asia, where a significant proportion of the population bears the burden of disease that is attributed to inadequate access to and use of safe drinking water, inadequate sanitation facilities and unhygienic practices (Boschi, 2008).

Community interventions concentrates on the whole community rather than on individual behaviours. People decide together how they will create a clean and hygienic environment that benefits everyone. A departure from traditional sanitation strategies is that in CLTS there is no subsidy, people use their own means and resources to construct latrines. They also learn to wash hands with soap or ash before preparing food and eating, after the toilet, and after contact with babies' faces, how to handle food and water in a hygienic manner, and how to dispose of waste safely (Kamau, 2009). It uses community-led methods such as participatory mapping and analyzing pathways between feaces and mouth as a means of galvanizing communities into action (Petra *at el*., 2010). Community-Led Total Sanitation (CLTS) focuses on igniting a change in sanitation behaviour rather than constructing toilets. It does this through a social awakening that is stimulated by facilitators from within or outside the community. It concentrates on the whole community rather than on individual behaviours. Collective benefit from stopping open defecation (OD) can

encourage a more cooperative approach. People decide together how they will create a clean and hygienic environment that benefits everyone. Communities respond to CLTS triggering in different ways. Some are inspired to make changes immediately while others are reluctant or undecided at first but come around after seeing or hearing how other communities have changed. At the heart of the CLTS approach is the ripple effect that communities can take charge of their own destinies through various innovations (Plan International, 2010). In Kenya, CLTS was introduced in 2007, following two training workshops in Tanzania and Ethiopia and has now been rolled out in all 8 Development Areas where Plan operates including Ganze (Musyoki, 2007). The first Open Defecation Free (ODF) village was Jaribuni in Kilifi Ganze Sub County in November 2007 while others included Manera village in Homa Bay Ganze Sub County and Kochogo village in Nyando Ganze Sub County (Otieno, 2010).

In 1998, the Tanzania Partnership for Child Development carried out a study in the Lushoto Ganze Sub County of Tanzania (the Lushoto Enhanced Health Education Project (LEHEP), focusing on worm infection and personal hygiene, involving teacher-led, innovative and active, participatory health education methodology. A randomly selected group of schools was chosen to implement the project and compared with a set of randomly selected schools that were not adopting the LEHEP approach. An evaluation of the program offered good evidence of improved knowledge and practices in the intervention schools, but not in the control schools, particularly with reference to the provision of safe drinking water, water for hand washing, general environmental cleanliness, and health awareness. At the outset of the project, no schools provided drinking water or water for hand washing after using the latrine. By the end of the first year, all schools in the intervention area were doing both. A follow-up survey 15 months after the end of the project year found that many of the healthy behaviors adopted in the intervention schools were still maintained (Lansdown and Lancaster, 2001).

Improving sanitation and water supply in LMICs is clearly important for reducing rates of sanitation related diseases (Wolf *et al.,* 2014). There is also, however, a role for education promoting optimal use of the facilities available, although evidence

regarding the impact of such education is limited and inconsistent. Positive results were obtained, for example, in a school-based study in rural China, in which an educational intervention increased knowledge and reduced rates of infection with soil-transmitted helminths (Bieri *et al.*, 2013) and in a study in Zaire in which an educational intervention reduced the incidence of diarrhoea in young children (Haggerty *et al.*, 1994). Negative results have also, however, been reported.

According to Luby *et al.*, (2007) and colleagues who studied hand washing behaviour in 347 households from 50 villages across rural Bangladesh. The researchers compared a non-intervention control group with communities that were part of a large hand washing, hygiene/sanitation, and water quality improvement programme — Sanitation, Hygiene Education and Water Supply in Bangladesh (SHEWA-B), organised and supported by the Bangladesh Government, UNICEF, and the UK's Department for International Development (DFID,1998). They concluded that washing of hands with soap, or simply rinsing hands without soap prior to preparation of food can reduce the occurrence of diarrhoea in children.

Low rates of handwashing after defecation have been observed in low- and middle-income countries (LMICs) such as Ghana (Scott *et al.,* 2007). A study investigating bacterial hand contamination amongst Tanzanian mothers highlighted the difficulty of avoiding contamination where good water and sanitation provision is lacking (Pickering *et al*., 2011). A 27% reduction in the risk of diarrhoea was identified in Eritrean households where a toilet facility was available (Woldemicael, 2000). Active participation in rural sanitation and hygiene interventions strongly correlates to improved sanitation and hygiene outcomes (Ajanga *et al.,* 2006, Kleemeie, 2002).

In addition to limiting pathogen transmission in the public domain—such as at schools—school-level WASH interventions may also reduce community disease burden and improve hygiene knowledge. One study in Kenya found that in water-scarce areas, school-based WASH interventions that included improvement in water supply reduced diarrhoea among school students' siblings under the age of five who were not attending school (Dreibelbis *et al.,* 2014). The authors suggest this could be due to diffusion of improved hygiene practices and behaviours in both home

environments and community, or interruption of pathogen transmission in school contexts thereby reducing exposure and transmission in domestic environments (Dreibelbis *et al.,* 2014). Another study in Kenya documented transfer of knowledge from school students to their parents, identifying increased parental awareness and household use of water treatment with flocculent disinfectant following student hygiene education and provision of water treatment products to students, improved household water treatment practices were sustained over one year (Blanton *et al.,* 2010). However, based on their study in Burkina Faso, Erismann *et al.,* (2017) warn that although children can promote health messages to family members, effective behaviour changes among family members is more difficult to achieve due to the challenge of changing practices and the broader constraints that limit improved behaviours (e.g., water scarcity).

2.8. Conceptual Framework

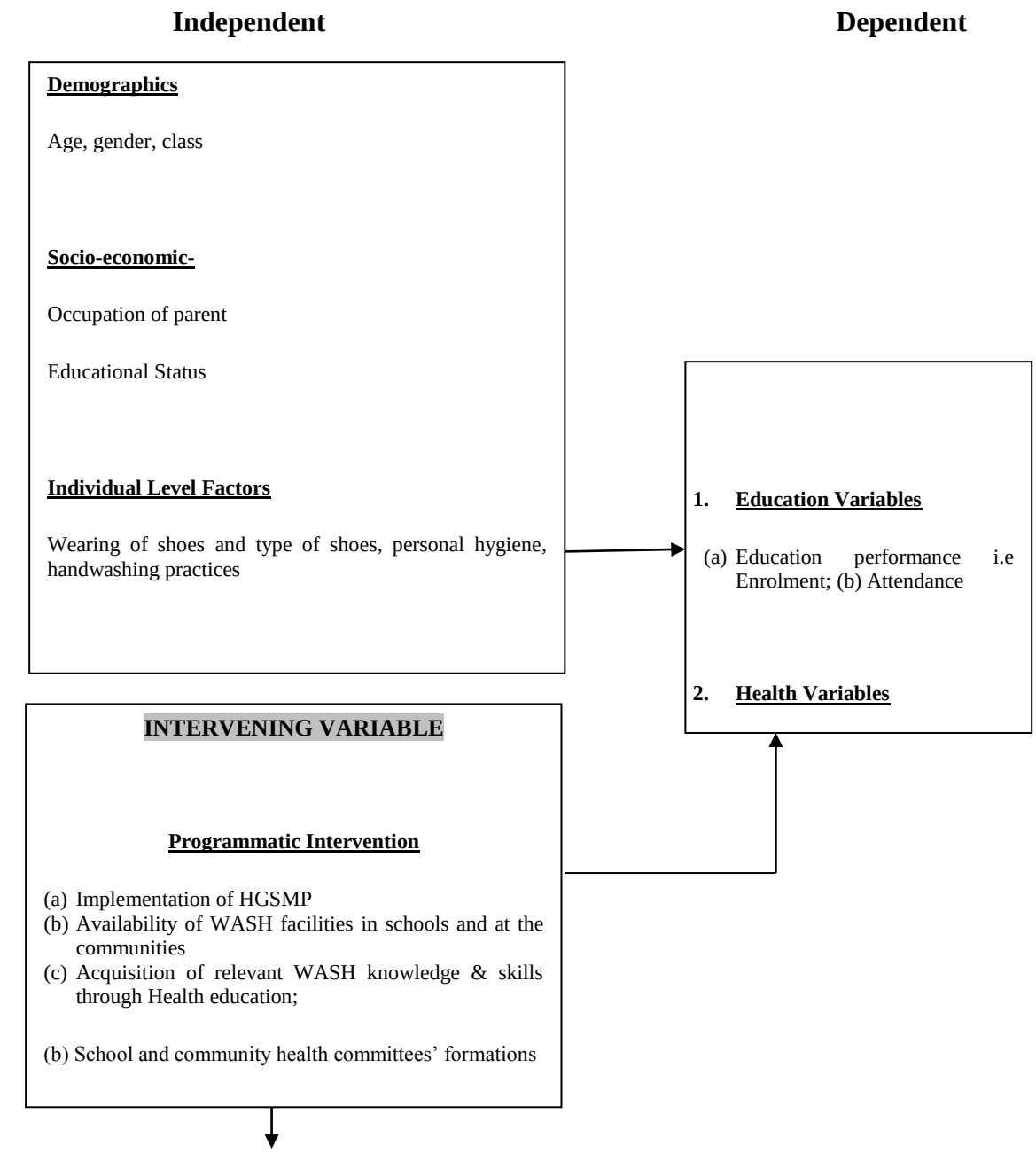

Figure 2.1: Conceptual Frame Work

CHAPTER THREE

MATERIALS AND METHODS

3.1 Study Area

The study was conducted in the 4 divisions of Ganze Sub County, Kilifi County, namely, Bamba, Ganze, Vitengeni and Jaribuni. The geographical coordinates are 3° 32' 0" South, 39° 41' 0" East and Altitude (feet), 830. Ganze has a population of 137,385 Citizens, with the males accounting for 62,868 (45.6%) and females accounting for 74,517 (54.4%) of the total population (KNBS, 2013) It is located in the North-West Coast of Kenya, and has semi-arid vegetation with rainfalls in the months of May and August and stretches on a 3,000 km^2 surface. (Hansad, 2006). Ganze Sub County is a semi arid area where horticultural crops are produced using drip irrigation system while food crops and livestock feeds are produced using water conservation structures (Ketiem *et al.,* 2007).

Ganze is a town within the larger Kilifi County with the predominant inhabitants (80%) being from the Mijikenda groups (mainly Giriama and Chonyi) (Wekesa *et al.,* 2003). The area falls within the Arid and Semi-Arid (ASAL) regions of Kenya where communities have inadequate sources of safe water which is worsened by the successive rain failure over the years (World Vision, 2010). Ganze is classified among the poorest areas in Kenya (Kenya National Assembly, 2006). It is estimated that more than 90%, 85% and 80% of the population living in Bamba, Ganze and Vitengeni Division respectively live below the poverty line (KNBS, 2013) and majority of the people are not able to access basic needs such as food, shelter, clothing, health, water and education. Factors influencing this include climate and low levels of education. Severe drought and poorly distributed rains have affected large areas of the marginal agricultural Ganze Sub County leading to a devastating food shortage that has dealt a heavy blow to access to and availability of food for most of the residents of the Ganze Sub Countys that has also continued to post poverty indices of up to 66.1% in the last five years. This has been compounded by the lack of adequate water to meet domestic and livestock needs leading to households trekking for up to 20Km return, to fetch water (World Vision, 2010).

Ganze constituency has the highest share of residents with no formal education at 45%. The constituency is 9 percentage points above the county average (KNBS, 2013). The area has a total of 125 primary schools, with 48 primary schools implementing the government led Home Grown School feeding Programme though it has low primary and secondary school enrolment rates (Hansad, 2006). In Ganze Sub County alone, assessment findings by the Bamba indicated that only 5% of the community had access to sanitation and the average walking distance to watering points is 5Km to 12Km. The method of drawing water mainly from open pans and dry riverbeds adds to contamination. This situation has lead to increased incidences of water borne diseases such as Cholera in June and July 2009 that lead to 5 confirmed deaths and 81-suspected cases in August. Kilifi, Ganze and Kaloleni area have experienced intermittent droughts for over ten years (World Vision, 2010).

Access to health services is still a challenge in some of the parts of the County and in some cases the patients have to travel for long distances as they seek for health services. Prevalent Diseases include**,** HIV/AIDS, Malaria, Diseases of the digestive System, diabetic cases, Cases of cancer have been on an increasing trend (County Government of Kilifi, 2017).

Map indicating the Study Area

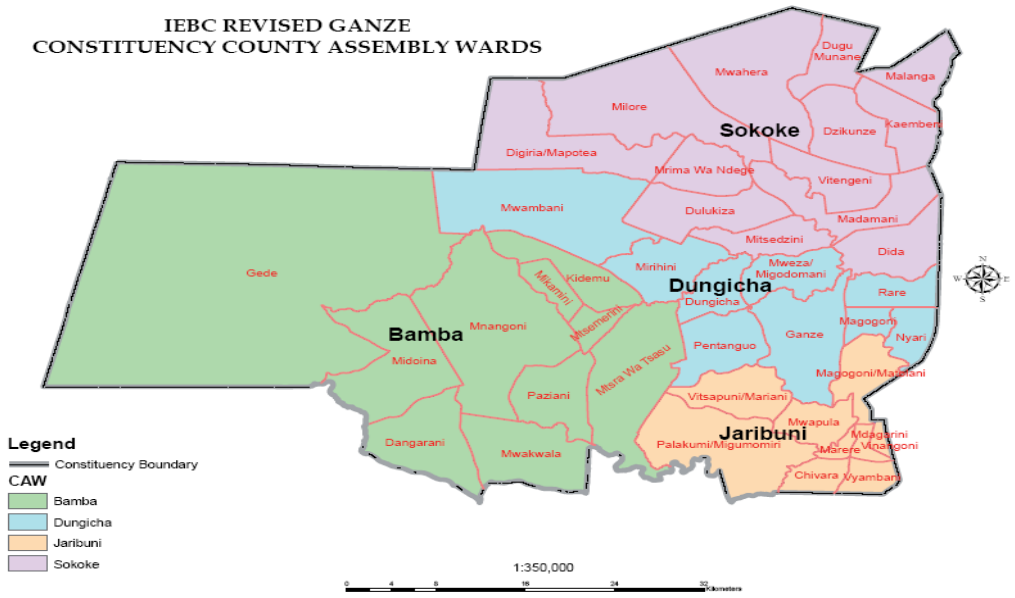

Figure 3.1: Map of Ganze Sub County showing the study area

3.2 Study Design

This was a comparative cross sectional study adopting quantitative and qualitative approaches. It entailed surveying schools implementing Home Grown School Meals Program (HGSMP) and comparing the same variables with schools not implementing Home Grown School Meals Program. Randomization will be done across the 24 schools and 120 pupils selected from each arm of the study. Data was compared from both arms of the study for children aged between 5-15 years and that from their guardians.

Focus group discussions included parents of the selected pupils. Three parents/guardians of the sampled pupils were selected from each school within each of the 4 divisions, giving a total of 12 participants per session per FGD. It also involved In-depth interviews (2 KIIs per division in the 4 divisions) with key informants such as quality assurance officers, agriculture extension officers, public health officers and local administration and 1 official from each relevant ministries within the county.

3.3 Sample size determination

The sample size calculation was based on a formula described by Demidemko, 2008, for a comparative study. Assuming that the school feeding program would result in a 10% change in all outcomes (Cohen, 1998 for small effect size), 80% power to detect the change, 5% level of precision, 80% response rates, the formula below result in a sample size of 470.

$$n = \frac{r+1}{r}\frac{(\bar{p})(1-\bar{p})\left(Z_{\beta}+Z_{\alpha/_2}\right)^2}{(p_1-p_2)^2}$$

Where r is the ratio of number of pupils required between the control and intervention sites, assumed 1:1. P will be average rates of outcomes set at 50% which is the maximum variation in proportion, Za is the Z score of a normal distribution (1.96) at 0.005 level of precision and Z score at 80% (0.84). P1- p2 is the effect size expected as a result of intervention. An additional 10% accounted for non-response, hence, the minimum sample size was 480. Estimated sample size for both control (120) and intervention (120) was 240. Parents (240) were paired with each pupil making 480 participants.

In this research, the sample size was determined using the formula by Fisher et al., (1998). n=Z 2 pq d 2 Where n=desired sample size.

- Z=standard normal deviate at 95% confidence level (1.96)

- P= proportion of the households target population with children under five years 15% (UNEP, 2009).

- q=1-P

- d=degree of accuracy desired (0.05) n=1.962 (0.15)(0.85/0.052 n=196

3.3.1 Inclusion criteria

- Primary school pupils aged 5-15 years.
- Head teachers of selected schools, Public Health Officers, Agricultural Extension Officers (AEO), Quality Assurance Officer (QASO) from the study area
- Parents/guardians of selected pupils
- Participants who gave written consent and assent to participate

3.3.2 Exclusion criteria

- Eligible participants unwilling to participate
- Eligible participants unwilling to give written consent to participate

3.4 Sampling Procedure

Twelve feeding schools under HGSMP were surveyed. The same number was allocated for the non feeding schools. A list of schools implementing the HGSMP were obtained and stratified per division and random sampling was used to select 12 schools as a representative number of schools. The same technique was used for non implementing schools. For ease of data collection, attempt was made to organize the schools randomly until the required sample size was reached. The school pupils (240) were then stratified according to their grade that is standard 1-8. Thereafter random sampling was done using class registers as the sampling frame and random numbers generator. Semi-structured questionnaires were administered to pupils and parents.

3.5 Study Population

The study targeted pupils aged 5-15 years in primary schools and their parents in Ganze, Kilifi County. A total of 24 schools were included. Ten pupils were selected randomly from each school, totaling to 240 participants. Parents/guardians were paired with the randomly selected pupils making a total of 480 study participants.

Once enrolled, pupils were followed home for the household survey involving their parents/guardians.

3.6 Tools of Data collection

3.6.1 Questionnaires

For the schoolbased survey, interviewer administered semi-structured questionnaires (Appendix 3) were developed and used as one of the data collection tools to elicit responses on individual and facility level factors. Interviewer based questionnaire was also administered to parents (Appendix 4). Before administration, approximately 10% of the 480 questionnaires (48 questionnaires) were pretested in schools in Chonyi location (A nearby location though not part of the study site).

3.6.2 Focus Group Discussions

Ganze has 4 divisions (Bamba, Jaribuni, Vitengeni and Ganze). In each school, parents/guardians to the pupils were included in the FGDs (2 male, 2 female group). A total of 16 FGDs were conducted with parents, with each arm of the study having 4 FGDs. Purposive sampling was used to select FGD participants, whereby 10-12 participants participated in the discussion. The FGD sessions took 1-1½ hours. The participants were prior-informed of the objectives of the discussion and their willingness and verbal and written consent to participate was sought. A discussion guide was developed addressing the main themes of health activities, access to safe water and sanitation and knowledge, attitude and practices with regard to WASH (Appendix 5). The sessions were held at the sub chief's camp in the 4 divisions.

The principal investigator moderated the sessions with an assistant research officer being the note taker and audio recorder. Interviews were conducted in local language and back translated into English for better understanding. Upon completion, the notes were reviewed and audiotapes transcribed for analysis.

3.6.3 Key informant interview

Stratified purposive sampling technique was used to select key personalities including, school head teacher, agriculture extension officer, health officers and quality assurance officer. The Key informant interviews took place at a convenient location to the respondents.

At least 2 key informant interviews were conducted in the four administrative locations, and 3 interviews at the county level with one county officials of health, education and agriculture. A total of 11 interviews were conducted. The key informant interview guide (Appendix 6) that was developed was pre-tested and amended accordingly and used to interview the above selected participants in various aspects. The guide was used to explore school water sanitation hygiene information. The KII guide helped in exploring the insights of the real issues in regard to factors associated with water, sanitation and hygiene and selected health outcomes among pupils in Home Grown School Meals Programme from the participants. The KIIs were contacted a week prior to the interviews and preliminary information on purpose of the interview were provided. These interviews were conducted by one of the investigators at their offices or a place identified as convenient.

3.6.4 Observational checklist for assessment of hygienic standards

An observational checklist (appendix 7) was used to evaluate the basic practices with regard to water sourcing, handling, use and sanitation. A total of 24 observational checklists were used, one per school. Safe management of excreta and type of human waste disposal (Pit latrine, sewer or septic tank) were observed. This was used to determine the association between hygiene behavior of the School age children, school water and sanitation conditions. For household survey, whenever the head of a household was present, he/she assisted in filling the checklist, otherwise any adult (18 years and above) household member assisted.

3.7 Data Management and Analysis

3.7.1 Quantitative data analysis

Once collected, quantitative data was coded and keyed-in to MS-Access. Data security was ensured by creation of back-ups in removable discs. Access of the data was limited through robust passwords to only those involved in the survey. Data was exported to Epidata Version 3.1 (EpiData Association) and Statistical Package for Social Sciences (SPSS version 20.0) for analysis. Summary/descriptive statistics was used to describe the data and generate summary tables for each level-factor. Frequencies of occurrences and percentages were noted. Correlation and Cross-tabulation analysis were used where applicable to establish the existence and nature of any relationships between variables being observed. Inferential analysis was used to establish different relationships with diarrhoea occurrence. Regression model was used to assess the association of intervention controlling for confounding factors. Results were presented in frequency distribution tables, charts and graphs. Differences between the parameters of estimate was deemed statistically significant at $p < 0.005$.

3.7.2 Inferential Analysis

Mixed-effect regression model was used for Univariate comparisons of changes between the intervention and control groups. Regression method for clustered data or multilevel models was used to adjust for confounding pupil variables such as age, gender and existing health conditions. Multiple regression model was used to assess the effect of intervention controlling for confounding factors.

3.7.3 Multiple Regression Models

The main objective of the study was to assess water, sanitation and hygiene practices as predictors of diarrhoea occurrence among pupils in schools implementing and non-implementing Home Grown School Meals Program in Ganze Sub County, Kenya. The multiple regression analysis was conducted through a hierarchical analysis with two tests where the first test involved testing the association of water,

sanitation and hygiene on diarrhoea occurrence. The second test involved testing the association of the confounding variables (Weather and climatic conditions and household factors) on the relationship between the independent variables and disease condition.

3.7.4 Logistic Regression Models

The study conducted logistic regression models to describe data and to explain the relationship between one dependent binary variable and one or more nominal, ordinal, interval or ratio-level independent variables. Regression method for clustered data or multilevel models was used to adjust for confounding pupil variables such as age, gender and existing health conditions.

3.7.5 Qualitative data analysis

Data collected from qualitative techniques – FGDs and KIIs were transcribed verbatim into Microsoft Word. The research team then checked the consistency of the transcripts against the audio files to ensure accuracy of the transcribed files. The cleaned transcripts were then exported into qualitative text analysis software Nvivo 10.0 (QSR, International). This software allowed the data to be coded systematically. Qualitative data was analysed using content and thematic analysis to identify emerging themes. The process of analysis involved familiarization with the data, development of initial codes based on the research questions and issues emerging from data, refinement of codes and their allocation to broad themes. Analysis of the various themes were then undertaken to help in exploring the associated factors. The qualitative results collected through the observation schedule was analyzed using themes, patterns and content. Patterns derived from observation schedule was summarized and results are presented in verbatim form.

3.8 Ethical Consideration

Approval to conduct this study was sought from Scientific Ethical Review Unit (SERU) at KEMRI. The principle of voluntary participation for respondents was observed and persons were not be coerced into participating in the study.

Participants were free to leave the study at any point and without being expected to give prior notice. Confidentiality and anonymity were key during the survey. Information gathered from respondents were coded and unique identifiers used to conceal the identity of respondents. Consent was sought before tape recording for FGDs and KII's. The respondents were not put at risk of harm through any activity related to the survey. Any benefit accruing from this survey was solely for the community. Assent was sought for all the children/ pupils were aged less than 18 years. Pupils were given the assent forms to take home for the parents to go through a day before the actual study (appendix 1). Parents/guardians and other people in the community plus teachers were given a separate consent form as attached in (appendix 2)

3.9 Study Limitation

Since this was a cross-sectional study, it would therefore be difficult to infer causality.

3.10 Validity of Instruments

Validity of the instrument was ensured by pre-testing the questionnaires in four schools to check if the results are the same and reflect the variables under study. The researcher also ensured that biases, interest or perspectives did not influence the results.

3.11 Reliability of Instruments

The researcher's aim was to ensure consistency of the response across all the variables. This was achieved through pilot testing in four **(4)** school neighbouring the study site where 6 pupils (24) were selected and matched with the same number of parents **(24)** to find out if the questions asked are the right ones and whether the responses obtained provided answers to the research questions.

CHAPTER FOUR

RESULTS

4.1 Response Rate

The study sought to collect data from 480 pupils and parents in primary schools in Ganze within Kilifi County. However, the study did not achieve a response of 100% as there were some non-response. Out of the 480 targeted pupils and parents, 474 gave adequate information through answering the questionnaires completely and returned the questionnaires accordingly. However, 6 respondents did not give response to the study making a non-response of 1.25%. All the pupils participated in the study while 6 parents did not participate. Thus, the study realized a response rate of 98.75% as shown in Figure 4.1.

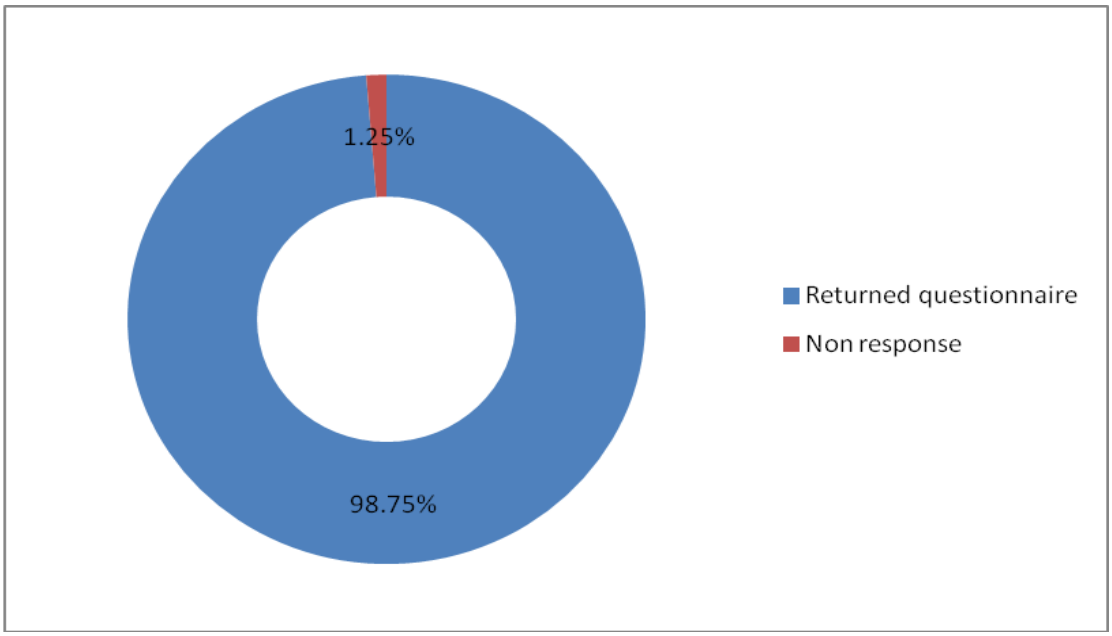

Figure 4.1 Response rate of study participants in Ganze Sub County

4.1.1 Demographic Characteristics of Pupils

Findings of the study indicated that majority (69.7%) of the pupils aged between 10 – 14 years, while those aged between 15-18 years were 25.5% and the least were aged between 5-9 years old at 5.0%. Pupils in class 5-6 formed 48.7% of the responses, followed by classes 7-8 at 46.7% while classes 3-4 at 4.6 %. The study results indicate that 53% of the pupils were male and 47% female (Table 4.1).

Table 4.1: Demographic Characteristics of Pupils in Schools in Ganze Sub County

		Feeding		Non-feeding	
		Frequency	**Percentage**	**Frequency**	**Percentage**
Distibution by Age (years)					
5-9		6	5%	6	5%
10 -14		90	70%	77	69%
15-18		33	26%	28	25%
Distribution by Class					
3-4		6	5%	5	5%
5-6		63	49%	54	49%
7-8		60	47%	52	47%
Respondents					
	Male	68	53%	58	53%
Pupils	Female	61	47%	52	47%

4.1.2 Enrollment Information of Schools

The study findings indicate that all schools studied were mixed schools. The total number of boys was higher as compared to the total number of girls, when comparisons were made. Further, the study carried out means and standard deviations for the number of boys and girls enrolled in the schools. The findings indicate that the mean for the boys enrolled was 265.92, SD = 85.642, mean for girls enrolled was 262.42, SD = 87.011. The mean value for total boys present was 242.92, SD = 69.846 and the mean value of girls present was 243.00, SD = 69.918. (Table 4.2).

Table 4.2 Number of Girls and Boys Enrolled in Primary Schools in Ganze Sub County

	N	Minimum	Maximum	Mean	Std. Error	Std. Deviation
Boys enrolled	12	189	501	265.92	24.723	85.642
Girls enrolled	12	175	493	262.42	25.118	87.011
Boys present today	12	156	400	242.92	20.163	69.846
Girls present today	12	170	414	243.00	20.184	69.918

Objective 1: To determine the proportion of school age children with diarrhoea aged 5-15 years in schools implementing HGSMP and Non HGSMP in Ganze Sub County

4.2: Proportion of pupils with diarrhea and corresponding population of schools Implementing HGSMP and WASH Programmes

Diarrhoea prevalence among children under the age of fifteen was estimated based on the number of children who reportedly had diarrhoea during the 2 weeks preceding the interview as the numerator and the overall number of children in the sample as the denominator.

Diarrhoeal cases occurring within the 2 weeks preceding the interview were reported for one in four children, giving an overall prevalence of 31.80% among pupils in schools implementing HGSMP and a prevalence of 40.20% among pupils in schools not implementing HGSMP respectively, but this difference was not statistically significant ($P = 0.22$). A total of 20.0% schools impelementing HGSMP had water and sanitation programmes while 80.0% of schools not implementing HGSMP did not have water and sanitation programme. (Figure 4.2).

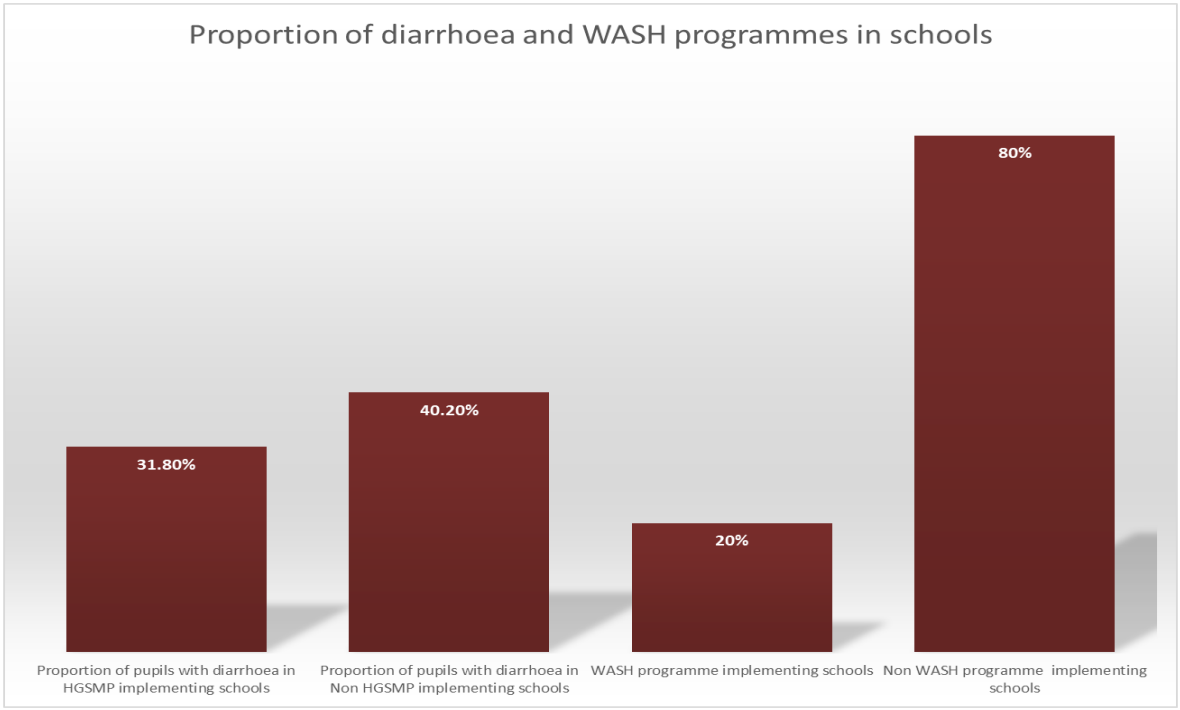

Figure 4.2: Proportion of pupils with diarrhea and corresponding population of schools Implementing HGSMP and WASH programmes in Ganze Sub County, Kilifi County

4.3 WASH Related Practices and Diarrhoea Occurrence in Schools

The variables had no statistically chi-square association with distribution on occurrence of diarrhoea in the school at 49.6% for the feeding and 50.4% for the non-feeding, hand washing at 47.1% and 52.9% for feeding and non-feeding proportions respectively. 50.3% and 49.7% for feeding and non-feeding among respondents respectively on friends washing hands in school. Latrines/toilets use among repondents from schools with feeding programs were 49.1% with 50.9% respondents from non-feeding schools. Availability of soap at hand washing station always or sometime were 60% and 40% among respondents in schools with feeding and non-feeding program respectively. For washing of hands with soap and water after visiting the toilet. Respondents indicated to have always or sometime were 49% and 51 % among respondents in schools with feeding and non-feeding program respectively. The respondents who said that water was either always or sometimes available for drinking in feeding and non-feeding school were 53% and 47%

respectively. The respondents who indicated that they use school water as source for drinking were 46% and 48% were from feeding and non-feeding program respectively. The respondenys who indicated that they was washing hands before feeding were 52.9% and 47.1% among the repondents from feeding and non-feeding program respectively. While the respondents who wash hands after feeding were 41.8% among the feeding and 58.2% among the non-feeding schools. Place of washing hands at school had tab water leading by 52.7% and 47.3% from feeding and non-feeding program respectively. Hand washbasins had 43% respondents from feeding schools and 56.3% from non-feeding schools. For schools with leaky tins, majority of the respondents were from non feeding schools at 58.2% with the rest coming from feeding schools at 41.8%. All the chi square associations were not statistically significant as P>0.005 (Table 4.3).

Table 4.3: Association between WASH related practices and diarrhoea occurrence in schools in Ganze Sub County

	WASH practices in feeding and non feeding schools with diarrhoea occurrence		χ^2	**df**	**P-value**
	Frequency (%)	**Frequency (%)**			
	Feeding	Non feeding	0.423	1	0.516
Yes	71 (50.4)	71 (50.4)			
No	50 (53.2)	50 (53.2)			
Washing Hands					
Yes	99 (47.1)	111(52.9)	0.556	1	0.456
No	15 (68.2)	7 (31.8)			
Friends Washing Hands in School					
Yes	94 (50.3)	93(49.7			
No	20(43.5)	26(56.5)	0.184	1	0.668
Use of Latrine/Toilet					
Yes	106(49.1)	110 (50.9	2.088	1	0.148
No	8(47.1)	9 (52.9)			
Availability of soap at handwashing station					
Always	18 (56.3)	32 (43.8)	0.401	2	0.818

Sometime	13 (65.0)	20 (35.0)			
Never	83 (45.9)	98 (54.1)			
Washing of hands with soap and water after visiting the toilet					
Always	19 (47.5	21 (52.5)	2.219	2	0.330
Sometime	20 (51.3)	19 (48.7)			
Never	80 (50.3)	79 (49.7)			
Availability of drinking water in school					
Always	58 (52.3)	53 (47.7)	0.836	2	0.658
Sometime	55 (52.9)	49 (47.1)			
Never	6 (35.3)	11 (64.7)			
Use of school water source for drinking					
Always	86 (49.1)	89 (5.9)	3.022	2	0.221
Sometime	12 (46.2)	14 (53.8			
Never	17 (51.5)	16 (48.5)			
Frequency for washing hands					
Before Feeding	74 (52.9)	66 (47.1)	2.098	2	0.350
After feeding	38 (41.8)	53 (58.2)			
Other	2 (100)	0			
Place of washing hands at school					
Tap water	77 (52.7)	69 (47.3	0.027	2	0.986
Hand Wash Basin	14(43.8)	18 (56.3)			
Leaky Tins	23 (41.8)	32(58.2)			

4.4 Odds Ratios

Estmated Odds Ratio indicated no level of significance among the tested variables for both feeding (HGSMP) and non feeding schools (Non HGSMP) (Table 4.4).

Table 4.4: Estimate of Odds Ratios for a comparison between feeding and non feeding schools in Ganze Sub County

The effect of HGSMP on Diarrhoea Occurrence		**Value**	**95% Confidence Interval**	
			Lower	**Upper**
No HGSMP	Odds Ratio for Member of the household suffered from diarrhoea in the last 2 weeks (No / Yes)	1.148	.323	4.074

	For cohort Age of family member who suffered from diarrhoea = 5 – 15years	1.097	.465	2.591
	For cohort Age of family member who suffered from diarrhoea = Above 15years	.956	.636	1.437
	N of Valid Cases	**51**		
Have HGSMP	Odds Ratio for Member of the household suffered from diarrhoea in the last 2 weeks (No / Yes)	.692	.379	1.261
	For cohort Age of family member who suffered from diarrhoea = 5 – 15years	.790	.538	1.158
	For cohort Age of family member who suffered from diarrhoea = Above 15years	1.142	.917	1.422
	N of Valid Cases	**189**		

4.5 Correlations

Knowledge of diseases associated with water, sanitation and hygiene when one practices open defecation had a significant dependence with the disease associated with water at a $P<0.05$. Similarly, this had a significant relationship with family members who had suffered from diarrhoea at $P<0.05$. The disease associated with water had a significant relationship with family members who suffered from diarrhoea at $P<0.05$ (Table 4.5).

Table 4.5: Correlations of WASH practices and diarrhoea occurrence in Ganze Sub County

		Schools with and without HGSMP status	Age of family member who diarrhoea	Knowledge of diseases associated with water, sanitation and hygiene practices (open defecation)	Which disease is associated with water	Member of the household suffered from diarrhoea in the last 2 weeks
Schools with and without Home Grown School Meals Program status	Pearson Correlation	1	-.018	.079	-.105	.100
	Sig. (2-tailed)		.780	.220	.106	.122
	N	240	240	240	240	240
Age of family member who diarrhoea	Pearson Correlation	.079	-.022	1	-.410**	.672**
	Sig. (2-tailed)	.220	.731		**.000**	**.000**
	N	240	240	240	240	240
Which disease is associated with water	Pearson Correlation	-.105	.019	-.410**	1	-.682**
	Sig. (2-tailed)	.106	.769	**.000**		**.000**
	N	240	240	240	240	240
Member of the household suffered from diarrhoea in the last 2 weeks	Pearson Correlation	.100	-.066	.672**	-.682**	1
	Sig. (2-tailed)	.122	.310	.000	.000	
	N	240	240	240	240	240

**. Correlation is significant at the 0.01 level (2-tailed).

Objective 3: To determine school level factors in the occurrence of Diarrhoea among school age children in schools implementing HGSMP and Non HGSMP in Ganze Sub County.

4.6 School Training on WASH

Training on health related issues at school was 82.2% for those who are trained and 17.8% for those not trained, training was significantly associated with diarrhoea occurrence at χ^2= 3.938, df = 1, P<0.005. Those trained on environmental sanitation were 27.3%, 44.4% on personal hygiene, 17.2% on behavior change and 11.1% on WASH use and practices. There was however no significant dependency between health related training and disease occurrence χ^2 = 0.507, df = 3 P>0.005. Trainings

by teachers constituted, 12.2%, health club members and 5.1% by NGOs with no statistical significance of (χ^2= 1.814, df = 3, P>0.005). Tabulation of practicing what one has been trained on was 85.4% for those who did practice and 14.6% for those who did not practice. Study indicated no significant relationship between trained on topics and diarrhoea occurrence at χ^2= 0.008, df = 1, P>0.005. Sharing of information acquired from the training was 85.3% for those who shared information and 14.7% for those who did not share though no significant dependency was revealed between those sharing information with friends/guardian (χ^2= 0.052, df = 1, P>0.005) and diarrhoea occurrence.

Display of sanitation and behavior change posters at school was 10.0% displayed in a school and posters not displayed in 90.0% schools. A quarter of the proportion 44.4% were schools with forums for disseminating hygiene messages and 55.6% were schools with no such forums. The study however revealed no significant association between water and sanitation programme at χ^2= 0.278, df = 1, P>0.005), behavior change posters at χ^2= 0.900, df = 1, P>0.005 and diarrhoea occurrence (Table 4.6).

Table 4.6: Association between WASH Trainings and diarrhoea occurrence in schools in Ganze Sub County

	WASH Trainings in Schools and diarrhoea occurrence				
	Frequency (%)	**Frequency (%)**	**χ2**	**df**	**P- value**
	Training on health related issues				
	Feeding	Non Feeding			
Yes	120 (86.3)	19(13.7)	3.938	1	**0.047**
No	74(76.3)	23(23.7)			
	Practice of what one has been trained on				
Yes	101 (85.6)	17(14.4)	0.008	1	0.93
No	63(85.1)	11(14.9)			
	Sharing of information one gets from training with guardians/friends				
Yes	102 (85.7)	17(14.3)	0.052	1	0.82
No	60(84.5)	11(15.5)			

	Sanitation posters and behavior change displayed in the school					
Yes	0(0.0)	1(100.0)	0.9	1		0.343
No	4(50.0)	4(50.0)				
	Water and Sanitation Programme					
Yes	0(0.0)	1(100.0)	0.278	1		0.598
No	2(22.2)	7(77.8)				
	Type of training received					
	Environmental Sanitation	Personal Hygiene	Behavior Change	Wash Use and Practices		
Yes	35(28.9)	52(43.0)	21(17.4)	13(10.7)	0.507 3	0.917
No	19(24.7)	36(46.8)	13(16.9)	9(11.7)		
	Delivery of training					
	Teachers	Health Club	NGO	Others		
Yes	98(81.7)	15(12.5)	5(4.2)	2(1.7)	1.814 3	0.612
No	62(81.6)	9(11.8)	5(6.6)	0(0)		

4.7 Other programmes implemented in school and Diarrhoea occurrence

Assessment of other programmes alongside WASH programmes being offered in schools included, provision of ORS which revealed no levels of significance (χ^2= 0.875, df = 1, P>0.005) with diarrhoea occurrence. Treatment of water used at schools was found to be statistically significant (χ^2= 3.938, df = 5, P<0.005) with diarrhoea occurrence. Use of micronutrients and administering of dewormers was also done in the schools at 100.0%, though the study indicated no significant dependency between micronutrients and deworming with diarrhoea occurrence

(χ^2= 0.141, df = 1, P>0.005).

Table 4.7: Association between other programmes implemented in school and Diarrhoea occurrence among pupils in Ganze Sub County

Other programmes implemented in school and Diarrhoea occurrence					
	Frequency (%)	**Frequency (%)**	**χ^2**	**df**	**P-value**
Availability of ORS					
Yes	1(0.0)	1 (100.0)	0.875	1	0.350
No	3 (37.5)	5 (62.5)			
Treatment of water used in schools					
Yes	1 (100.0)	0 (0.0)	3.938	5	**0.047**
No	1 (12.5)	7 (87.5)			
Use of Micronutrients and Dewormers					
Yes	0 (0.0)	1 (100.0)	0.141	1	0.708
No	1 (12.5)	7 (87.5)			

4.8 School feeding programme

There was a statistical significance between number of pupils with diarrhoea within the last 3 months at (χ^2= 7.000, df = 1, P>0.008). The proportion of Schools without Home Grown School Meals Program were 33.3%, with pupils aged 5-15years with diarrhoea occurrence. There was however no significant association between schools without HGSMP and diarrhoea occurrence at χ^2= 0.046, df = 1, P>0.005. Schools with Home Grown School Meals Program was 35.4% with children aged 5-15years with diarrhoea. Study findings revealed a significant relationship between schools implementing HGSMP and diarrhoea occurrence at χ^2= 1.455, df = 1, P<0.005 (Table 4.8).

Table 4.8: Association between School feeding programme and Diarrhoea occurrence among pupils in Ganze Sub County

	Implementation of School Feeding Programme				
	Frequency (%) Feeding	**Frequency (%) Non Feeding**	**χ^2**	**df**	**P-value**
Number of pupils with diarrhoea in the last 3 months					
Yes	1(100.0)	0 (0.0)	**7.000**	**1**	**0.008**
No	0 (0.0)	6 (100.0)			
Main source of water for cooking for pupils in this schools					
Yes	1 (100.0)	0 (0.0)	0.240	1	0.624
No	4 (80.0)	1 (20.0)			
Months of the year that school lack water for cooking					
Yes	1 (50.0)	1 (50.0)	0.746	1	0.381
No	1 (50.0)	1 (50.0)			
Age of Pupils suffering from diarrhoea in the school					
	5-15 years	Above 15 years			
NO HGSMP					
Yes	12(34.3)	23(65.7)	0.046	1	0.831
No	5(31.3)	11(68.8)			
Have HGSMP					
Yes	34(31.8)	73(68.2)	1.455	1	**0.028**
No	33(40.2)	49(59.8)			

Objective 4: To determine WASH Knowledge, Attitude and Practices among parents/guardians of school age children in Ganze Sub County, Kenya

4.9 Demographic information on parents

The findings indicate that 22.5% of the respondents were aged 28-33 years, 35.8% were aged 34-39 years and 32.4% were aged 40-45 years while the least were aged 46-52 years forming 9.3% of the responses. Further findings indicate that majority 88% of the parents were married while 12% were not married. On the level of

education of the parents, the study determined that 64% had attained primary school as the highest level of education while 36% had secondary education. The findings on the religion of the parents indicate that majority of the respondents 92% were Christians while 8% were Muslims (Table 4.9).

Table 4.9: Demographic information on parents/guardians of pupils in Ganze Sub County

Distribution of Parents demographics	Frequency	Percentage
Age (years)		
28 - 33	34	22.5
34 - 39	54	35.8
40 - 45	49	32.4
46 - 52	14	9.3
Gender		
Male	67	44%
Female	87	56%
Marital Status		
Single	19	12%
Married	135	88%
Level of education		
Primary	35	64%
Secondary	48	36%
Religion of Parents		
Christian	122	92%
Muslim	11	8%

4.10 Parents hand washing practices

4.10.1 Times of washing hands

The findings in the study indicate that slightly below half of the respondents 43.1% washed their hands before eating, 24.8% washed their hands after using the toilet, and 23.8% washed their hands after eating while 5.2% washed their hands before food preparation. A small percentage (0.3%) washed hands after defeacation, handling animals and rubbish (Figure 4.3).

Figure 4.3: Times for washing hands by pupils at household level in Ganze Sub County

4.10.2 Hand washing facilities at the homestead

Using observations, the study found out that 58% of the homesteads had no available washing facilities, 24.4% had only water at a designated hand washing area while 17.6% had only water near or within the latrine (Figure 4.3).

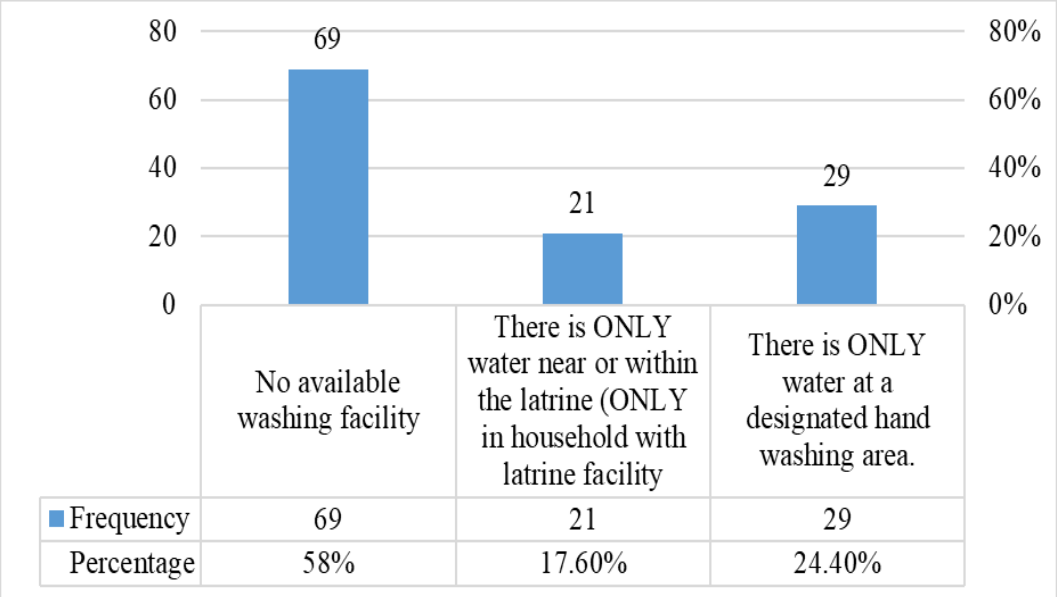

Figure 4.4: Hand washing facilities at the homestead in Ganze Sub County

4.11 WASH practices at the household level

4.11.1 Demographic distributions and significance

Household head distribution on gender was 55.4% for male and 44.6% for female with a significant association with diarrhoea occurrence (χ^2= 7.979, df = 1, P<0.005). The household distribution of people according to age, 17.1% were 15-19 years, 19.2% were 20-24 years, 22.9% were 25-29 years, 12.1% were 30-34 years, 12.9% were 35-39 years, 10.0% were 40-44 years and 5.8% were 45-49 years, however study findings did not reveal a statistical significance between age of household head and diarrhoea occurrence (χ^2= 7.988, df = 6, P>0.005). The current marital status in the study indicate those who are single were 42.5%, married were 40.8%, 11.8% were divorced. The results indicate a significant dependency between marital status and diarrhoea occurrence (χ^2 = 12.081, df = 5, P<0.005). Educational level results indicate that 2.5% had no education, 32.5% had acquired primary education, 45.0% had secondary education and 20.0% had post secondary education. The findings on religion indicates that, 94.5% were Christians, 5.5% were Muslims. Study findings indicates no significant association between education levels (χ^2= 5.992, df = 3,

P>0.005) and religion (χ^2= 3.194, df = 3, P>0.005) with diarrhoea occurrence (Table 4.10).

Table 4.10: Association between Demographic Characteristics of Parents and household diarrhea occurrence in Ganze Sub County

	Demographic characteristics of parents and diarrhea occurrence								df	
	Frequency (%)							**χ^2**		**P-value**
Gender	Yes						No			
Male	68(47.9)						74 (52.1)	7.979	1	**0.005**
Female	65 (66.3)						33(33.7)			
Age										
	15-19	20-24	25-29	30-34	35-39	40-44	45-49	7.988	6	0.239
Male	32(22.5)	26(18.3)		32(22.5)	16 (11.3)	12(8.5)	8(5.6) 16(11.3)			
Female	9(9.2)	20(20.4)		23(23.5)	15(15.3)	12(12.2)	6(6.1) 13(13.3)			
Marital Status										
	Never in Union	Married	Living with partner		Widowed		Divorced Separated	12.081	5	0.034
Male	72(50.7)	40(28.2)	7(4.9)		4(2.8)		3(2.1) 16(11.3)			
Female	30(30.6)	46(46.9)	5(5.1)		5(5.1)		5(5.1) 2(2.0)			
Highest Level of Education										
	No education		Primary		Secondary		Higher	5.992	3	0.112
Male	6(4.2)		48(33.8)		64(45.1)		24(16.9)			
Female	0 (0.0)		30(30.6)		44 (44.9)		24(24.5)			

4.11.2 Sanitation and Hygiene

Participation in any water, sanitation and hygiene programs results indicate that, 82.1% have never participated in any water, sanitation and hygiene programs, while only 12.1% had participated and 5.8% did not know. Study findings revealed no significant relationship between participation in water, sanitation and hygiene programs and diarrhoea occurrence (χ^2= 2.339, df = 2, P>0.005).

The results on practice of putting up simple toilets indicated that 24.4% had not put up simple toilets, 69.7% had put up simple toilets and 5.9% did not know. Respondents using ash to disinfect were 91.3% while 8.8% did not use ash to disinfect. Participants with latrines were 54.5% for those with no latrines and 19.6% for those with latrines. The type of latrine used was 28.8% ventilated improved latrine, 15.8% unimproved (unsanitary) latrine, 12.1% open pit latrine, 9.2% trench latrines and 34.2% others at χ^2= 4.045, df = 4, P>0.05. Study findings indicated no significant association between not having a latrine (χ^2 = 12.653, df = 12, P>0.005), putting up simple toilets (χ^2= 1.148, df = 2, P>0.005) as well as using ash as a disinfectant (χ^2= 0.071, df = 1, P>0.005) and diarrhoea occurrence (Table 4.11).

Table 4.11: Association between Sanitation and Hygiene Practices and diarrhea occurrence at the Household Level in Ganze Sub County

Gender	Sanitation and Hygiene Practices and diarrhea occurrence at the Household Level			χ^2	df	P-value
	Frequency (%)	**Frequency (%)**				
	Participated in any water, sanitation and hygiene programme					
	Yes	No	Don't Know			
Male	14 (9.9)	118(83.1)	10 (7.0)	2.339	2	0.311
Female	15(15.3)	79(80.6)	4 (4.1)			
	Putting up of simple toilets					
	Yes	No	Other			
Male	95 (67.9)	35(25.0)	10(7.1)	1.148	2	0.563
Female	71(72.4)	23(23.5)	4 (4.1)			
	Having a Latrine					
	Yes	No				
Male	15(21.1)	42(59.2)		12.653	12	0.395
Female	7(17.1)	19(46.3)				
	Types of Latrine					
	Other Unimproved	VIP Latrine	Open Latrine Latrines	Trench	4.045	4	0.4
Male	49(34.5) 25(17.6)	38(26.8)	20(14.1)	10(7.0)			
Female	33(33.7) 13(13.3)	31(31.6)	9(9.2) 12(12.2)				
	Use of Ash for disinfection					

	Yes	No			
Male	13 (9.2)	129(90.8)	0.071	1	0.789
Female	8(8.2)	90(91.8)			

4.11.3 Water management

The household distribution was 93.3% for water sources not protected, 0.8% for water sources protected and 5.8% for those who did not know. Drinking of safe water was also tabulated with 87.0% giving a no response, 11.6% giving a yes response while 1.4% did not know. 20.5% of respondents had water source within 500m, while 8.0% of respondents were 0.5-1km and 71.4% within 1-3kms. Current study did not show a statistical significance between protecting water source (χ^2= 2.370, df = 2, P>0.005), drinking of safe water (χ^2= 2.972, df = 2, P>0.005) as well as water source proximity (χ^2= 0.102, df = 2, P>0.005) and diarrhoea occurrence.

Study findings reported that household indicated lack of treatment of water before use at 100.0%. Water spent per day in a household indicate 8.8% were less than 20 litres, 82.1% were 20-37 litres, 1.7% were 38-75 litres and 5.0% were more than 75 litres, findings revealed no statistical significance with diarrhoea occurrence (χ^2 = 3.756, df = 4, P>0.005). Expenditure incurred on water usage at the household level shows 7.5% were less than Kshs.100, 85.4% were Kshs. 101-300, 2.1% were Kshs. 301-500, 2.1% were Kshs. 501-1000, and 2.9% over Kshs. 1000. There is a significant dependency between amount of money incurred per day on water usage and diarrhoea occurrence at (χ^2= 11.978, df = 4, P>0.005).

A third of the respondents (39.6%) had no knowledge of diseases associated with water, sanitation and hygiene and 60.4% had knowledge on it. These diseases associated with water were reported by respondents as 27.5% for diarrhoea, 17.5% for cholera, 13.8% for tungiasis, and 41.3% for scabies. There is a significant relationship between knowledge of diseases associated with water (χ^2 = 108.519, df = 1, P<0.005) as well as diseases associated with WASH (χ^2= 235.986, df = 3, P<0.005) (Table 4.12).

Table 4.12: Association between water practices and diarrhea occurrence at the household level in Ganze Sub County

Association between water practices and diarrhea occurrence at the household level				χ^2	df	P-value
Gender	**Frequency (%)**	**Frequency (%)**				
Protection of water source						
	Yes	No	Don't Know	2.370	2	0.306
Male	2 (1.4)	130(91.5)	10(7.0)			
Female	0(0.0)	94(95.9)	4(4.1)			
Safety of drinking water						
	Yes	No	Didn't know	2.972	2	0.226
Male	10 (14.3)	60(85.7)	0(0.0)			
Female	6(8.8)	60(88.2)	2(2.9)			
Distance to source of drinking water						
	Within 500m	0.5-1KM	1-3KM	0.102	2	0.950
Male	15 (21.1)	6(8.5)	50(70.4)			
Female	8(19.5)	3(7.3)	30(73.2)			
Amount of money in Kshs spent per day on water expenditure						
	Less than 100	101-300	501-1000	Over 1000	**11.978**	**4**	**0.018**
Male	301-500 15 (10.6)	116(81.7)	1(0.7)	5(3.5)			
Female	5(3.5) 3(3.1)	89(90.8)	4(4.1)	2(2.0)			
Maintenance of water point	0(0.0)						
	None	Water Public Works	Village Management	Community Elders	Private User Other	11.396	6	0.077
Male	14(9.9)	111(78.2)	0(0.0)	7(4.9)	6(4.2)			
Female	0(0.0) 3(3.1)	83(84.7)	2(2.0)	4(2.8) 2(2.0)	3(3.1)			
Knowledge of diseases associated with water	2(2.0)			3(3.1)				
	Yes			No		**108.519**	**1**	**0.000**
Male	95(66.9)			47(33.1)				
Female	0(0.0)			98(100.0)				
Diseases associated with WASH								
	Diarrhoea			Tungiasis	Scabies	**235.986**	**3**	**0.000**
Male	Cholera 0(0.0)		42(29.6)	1(0.7)				
Female	66(67.3)		0(0.0)	99(69.7) 32(32.7)	0(0.0)			
Amount of water in litres spent per day in the entire household								
	Less than 20			20-37	38-75	3.756	4	0.440
	More than 75							

Male	15(10.6) 111(78.2)	3(2.1) 13(9.1)		
Female	6(6.1) 86(87.8)	1(1.0)	5(5.1)	

4.11.4 KAP towards Diarrhoea Occurrence at the Household Level

Respondents response on health seeking behavior was 3.3% with no action, 38.3% buy medicine, 1.3% go to clinic/health facility and 37.9% given herbs (χ^2= 5.292, df = 6, P>0.005). Health facility treatment expenditure for diarrhoea among household was 7.5% less than Kshs. 100, 214 (89.2%) for Kshs. 101-300, 0.4% Kshs. 501-1000 and 2.9% over Kshs. 1000 (χ^2 = 6.648, df = 3, P>0.005). Causes of diarrhoea among household was 10.8% caused by rain, 21.7% dirty hands, 15.8% part of child growth, 29.2% blackmagic/witchcraft, 20.0% germs, and 2.5% dirty food (χ^2= 7.027, df = 5, P>0.005). The above attributes were not statistically significant (Table 4.13).

Table 4.13: Association between KAP and diarrhoea occurrence at the household level in Ganze Sub County

Knowledge Attitude Practices and diarrhoea occurrence							**χ^2**	**df**	**P-Value**
Action taken when a family member has diarrhoea									
	No health Action	Buy Medicine	Go to Facility	Give Herbs	6	Charcoal	5.292	6	0.507
Yes	6(4.2)	50 (35.2)	1(0.7)	55(38.7)	0(0.0)	20(14.1)	10(7.0)		
No	2(2.0)	42(42.9)	2(2.0)	36(36.7)	1(1.0)	11(11.2)	4(4.1)		
Health facility treatment expenditure									
	Less than 100		101-300	501-1000		Over 1000	6.648	3	0.084
Yes	15(10.6) 3(3.1)		122(85.9) 92(93.9)	0(0.0) 1(1.0)		5(3.5) 2(2.0)			
No									
Opinion on causes of diarrhoea									
	Rain	Dirty	Part of child Growth	Witchcraft	food	l Germs	Dirty	7.027	5	0.219

	16(11.3)	32(22.5)	25(17.6)	39(27.5) 6(4.2)	24(16.9)
	10(10.2)	20(20.4)	13(13.3)	31(31.6) 0(0.0)	24(24.5)
Yes					
No					

4.12 Inferential Analysis

4.12.1 Relationship between Environmental Factors and Diarrhoea occurrence

The study sought to determine the relationship between environmental factors and diarrhoea occurrence using regression analysis.

The study found that environmental factors explained a significant proportion of variance in diarrhoea condition, R^2= .891. This implies that 89.1% of the proportion in diarrhoea condition can be explained by environmental factors in primary schools in Ganze within Kilifi County. Other factors not covered by this study therefore contribute to 11.9%. The study found that environmental factors significantly predicted diarrhoea occurrence (β = .944, p = .000), since the p value was less than <.005 set by the study (Table 4.14).

Table 4.14 Model Summary and Coefficients tables for Environmental Factors and Diarrhoea among pupils in Ganze Sub County

Model summary	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.944[a]	.891	.890	.191

a. Predictors: (Constant), Environmental Factors

Coefficients Table for Environmental Factors and Diarrhoea		Unstandardized Coefficients		Standardized Coefficients	Sig.
		B	Std. Error	Beta	
1	(Constant)	1.613	.084		
	Environmental Factors	.632	.021	.944	.000
					.000

a. Dependent Variable: Diarrhoea Occurrence

4.12.2 Relationship between Demographic Characteristics and Diarrhoea

The study determined the relationship between demographic characteristics and diarrhoea occurrence.

The study found that demographic characteristics explained a significant proportion of variance in diarrhoea occurrence, R^2= .636. This implies that 63.6% of the proportion in diarrhoea occurrence can be explained by demographic characteristics like age and gender in primary schools in Ganze within Kilifi County. Other factors not covered by this study therefore contribute to 36.4%. The study found that demographic characteristics significantly predicted diarrhoea occurrence (β = .176, p = .000). The study therefore concluded that demographic characteristics significantly influenced diarrhoea occurrence in primary schools in Ganze within Kilifi County (Table 4.15).

Table 4.15: Model Summary and Coefficients Table for Demographic Characteristics and Diarrhoea among pupils in Ganze Sub County

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.754[a]	.636	.607	.728

a. Predictors: (Constant), Demographic Characteristics

Model		Unstandardized Coefficients		Standardized Coefficients	Sig.
		B	Std. Error	Beta	
1	(Constant)	4.699	.335		
	Demographic Characteristics	.159	.084	.176	.000
					.000

a. Dependent Variable: Diarrhoea Occurrence

4.12.3 Relationship between Behavioral Factors and Diarrhoea

Regression analysis was done between behavioral factors like personal hygiene and diarrhoea occurrence.

The study found that behavioral factors explained a significant proportion of variance in diarrhoea occurrence, R^2= .695. This implies that 69.5% of the proportion in diarrhoea occurrence can be explained by behavioral factors in primary schools in Ganze within Kilifi County. Other factors not covered by this study therefore contribute to 30.5%. The study found that behavioral factors significantly predicted diarrhoea occurrence (β = .448, p = .000). The study therefore concluded that behavioral factors significantly influenced diarrhoea occurrence in primary schools in Ganze within Kilifi County (Table 4.16).

Table 4.16: Model Summary and Coefficients tables for Behavioural Factors and Diarrhoea Occurrence among pupils in Ganze Sub County

Model Summary	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.848[a]	.731	.695	.677

a. Predictors: (Constant), Behavioral Factors

Coefficients table for behavioral factors		Unstandardized Coefficients	Standardized Coefficients	Sig.
		B	Std. Error	Beta	
1	(Constant)	1.729	.297		
	Behavioral Factors	.472	.081	.448	.000
					.000

a. Dependent Variable: Diarrhoea Occurrence

4.13 Multiple Regression

Results in Table 4.17 indicate the regression model summary showing the extent to which the water, sanitation and hygiene influenced diarrhoea occurence. From the results, the predictor variables explain 72.7% of the variation in disease condition in primary schools in Ganze, Kilifi County. This is as represented by the R^2 coefficient of 0.727. This therefore reveals that other factors not studied in this research contribute to 27.3% of the variability in primary schools in Ganze within Kilifi County.

From the results presented in Table 4.17, the change in R^2 showed a positive change where the percentage of the variability accounted for by the predictor variables went up from 72.7% to 73.7% (R^2 = .727 - R^2 = .737). Based on the coefficients, the predictor variables explain 73.7% of the variation in disease condition in primary

schools in Ganze, Kilifi County. This is as represented by the R^2 coefficient of 0.737. This therefore reveals that other factors not studied in this research contribute to 26.3% of the variability in primary schools in Ganze within Kilifi County. The model was obtained after the data was subjected to hierarchical regression test through which the initial test gave the results for the relationship between the dependent and independent variables. The final test that involved testing the association of the confounding variables on the relationship was conducted with both Weather and climatic conditions and household factors as additional variables.

Table 4.17: Model Summary for the Multiple and Moderated Model among pupils in Ganze Sub County

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.826[a]	.727	.710	.529

a. Predictors: (Constant), Water, Sanitation, Hygiene

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.826[a]	.727	.710	.529
2	.864[b]	.737	.724	.550

a. Predictors: (Constant), Water, Sanitation, Hygiene

b. Predictors: (Constant), Water, Sanitation, Hygiene, Weather and climatic conditions, Household Factors.

The estimates of the regression coefficients and the p-values for the relationship between the variables of the study are as shown in Table 4.18. From the findings, water had a coefficient (β = .521, p < .005). Sanitation had coefficients (β = .299, p < .005) while hygiene had coefficients (β = .364, p < .005). From the findings on the moderated model, water had a coefficient (β = .544, p < .005). Sanitation had coefficients (β = .342, p < .005) while hygiene had coefficients (β= .449, p < .005). Testing the influence of the confounding factors, weather and climatic conditions had

coefficients (β = .226, p < .005) while household factors had coefficients (β = .229, p < .005).

Table 4.18: Coefficients for the Multiple and Moderated Model among pupils in Ganze Sub County

Model		Unstandardized Coefficients		Standardized Coefficients	Sig.
		B	**Std. Error**	**Beta**	
1	(Constant)	.363	.087		
	Water	.532	.040	.521	.003
	Sanitation	.322	.064	.299	.011
	Hygiene	.323	.054	.364	.009
					.000

a. Dependent Variable: Disease Condition

Model		Unstandardized Coefficients		Standardized Coefficients	Sig.
			Std. Error	**Beta**	
1	(Constant)	.363	.087		
	Water	.532	.040	.521	
	Sanitation	.322	.064	.299	
	Hygiene	.323	.054	.364	
2	(Constant)	.376	.089		
	Water	.576	.065	.554	
	Sanitation	.356	.064	.342	.003
	Hygiene	.452	.057	.449	
	Weather and climatic conditions	.275	.034	.226	.011
	Household Factors	.223	.080	.229	.009
					.000
					.000
					.001

	.003
	.000
	.001
	.007

a. Dependent Variable: Disease Condition

4.14 Logistic Regression Models

The study first sought to determine the relationship between the use of latrine and age of pupils. The use of latrine was used as a dependent variable while the age of the pupils was used as covariate variable. The findings obtained indicated that there was no significant relationship between the age of pupils and the use of toilets (p = .658). The chi-square tests also confirm that age and use of toilets had no relationship as shown by the significant value of 0.854. The study also sought to examine whether they existed a significant relationship between the use of latrine by pupils and their gender. The findings indicate that there was a significant relationship between the use of a latrine by pupils and their gender (p = .000) (4.19)

Table 4.19: Logistic model for latrine use at schools in Ganze Sub County

Age and latrine use at school		B	Std. Error	Wald	df	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
								Lower Bound	Upper Bound
Yes	Intercept	3.488	2.352	2.200	1	.138			
	age	-.072	.163	.196	1	.658	.930	.677	1.280
Gender at latrine use at school									
Yes	Intercept	-17.282	.364	2255.964	1	.000			
	gender	18.935	.000	.	1	.000	167210015.819	167210015.819	167210015.819

The study found out that there was no relationship between washing of hands using soap by pupils and their age and gender. On the relationship between washing of hands after visiting the toilet and gender, p values of 0.477 and 0.671 were obtained for those who washed their hands regularly and sometimes respectively. On the relationship between washing of hands after visiting the toilet and the age of pupils, the study found that p values of 0.534 and 0.694 were obtained for those who washed their hands regularly and sometimes respectively. This confirms of no existence of a significant relationship since the p values were more than 0.05 at 95% confidence interval (Table 4.20).

Table 4.20: Logistic model for hand washing and age/gender of pupils in Ganze Sub County

Washing hands with soap after visiting the latrine		B	Std. Error	Wald	df	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
								Lower Bound	Upper Bound
	Intercept	-1.324	2.936	.203	1	.652			
Always	Gender	.481	.677	.506	1	.477	1.618	.429	6.096
	Age	-.113	.181	.387	1	.534	.893	.626	1.275
	Intercept	-1.425	2.552	.312	1	.576			
Sometimes	Gender	.252	.595	.180	1	.671	1.287	.401	4.128
	Age	-.061	.155	.155	1	.694	.941	.694	1.275

a. The reference category is: Never.

4.15 Summary of the Qualitative Results

4.15.1 Socio-demographic characteristics of respondents

A total of sixteen (16) FGDS were conducted within the 4 selected study sites. The group category comprised of youth male (12), female (12), adult male (12), and female (12). Socio demographic characteristics of participants are indicated on table 4.21.

Table 4.21 Socio-demographic characteristics of respondents for FGDs in Ganze Sub County

Description		Frequency (*N* =192)	Percentage (%)
Gender	**Male**	**98**	**51.0**
	Female	**94**	**48.5**
Age in years	**≥18**	**4**	**2.1**
	19-24	**49**	**24.7**
	25-29	**29**	**15.3**
	30-34	**30**	**15.8**
	35-39	**22**	**11.6**
	40-44	**15**	**7.9**
	45-49	**9**	**4.7**
	≥ 50	**34**	**17.9**
Education level	**Primary level**	**96**	**49.5**
	Secondary level	**62**	**32.6**
	College	**32**	**16.8**
	None	**1**	**0.5**
	Missing	**1**	**0.5**
Religion	**Christian**	**188**	**97.9**
	Muslim	**2**	**1.1**
	Non- practising	**1**	**0.5**
	Missing	**1**	**0.5**
Occupation	**Farming**	**83**	**42.6**
	Business	**14**	**7.4**
	Casual labourer	**53**	**27.9**
	Teacher	**3**	**1.6**
	Student	**26**	**13.7**
	Driver	**2**	**1.1**
	Mechanic	**4**	**2.1**

	Housewife	**3**	**1.6**
	Social worker	**2**	**1.1**
	Missing	**2**	**1.1**

4.15.2 Assessment of Knowledge and Awareness

4.15.2.1 Avenues of information

The FGDs with parents revealed that the majority of the participants had heard about water sanitation and hygiene before. The sources of information included schools, posters, radio and community gatherings (*baraza*), with the health workers the most mentioned. One respondent noted,

> 'I heard about it through the community health workers, they normally visit us a lot especially when there are barazas at the chief's camp for health talks.'

4.15.2.2 Preferred sources of information

With regard to spreading information about diarrhoea and jiggers, participants mentioned a few sensitization methods that they felt would work best in their community: a 40-year-old female farmer from Ganze said:

> 'Door to door is best because the village elders know each and every one of their village and they can do it easily'

A 28-year-old youth male participant in Vitengeni said:

> 'I wish they can use billboards in those rural areas it is the best one because you see as you walk.'

4.15.3 Knowledge about WASH related diseases

Youth female and male FGDs indicated that some of the common diseases in the area were (as mentioned by participants), Diarrhoea, Malaria, Typhoid and jiggers and the main symptoms (as mentioned by participants), loose stool, blood in stool at times, stomach ache, headache, dizziness and joint aches. Our study revealed that the

majority of the participants felt they did not have adequate information about diarhoea. A female youth business owner said:

> ‘Some are informed while others are not, depending on the literacy level. If you didn't go to school then you can't be informed about it.’

A 26-year-old male youth said:

> ‘Personally, I don't think that I know the difference between diarrhoea and typhoid, because I see the symptoms as the same.’

Some of the participants had some information on how the diseases can be caused and prevented. For example, a youth female said:

> ‘I think by washing hands before eating, and after visiting the toilet can help in prevention.’

A male youth observed:

> ‘For example, if I mix ORS with water and drink when having bouts of diarrhoea.’A male participant from Jaribuni indicated that ‘poor sanitation is to be blamed for diarrhoea and other sanitation related infestation’.

But lack of knowledge also turned out to be expensive for the community economically. This was echoed by one of the male respondents from the KIIs who reported:

> ‘That due to lack of knowledge the community do face problems when they are infected with bouts of diarrhoea for it often causes death and also a lot of energy is lost in terms of finances, much time is consumed hindering one from participating in economic growth and it impairs growth in children.’

4.15.3.1 At risk groups

It was the general view of participants that children are mostly affected and more at risk compared with others from the FGDs and KIIs. They attributed this to many

extracurricular activities like playing and not observing hygiene as explained by a female respondent,

> 'I think its children since they eat before washing hands and further eat fruits that have not been washed'

A business person echoed this,

> 'As for me, I think anybody can get infected by this disease (be it diarrhoea), whether it's a child or an adult and especially those people who don't observe hygiene'

A few however, bearing in mind gender roles, felt that a particular gender was more at risk

> 'For me, if I may reflect back on how we grew up, men…, male children were the people who were really affected by diarrhoea, The reason why we are mostly affected is that we expose ourselves in areas having water when we go to graze animals or when we are playing while girls are always at home and even go to the bush for long calls, we even bathe and drink the river water while grazing'

FGD youth female indicated children as the group that tends to get the disease more with challenges faced from the disease (as mentioned by participants), Weakness, unable to eat, going to the toilet many times, some people become bed ridden, though adult male FGDs showed that everybody was at risk of getting the disease.

4.15.4 Assessment of attitude

One of the factors that the participants mentioned and that could pose as a barrier in WASH related disease control is the attitude of community members toward those infected with the diarrhoea. A male participant said,

> 'They can judge you and mistake it for other diseases like HIV'

A female participant noted,

> ‘When you suffer from those symptoms like diarrhoea and swollen stomach, they think that you are HIV positive’

A female youth in Vitengeni said,

> ‘I think when you become sick, you need to seek medical attention to ascertain what really you are suffering from’

The youth female FGDs thought that toilets should be build, they should come together and build toilets in the community and that the government needs to be more involved by building more latrines, taking care of existing latrines and educating the community on health education more often. A female clerk in Ganze said,

> ‘Our people don’t like using latrines, they would rather use the bush and this spreads diseases like diarrhoea’

Local and international NGO’s have been reported to play a role in the building of sanitation infrastructure. A KII with a headteacher from Bamba indicated that *‘NGO’s*

> ‘Like plan international have been buiding toilets and handwashing facilities for the schools though they are not sufficient for all pupils in the school.’A male youth aged 30years indicated that ‘there is a common borehole where we get clean piped water though it’s far and the waterpoint is used by the whole community’

4.15.4.1 Seeking treatment

The majority of the participants thought that treating jiggers and diarrhoea are very expensive from the FGDs and the KIIs. The youth female discussions indicated that seeking treatment is costly and its time consuming and the health facilities are very far from the homesteads. Participants indicated visiting the health facility for treatment and drugs but some opted to use herbal treatment, which they found cheap.

Community members opted to optimize the door-to-door campaign by the health worker as reported by a male administrator,

> ‘The community have advanced a step forward in the recent days out of the tireless activities of our community health workers who go door to door to campaign and teach our community on general health issues and even give our children and adults dewormers and ORS’

A female participant in the KIIs reported that,

> ‘Hospitals are really far and at times we have to carry patients on bikes to the hospitals and it’s very expensive and uncomfortable.’

4.15.4.2 Susceptibility and severity

More than half of the participants were of the opinion that diarrhoea is a serious disease, and that improper sanitation exposed them to infection. These sentiments were reflected in the FGDs by a female youth noted:

> ‘Where I come from it is a problem because, people do not go to the toilets and they openly defeacate in the bush. People also swim at the local there and at the far end there is a bush that people use for defeacation while at the river’

A female respondent elaborated,

> ‘Diarrhoea is not a joke, reason being that it also brings with it painful stomach, loose stool and lose of wait. Therefore, it comes along with many infections to your body. You are always weak even standing up to walk becomes a problem’

Similar thoughts were echoed by a male administrator who noted,

> ‘It's very serious because any disease can kill if not treated in time, so according to me diarrhoea can kill and therefore it's a very serious disease’

4.15.5 Assessment of Practice

4.15.5.1 Water and use of sanitation facilities

A number of local and international NGOs like world vision and Plan International were termed as some organisations with activities geared towards WASH.This was reiterated in the KIIs by one of the local male administrators reported,

> ‘A number of handwashing facilities and water points including boreholes and water tanks in the community and within the schools have been built by plan and world vision though maintenance have been very poor’

A KII with a male respondent elaborated,

> ‘Maintenance of the water points is even more difficult since the NGOs normally leave at some point without proper sustainability plans in place’

Scarcity of water and lack of treatment of water before use was also linked to infections related to sanitation. FGD with female respondent noted,

> ‘We don’t normally get enough rainfall here and clean tap water is scarce, we are forced to get water from the nearby river then I boil for drinking but there are those who drink the water as it is hence they start feeling sick with diarrhoea or typhoid’

FGDs with adult male indicated that most of the community members thought that they are the main cause of spreading the diseases. For example, one of the male respondent said,

> ‘The community in large numbers do not use pit latrine and they usually dig shallow holes which after filling they take a long time to prepare another one’

A male village elder also lamented,

> ‘The community around me do not use toilet especially children and in most cases they forget to wash their hands after defeacating which is a link to diarrhoea’

This was further echoed by one of the respondent from the KII who reported,

> ‘There is need for the community to be sensitized on proper sanitation practices since many do wash hands after visiting the toilet’

A KII with a chairperson in one of the organizations reported,

> ‘Most of the community members have no toilets, hence they go to the open fields to relieve themselves’ and that the community water points are also scarce and unprotected’

A KII with a male local administrator to the area also lamented,

> ‘I would say that the community within my area of jurisdiction are conversant with using toilet for about 60% residential do each have a toilet facility only that some sense of hygiene need be conveyed to many because about 40% of these people do not remember to wash their hands after visiting the toilet before eating’

CHAPTER FIVE

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Discussion

5.1.1 Proportion of diarrhoea among pupils

Diarrhoeal cases occurring within 2 weeks preceding the interview were reported for one in five children, giving an overall proportion of diarrhoea occurrence at of 36.0% (n = 240). Specifically schools not implementing HGSMP had a proportion of 40.20% of diarrhoea occurrence among pupils as compared to 31.80% of diarrhoea occurrence among pupils in schools implementing HGSMP respectively. This is higher compared to other studies in secondary cities of sub-Saharan Africa that reported lower rates of diarrhoea: 23.6% in a 2008 survey in Nouakchott, Mauritania, 14% in 2006 in Yopougon, Côte d'Ivoire, and 13.5% in 2010 in other districts of Nouakchott, Mauritania (Touray *et al.,* 2012, Sy *et al.,* 2008). In the current study, prevalence was slightly higher among boys than girls, but this difference was not statistically significant. In concurrence, diarrhoea was more frequent among boys in a study from Sudan (Siziya *et al.,* 2013).

Study findings registered a significant association between school age children below 15years affected by diarrhoea. Findings concur with a study by Walia *et al*., (1989),which posted that poor sanitation status is an important factor responsible for high diarrhoea morbidity due to ease of transmission of infection in relation to age (Walia *et al.,* 1989). Findings also concurs with a study by Eshuchi (2016) which reported that incidence of infectious diseases among school age children in developing countries is very high (Eshuchi, 2016).

5.1.2 Individual level factors influencing diarrhoea occurrence

Current study findings posts that demographic characteristics like age significantly predicts diarrhoea occurrence. This concurs with a study by Manunebo *et al.,* (1994), which revealed that a child's risk of diarrhoeal attack is associated with age. These

results reveal that the age of a child presented a risk for childhood diarrhoea. Demographic actors are key predictors of student absence from school (Marmot and Bell, 2016). Children between the ages of 5 to 15 years were more likely to contract diarrhoea. This could be attributed to the stage when the child is interacting with his environment hence vulnerability to contamination indicating poor and unhygienic environment. These findings confirm earlier studies by Tagoe (1995) which found an association between the age of the child and diarrhoeal incidences (Tagoe, 1995). It is evident that, age of child is more likely to influence childhood diarrhea (Magadi, 2000).

The current study further revealed that behavioral factors significantly predicted diarrhoea occurrence. This concurs with a study by Curtis (2003), that indicated that effectiveness of interventions is usually measured by changes in behaviours, on the assumption that change in behaviour will usually be reflected in reduced morbidity and mortality (Curtis, 2003). This current finding also concurs with a study by Rao *et al.,* (2006) on personal hygiene, which indicates that perception strongly influences one's hand washing beliefs and practices. In addition to having proper resources and facilities, hygiene practices are heavily influenced by students' behaviour towards hygiene (Rao *et al.,* 2006). The question of whether health education and hygiene promotion actually leads to reduction in disease burden in the community has always elicited mixed results. Findings contracts reports from Bawku West in Ghana, which noted that despite many efforts by both government and non-governmental organizations in providing water and sanitation infrastructure, health education and hygiene promotion, little had been achieved in reduction of water and sanitation related diseases or improvement in hygiene behaviours. The function of hygienic behaviour is to prevent the transmission of the agents of infection (Curtis, 2003).

The current study posts a significant relationship between the use of a latrine by pupils and their gender. This concurs with a study by Joshua *et al.,* (2017) which revealed some evidence suggesting facility dirtiness may deter girls from use, but not boys, these relationships provide insight into the complexity of factors affecting pupil toilet use patterns, potentially leading to a better allocation of resources for school sanitation, and to improved health and educational outcomes for children.

Studies by Mathew *et al.,* (2009), Njuguna *et al.,* (2008) indicate that usage of school toilets is associated with their level of cleanliness. There is some evidence that maintained and clean latrines can reduce absence in school-aged children (PCD/HGSF, 2011, Pengpid and Peltzer, 2012), but a few studies found that school-based WASH interventions had no impact on student attendance regardless of gender (Caruso *et al.,* 2014, Oster and Thornton, 2009). A study by Freeman *et al.,* (2015) also concurs with these findings that for school sanitation factors, the type of toilet, toilet conditions, and pupil to latrine ratio were all associated with overall or worm-specific infections (Freeman *et al.,* 2015). Greene *et al.,* (2012) also asserts that the addition of new latrines to intervention schools significantly increased E. coli risk among girls, with a non-significant increase among boys (Greene *et al.,* 2012).

5.1.3 School level factors influence on diarhoea occurrence

Current study indicated a positive relationship between schools implementing Home Grown School Meals Programme and diarrhoea occurrence. Findings further reveal that only 20% of the sampled schools implemented any form of WASH programmes. A study by Erismann *et al.,* (2017) concurs with the findings that indices of undernutrition did not decrease in intervention schools (Erismann *et al.,* 2017). This is also in tandem with studies that reported disease-related outcomes that found reductions in diarrhoeal disease and other hygiene-related diseases, such as respiratory illness and soil-transmitted helminths, among students at intervention schools (Langinger, 2011, Pengpid and Peltzer, 2012). It further concurs with a study by Alexander *et al.,* (2013) which posted findings that intervention schools made significant improvements in provision of soap, handwashing water, treated drinking water, and clean latrines (Alexander *et al.,* 2013). A study by Migele *et al.,* (2007), also concurs with these findings that diarrhea incidence rates decreased after implementation of the intervention (Migele *et al.,* 2007). However, other interventions like provision of micronutrient and deworming posted no level of significance.

Current study findings indicate a significant relationship between training on health related issues at school and diarrhoea occurrence. The current findings concurs with a similar study undertaken by Sidibe and Curtis (2002) to determine whether a large 3-year hygiene promotion programme in Bobo-Dioulasso, Burkina Faso was effective in changing behaviours associated with the spread of diarrhoeal diseases through capacity building and trainings at various levels, some notable gains included safe disposal of children's stools, that increased from 80% at pre-intervention (1995) to 84% post (1998). There was reduced prevalence of diarrhoea and improved general health status of children aged less than five years (Sidibe and Curtis, 2002). Based on the current findings right messages can be developed targeting the high risk group hence contributing towards WASH prevention and control. There is evidence that health message-based hygiene promotion efforts alone are not always sufficient to motivate behavior change among adults in developing countries, but it is not known whether this strategy improves hygiene practices among children (Curtis *et al.,* 2003, Biran *et al.,* 2011). However, Njuguna *et al.*,(2008) in an evaluation of an intervention in Kenyan schools found no evidence that teacher trainings and school health club activities improved handwashing behavior (Njuguna *et al.,* 2008), though this concurs with findings from the current study that revealed a no significant association between persons delivering the health trainings at school and diarrhoea occurrence. The current study also concurs with findings from Biran (2011) which further asserts that health-education package increased students' knowledge of STHs, improved hygiene behaviour, and reduced STH infection by 50% within 1 school year in a cluster randomized trial (Biran *et al.,* 2011).

The current study reveal that environmental factors significantly predicts diarrhoea occurrence, which suggests that most of the diarrhea cases are influenced by inadequate environmental factors. This concurs with study by Heller *et al.,* (2003) which indicated that effects of improved environmental sanitation conditions and hygiene practices on preventing occurrence of diarrhoea among children under five years included washing and purifying fruits and vegetables, domestic water reservoir conditions, faeces disposal, presence of vectors in the house and flooding in the lot.

The current study however revealed no significant relationship between hand washing and diarrhoea occurrence.

Study findings revealed that weather and climatic conditions also significantly influence disease occurrence. This concurs with a study conducted in Burkina Faso during the cold, dry season (December 2009–February 2010) which found a rotavirus prevalence of 63.8% among children under the age of five. The same study showed that up to 90% of all diarrhoea cases in this population group were related to rotavirus (Nitiema *et al.,* 2011). In view of these findings, more attention should be given to exploring diarrhoea seasonality and the influence of climatic parameters, in order to more effectively prevent and manage diarrhoea in schools and the communities at large.

The current study indicates no significant relationship between school provision of handwashing facility as well as availability of soap at the handwashing point and diarrhoea occurrence. The current findings concurs with a study by Bowen *et al.,*(2007) that posted no significant effect on diarrhoeal illness after handwashing intervention in China (Bowen *et al.,* 2007). This findings however contradicts findings by Grimes *et al*., (2017) which indicates that health benefits of improved WASH infrastructure and resources in schools may depend on consistent availability of soap and water for handwashing (Grimes *et al.,* 2017). This finding further contradicts with a study by Jae-Hyun Park *et al.,* (2010) on hand washing practice conducted in Korea that noted out of the 942 students who participated there was a 30.3% increase in hand washing an improvement of one carried out one year earlier. Targeted interventions aimed at increasing hand washing practice should be encouraged across all communities including schools. Study findings revealed no significant association between availability of water and diarrhoea occurrence. Another study by Bowen *et al.,* (2007) by also contradicts this findings since it posted that provision of standard and expanded hand-washing promotion program and soap in schools was associated with significantly reduced days and episodes of student absence (Bowen *et al.,* 2007).

5.1.4 Knowledge, Attitude and Practices on WASH among parents/guardians and its influence on diarrhoea occurrence

At the household levels, demographic characteristics such as marital status and age revealed levels of significance. Socio-cultural and contextual factors such as, low socioeconomic status, low education levels, social instability and gender disparities can lead communities to compromise in hygiene and sanitation issues. There are several socio economic and cultural cross cutting factors that affect sanitation levels within the households. The current study findings concurs with a study by Dreibelbis *et al.,* (2013), which registered that demographic features (e.g., gender, SES, household characteristics) were important predictors of absence of children in schools (Dreibelbis *et al.,* 2013). Though the study indicated no significant association between religion as well as educational level and disease occurrence. The findings do not concur with several studies which posted that demographic variables play a role in diarrhea prevalence. For example, children of more educated mothers tend to have lower diarrhea prevalence, irrespective of water and sanitation conditions and this is due to better understanding of proper hygiene (Ahiadeke, 2000). Other studies have found that child diarrhea incidence was significantly lower when mothers had secondary education, compared to mothers with no education. Mother's education was a significant determinant of diarrhea (Ahiadeke, 2000). The current findings further revealed no significance in putting up simple toilets (p= .563) and diarrhoea occurence. This finding is in line with a recent study from Ethiopia, where no association was found between sanitary facilities and the occurrence of diarrhoea (Gebru *et al.,* 2014). Conversely, another study from Ethiopia found that the availability of a latrine was negatively associated with diarrhoea after controlling for potential confounding factors (Dessalegn *et al.,* 2011).

Study findings indicates a significant relationship between knowledge of diseases associated with water, sanitation and hygiene and diarrhoea occurrence. This findings concurs with studies on WASH knowledge, attitudes and hygiene behaviours that reported evidence of positive change among students in intervention schools including hand-washing with soap or sanitizer (Greenhalgh *et al.,* 2007), improved knowledge of WASH-related diseases, and improved hygiene habits

(Langinger, 2011). It also concurs with a study by Hetherington *et al.,* (2017) which reported statistically significant improvements in self-reported hygiene behaviour and knowledge, increased WASH communication (Hetherington *et al.,* 2017).The theoretical foundation in the Health Belief Model (HBM), integrates people's knowledge, perceptions, attitude and practices to a disease in establishing trends of infection (Gelaw *et al*, 2013). Findings are also intandem with a study by Blanton *et al.,* (2010), which posted that before and after their survey, the program resulted in pupil-to-parent knowledge transfer around water treatment and increases in household water treatment practices that were sustained over 1 year and reduction in student absentee rates.The current findings however revealed no level of significance between pupils sharing information with friends/guardian and the frequency of sharing information with friends/guardian with diarrhoea occurrence.This however does not concur with findings from Karon *et al.,* (2017), which revealed that increased student communication with parents about hygiene, improved student WASH knowledge, increased rates of student handwashing after defecation, and lower reported rates of open defecation (Karon *et al.,* 2017).

This study reveals a significant relationship between diseases associated with water and diarrhoea occurrence. In the developing world today, sanitation related diseases specifically water borne are among the leading causes of child mortality and it has been shown that the simple acts like access to clean and safe water can decrease diarrhoea risk by almost half. Findings concurs with a study by (Chard *et al.,* 2018) which posted, that water-transmitted enteric disease and person-to-person transmitted enteric disease was lower among pupils attending beneficiary schools (Chard *et al.,* 2018). These findings support several other studies that suggest that quality of water and the general level of household hygiene affect exposure to diarrhoea pathogens (Freeman *et al.,* 2014). The findings of this study are also consistent with a study in Nicaragua where schools were without adequate sanitation infrastructures including lack of water at the handwashing points, highlighting several WASH challenges including diseases (Jordanova *et al*., 2015). Similar observations have been made in South Africa where the majority of the schools had only one water tap, which was mostly located at a central point on the school premises (Sibiya *et al.,* 2013). In a 2002 logistic regression analysis of data from three East African countries, Tumwine

et al., (2002), indicated that households with piped water connections did not have significantly lower diarrhea likelihood than households that lacked piped water (Tumwine *et al.,* 2002). Waterwiki (2010) also posts that transmission of diarrhoea and water-related diseases are directly linked to inadequate access to water (Waterwiki, 2010).

The current study reported no level of significance between washing of hands after visiting the toilet with gender and age of pupils. These results do not compare well with other studies by the World Bank, Water and Sanitation programme in Cambodia, which have shown that health improvement can be easily registered in resource constraint communities by applying different approaches and solutions with regard to age and gender (WSP, 2002). The current study was not consistent with studies conducted in Gondar and Babile (Gelaw *et al,* 2013), where there was significant association between intestinal parasitic infections and hand washing practice. The promotion of hygienic behaviour especially hand washing has been identified as a public health intervention likely to have considerable impact in the reduction of diarrhoeal diseases in young children in developing Countries (McLennan, 2000). Washing of hands at critical times is accepted as an effective intervention against diarrhoeal disease (Cairncross, 20011). This study does not also indicate any significant relationship between action taken when pupils have diarrhoea, cause of diarrhoea and its prevention. The current findings do not also concur with a study by Boubacar Maïnassara and Tohon (2014) which posted that reduction in self-reported diarrhoea cases and abdominal pain was noted in both intervention and control schools (Boubacar Maïnassara and Tohon 2014).

Significance was also determined on preferred water treatment methods with diarrhoea occurrence. Study indicates that water treatment practices and methods were also observed to present a risk for diarrhoea occurrence with households using water settling method presenting the highest risk for diarrhoea. This can be explained that settling as a method of treating water does not eliminate all the possible water pathogens hence causing risk in the water uses. Study findings are intandem with a study of a school-based WASH intervention in Kenya which documented the transfer of knowledge about point-of-use water treatment practices and increased utilisation

of WaterGuard in student's households as indicated by having chlorine residuals in stored water, parents also reported improved hand-washing and 38% of parents demonstrated correct hand-washing technique (O'Reilly *et al.,* 2008). Household factor such as water treatment is important in explaining child health outcome. The current findings do not concur with some studies that have indicated that basic interventions that include water treatment do not reduce rates of diarrhoeal disease (Freeman *et al.,* 2014, Patel *et al.,* 2012). Findings from a study by Freeman and Clasen (2011) also contradicts these findings since no evidence that school-based intervention led to increased awareness or adoption of improved water management practices in homes (Freeman and Clasen, 2014). Current study however did not reveal a significant association between protecting water sources and diarrhoea occurrence. This might be explained by the very small differences across the sampled households in terms of drinking water sources. This concurs with a study in southwest Ethiopia, which did not find a significant association between drinking water sources and the risk of diarrhoea either (Gebru *et al.,* 2014). In contrast, two different studies from Ethiopia found that water sources are an important environmental predictor of diarrhoea morbidity (Dessalegn *et al.,* 2011).WHO (2005) also posted that improved water sources reduce diarrhoea morbidity by 21%, improved sanitation by 37.5% and hand washing by as much as 35% (WHO, 2005).

The current study showed a significant dependency between amount of money incurred per day on water usage at the household level and diarrhoea occurrence. WHO recommends minimum availability of 100 L of water per capita per day for all purposes (WHO, 2011). This concurs with many other studies that indicates that socioeconomic factors are strongly associated with the occurrence of diarrhoea, this appears to confirm the social determinants of health (Chiller *et al.,* 2006). These findings supported both UNICEF, 2008 report on childhood diarrhea and WORLD BANK, 2003 on water, sanitation and hygiene which observed that without adequate quantities of water and proper sanitation and hygiene, infections such as diarrhoea spread easily. In some areas, the prevalence rate is as high as 52% (AMREF, 2011).

These results agree with the general accepted norm that suggest that wealth has an inverse association with diarrhea likelihood (Amy Quinn, 2009).

Study findings revealed no level of significance between participation in WASH programmes and diarrhea occurrence. This does not concur with a study by Van Wijk-Sijbesma (1998) that asserts, participation of the community in health interventions in water scarce areas can bring distinct benefits to water sanitation and hygiene as a whole. Involving the community has been suggested to be one of the most important methods to improve sustainability by making users more responsible for the operation and maintenance of programs once donors or private financers are no longer involved (WSSCC, 2003). However, presence of waste management committee indicated negative significance with diarrhoea occurrence at the community level. This is not intandem with a study by Murcot (2012) that indicated that by encouraging community involvement, it may be easier to take advantage of local resources, build local capacity for WASH, ensure user satisfaction (Murcott, 2012), and involve underrepresented groups such as women (Sarkar, 2010). For this reason, decentralized decision making for WASH is supported by many NGOs who support ownership and management of projects to the lowest possible level (World Bank, 2012). Strategies to facilitate community involvement may include community mobilization through health clubs, community groups, meetings or school WASH committees (Ahmed *et al.,* 2000). The observed health gains are associated with differences in community involvement and the participatory approach adopted (Sarkar, 2010).

5.2 Conclusions

5.2.1 Conclusions

The following are conclusions drawn from the study,

1. Children within the ages below 15yrs are more susceptible to diarrhoea as compared to those not in that age set.

2. Diarrhoea occurrence can be influenced by individual, school and community level factors specifically, environmental, behavioral and demographic characteristics hence hindering on prevention and control of strategies.
3. Pupils in schools with a feeding programme are less susceptible to diarrhea as compared to their counterparts in schools without any form of feeding programme.
4. Training of WASH programmes is an essential component in the management as well as prevention and control of diarrhoea. School health teachers plays a crucial role in managing and controlling diarrhoea among the children in collaboration with community health workers
5. Empowering parents through participation in WASH activities, WASH knowledge i.e. water treatment helps to manage diarrhea.

5.3 Recommendations

Interventions aimed at improving sanitation and hygiene in communities and at school should target high risk groups.

Schools and communities need to be continually empowered to carry out the interventions like frequent sanitation trainings on PHAST in order to help in prevention and control of diarrhoea. There is also need of practicing safe excreta disposal and proper waste management both at home and at school.

Specific behaviour change interventions should be encouraged by upscaling SLTS/CLTS & PHAST to overcome sanitation and hygiene barriers in resource constrained communities as well as having school/community health clubs

Relevant Ministries, Teachers and parents to embrace food programme at school since occurrence of diarrhoea is lower in this schools compared to those schools without a feeding programme.

The National government –MoH/Ministry of education in conjunction with the counties should embrace WASH programmes i.e Integrating WASH programmes

into the school curriculum as a way of educating pupils on prevention and control WASH related disease like diarrhoea.

Develop capacity to improve diarrhoeal management by providing adequate training and infrastructure to CHWs and teachers in charge of health both in school and community.

5.4 Further Research

There should be continued and sustained research determining surveillance on burden of diarrhea as a disease.

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APPENDICES

Appendix I: Informed Consent Form for Participants

TITLE OF THE STUDY**: Water, sanitation and hygiene practices as predictors of diarrhoea occurrencea among school age children in Ganze Sub County**

Introduction

You are being asked to participate in a social research study on water sanitation and hygiene practices as predictors of diarrhoea occurrence among school age children in Ganze Sub county. Sanitation remains one of the biggest development challenges in developing countries. Around 6,000 people, mainly children under five, die every day due to problems associated with water, sanitation and hygiene. Sanitation-related diseases such as diarrhoea continue to undermine human health and well-being. Improving sanitation is therefore key to achieving the health-related sustainable development goals of reducing child mortality and combating disease. The purpose of this consent form is to give you information that might help you to decide whether to participate in the study or not. The study will take about two years. You are allowed to ask questions related to the study and implications on your part.

Purpose of the study

The main objective of the study is to determine the role of WASH practices as predictors of diarhoea occurrence among pupils in Ganze, Kilifi County. The study will provide important information on proportion of pupils with diarrhoea, school and individual level factors as well as knowledge, attitude and practices in relation to water sanitation and hygiene practices. The results from this study will provide critical information on the role of WASH and its influence on diarrhoea occurrence among pupils and host communities.

Study procedures

If you agree to take part in this study, you will be interviewed on various issues within the study. The questionnaire will take about 45 minutes. It will be conducted at the school or at any convenient and conducive place.

Stress or Discomfort

There is no stress or discomfort for participation in this study as you will not be required to give any human specimen. You will not be expected to give your names to the person collecting data from you.

Risks/Benefits/Costs to Study Participants: This study poses little risk to you or your family. We have a system in place to protect your privacy, but we will not ask any questions that are sensitive. It will not cost any money to be in the study. The data we collect from you will be kept private as allowed by the law. Your name will not be in any reports written about this study. Leaving the study will not affect you from receiving the benefits of the study in any way.

Assurance of Confidentiality

Your identity and other records about you will remain confidential and will not appear when we present this study or publish its results. You will receive a copy of the consent form.

Voluntariness

You do not have to be in this study. It is up to you, if you do not want to. You may change your mind at any time.

Storage of data

The data will be stored in secure cabinets and computers with password/s and will only be accessible to the investigators. Five years after completion of the study, the data will then be destroyed.

Right to refuse or withdraw

It is important that you understand the following general principles that will apply to all participants in the study:

1. Participation is entirely voluntary.

2. You may withdraw from this study at any time without penalty or loss of benefits.

Costs

There is no cost to participate in this research study.

Please feel free to ask any questions that you may have. Do you agree to participate?

Participant's Consent

I acknowledge that this consent form has been fully explained to me in a language that I understand and had the opportunity to ask questions which have been answered to my satisfaction. I agree voluntarily to participate in this study and understand that I have the right to withdraw at any time without penalty.

Participant's name:_____

Participant's signature _____

Date: _____

Study No.: _____

Investigator's signature: _____

Date: _____

Contact: If you have questions in future, please contact the secretary KEMRI National Review Committee P.O Box 54840-00200 Tel 020-2722541 ext 3307 or Ms. Judy Mwai, Kenya Medical Research Institute (KEMRI), Center for Public Health Research, P. O. Box 54840-0020, Nairobi, Telephone 020-2722541.

KIPENGELE CHA I: FOMU YA MAONI YA WAHUSIKA

KICHWA CHA UTAFITI**:** Athari za maji, usafi na matokeo ya afya kwa wanafunzi katika shule za msingi Ganze

Unaombwa kuhusika katika utafiti wa kuhusu maji na usafi kwa jumla. Usafi kwa ujumla umebaki kuwa kikwazo kikuu cha uimarishaji katika nchi zinazostawi. Kadri ya watu 6,000,wengi wakiwa watoto chini ya umri wa miaka 5,huaga dunia kila siku kwa sababu ya shida zinazohusiana na maji na usafi. Magonjwa yanayohusiana na usafi huu kama vile kuendesha na kipindupindu yanaendelea kuathiri afya ya mwanadamu na kuishi vyema. Uimarishaji wa usafi kwa hivyo ni muhimu ili kuafikia malengo ya millennia kuhusu afya ya kupunguza vifo vya watoto na kukabiliana na magonjwa yanayohusiana nayo.Lengo la fomu hii ni kukupea maelezo yatakayoweza kukusaidia kuamua kama utahusika katika utafiti huu ama hutaweza kuhusika.Utafiti huu utachukua muda wa mwaka mbili.Unaruhusiwa kuuliza maswali yanayohusiana na utafiti na athari zitakazoweza kuchipuka.

Malengo ya utafiti

Lengo kuu la utafiti huu ni kubaini mambo yanahusiana na maji na usafi matokeo husika ya afya kwa wanafunzi wa Ganze,kaunti ya Kilifi. Matokeo ya utafiti huu yatakuwa ya muhimu katika kubuni mbinu mpya na utekelezaji ili kuimarisha uadilifu kwa wanafunzi shuleni.

Njia za utekelezaji utafiti

Ikiwa utakubali kuhusika katika utafiti huu, utahojiwa katika maswala kadhaa kama vile elimu, matazamio,utekelezaji na takwimu na maswala mengine muhimu.Mahojianao yatagharimu muda wa dakika 45.Mahojiano hayo yatafanyika shuleni ama mahali pengine patulivu.

Madhara

Hakuna madhara yoyote katika kuhusika kwa mardi huu kwani hutaitishwa sampuli yoyote ya upimaji.Hutaruhusiwa pia kupeana majina kwa atakaye kuwa anakusanya takwimu kutoka kwako.

Manufaa

Hakutakuwa na manufaa ya moja kwa moja kama mhusika lakini maelezo yatakayopatikana kutokana na ushirikiano wako yatasaidia mradi wa maji na usafi kwa jumla na kubuni sera zitakazosaidia jamii yote kwa ujumla.Na kwa sababu maelezo uliyotupatia yatatusaidia kubuni njia za kuhamasisha mikakati mpya ili kuimarisha usafi na tabia njema na kuimarisha matokeo mema kwa wanafunzi. Wewe pia na wengine mtanufaika kutokana na sera hizi punde tu zitakapo bainishwa.

Hakikisho na Usiri

Kitambulisho chako na haki zozote zile zitabaki kuwa siri na hazitaonyeshwa kokote katika utafiti huu ama katika uchapishaji wa matokeo haya.Utapokea nakala ya fomu ya kujiandisha katika utafiti huu.

Uwekaji wa takwimu

Takwimu zote zitahifadhiwa katika makabati na tarakanishi zilizolindwa na takwimu hizo pia zitakuwa zinaangaliwa na wahusika wakuu katika utafiti huu pekee.Miaka mitano baada ya kukamilisha utafiti huu, takwimu zote zitaharibiwa.

Haki ya kutohusika ama kutoka katika utafiti

Ni muhimu kuelewa vipengele vifuatavyo vitakavyo jumuishwa kwa wahusika katika utafiti:

1. Kuhusika ni kwa hiari/kujitolea.

2. Unaweza kujiondoa katika utafiti huu wakati wowote ule bila adhabu ama kupoteza manufaa.

Kujitolea katika kushiriki

Si lazima uwe katika utafiti huu.Ni jukumu lako, na pia si lazima ujibu maswali ama kuruhusu mtu kujibu maswali kukuhusu.Unaweza badili nia wakati wowote ule.

Gharama

Hakuna gharama ya kushiriki katika utafiti huu.

Tafadhali jisikie huru kuuliza swali lolote utakaloweza kuwa nalo.Na je, unakubali kushiriki?

Na kubali kwamba fomu hii ya maelezo imeelezewa vizuri na kwa ufasaha na kupata nafasi ya kuuliza maswali ambayo pia yalijibiwa vyema hadi nikaridhika.Nakubali bila kushurutishwa kuhusika katika utafiti huu na naelewa kwamba niko na haki ya kutoka wakati wowte ule bila adhabu.

Jina la mhusika: _____

Sahihi ya mhusika _____

Tarehe: _____

Nambari ya utafiti: _____

Sahihi ya mkaguzi: _____

Tarehe: _____

Mawasiliano: Ikiwa utakuwa na maswali hapo baadaye,tafadhali wasiliana na mwandishi wa Kamati kuu ya kitaifa ya uhiano ya taasisi ya utafiti wa matibabu nchini (KEMRI) S.L.P 54840-00200 Simu 020-2722541 ext 3307 ama Ms.Judy

Mwai, Kenya Medical Research Institute (KEMRI), Center for Public Health Research, S.L.P 54840-0020, Nairobi, Simu 020-2722541.

Appendix II: Assent Form

(Children aged above 13years and below 18 years)

TITLE: **Water, sanitation and hygiene practices as predictors of diarrhoea occurrencea among school age children in Ganze Sub County**

(*Parent or guardian should have already filled out the parental consent form*)

WHY IS THIS STUDY BEING DONE?

We are asking you to be in a research study. We want to learn about water, sanitation and hygiene. We asked your parents and they said it was fine for you to be in the study if you want to.

WHAT WILL HAPPEN?

If you agree, we will ask you questions on what you know about water, sanitation and hygiene

You can refuse to answer any question. You can refuse to let others give us any information about you.

BENEFITS:

By being in this study, you will help us know more on effects of water, sanitation and hygiene on selected health outcomes among pupils in schools implementing Home Grown School Meals Programme in Ganze, Kilifi County

RISKS:

We do not know of any risks to you if you answer questions or if other people answer questions about you.

PRIVACY:

What we talk about with you will be kept in private.

VOLUNTARY:

You do not have to be in this study. It is up to you. You do not have to answer questions or allow other people to answer questions about you. You may change your mind at any time.

IF YOU HAVE QUESTIONS:

We gave your parents phone numbers of people to contact if you have questions. I can answer any questions you might have right now about being in the study.

AGREEMENT:

Do you want to be in this study? _____ YES _____NO

Name (print):_____

Signature:_____

Date (DD/MM/YY): ___ / ___ / ___

KIPENGELE CHA II: FOMU YA KUJIANDIKISHA

(Watoto kati ya miaka 5–15)

KICHWA: Athari za maji, usafi na matokeo ya afya kwa wanafunzi katika shule za msingi Ganze

(*Mzazi ama mhusika lazima akuwe alijaza fomu hii ya kujianadikisha*)

KWA NINI UTAFITI HUU UNAFANYIKA?

Tunawaomba mhusike katika utafiti huu.Tungependa kufahamu kuhusu maji,usafi na afya.Tuliuliza wazazi wenu na wakatukubali tuwahusishe katika utafiti huu ikiwa mtapendelea.

NI NINI KITAKACHOFANYIKA?

Ikiwa mtakubali kuhusika, tutawauliza maswali ili kubaini ufahamu wenu kuhusu maji,usafi na afya.

Unaweza pia kutakaa kujibu swali lolote. Unaweza pia ghairi kushirikisha wengine kupeana maelezo kukuhusu.

MANUFAA:

Kwa wewe katika utafiti huu, utatuwezesha kufahamu mengi kuhusu athari za maji,usafi na afya katika maeneo husika kwa shule zinaotekeleza mradi wa upanzi wa vyakula Ganze,kaunti ya Kilifi.

HATARI/ATHARI:

Hatufahamu athari zozote kutokana kujibu maswali sahihi ama ikiwa mtu mwengine atajibu maswali kwa niaba yako kukuhusu.

USIRI/FARAGHA:

Tutakayojadili na wewe yatabaki kuwa siri.

KUJITOLEA KATIKA KUSHIRIKI:

Si lazima uwe katika utafiti huu.Ni jukumu lako.Na pia si lazima ujibu maswali ama kuruhusu mtu kujibu maswali kukuhusu.Unaweza badili nia wakati wowote ule.

UKO NA MASWALI:

Tulipatia wazazi wenu nambari za mawasiliano endapo mtakuwa na maswali.Naweza kujibu maswali yoyote mnaeza kuwa nayo kwa sahi kuhusu kushiriki kwako katika utafiti huu.

MAKUBALIANO:

Na je, ungependa kuhusika katika utafiti huu?

_____ NDIO _____ LA

Jina (andika):_____Sahihi: _____

Tarehe (DD/MM/YY): ___ / ___ / _

Appendix III: School Pupil's Questionnaire

CHILD INFORMATION	
Primary school code:	**Primary school name:**
Ganze Sub County Code:	**Ganze Sub County Name:**
Child ID:	**Date of visit:**
Age: **Class:**	**Gender:** ☐ **Male** ☐ **Female**

SCHOOL WASH INFORMATION
"Now I would like to ask you a few questions about your access and use of water, sanitation, and hygiene at school."
B1. At school, do you usually wash your hands? **Read out options, only enter one answer** 1=yes 2=No
B2. If yes, when do you usually wash your hands? 1=Before feeding 2=After visiting toilet 3=Other (specify)……
B3. At school, where do you usually wash your hands? **Read out options, only enter one answer** 1 = tap water, 2 = hand wash basin, 3 = leaky tins, 4 = Others (Specify)……..
B4. Do your friends wash their hands in school? 1=Yes 2=No
B5. At school, do you normally use a latrine/toilet? 1=Yes 2=No

B6. Do your friends also use the toilet at school? 1=Yes 2=No
B7. Does the school provide a place (such as container, basin, sink), for you to wash your hands after visiting the toilet? 1=Yes, 2=No
B8. Is the place accessible to you and your friends? 1=Yes, 2=No
B9. **If yes to B7**, is soap available at the hand washing place?1=Always, 2=Sometimes, 3=Never
B10. At school, do you wash your hands with soap and water after visiting the toilet/latrine? (can even be with own soap) 1=Always, 2=Sometimes, 3=Never
B11. **If yes to B7,** did you wash your hands with soap and water **at this place** the last time you visited the toilet/latrine at school? 1=Yes, 2=No
B12. Is there water available for drinking at school? 1=Always, 2=Sometimes, 3=Never
B13. **If always or sometimes to B12**, When you are at school, do you use the school water source for drinking? 1=Always, 2=Sometimes, 3=Never
B14. Are you trained on health related issues at the school? 1=yes 2=No
B15. If yes, what type of health related trainings do you get? 1. Environmental Sanitation…… 2. Personal hygiene…… 3. Other (specify)……
B16.Who delivers this kind of trainings at school? 1. Teachers 2. Health club members 3. NGOs 4. Others, specify…….
B17. Do you practice what you have been trained on? 1=Yes 2=No
B18. Do you share with your friends/guardians information you get from the

trainings? 1=yes 2=No
B19. If yes, how often do you share this information with your friends/guardians? 1=Oftenly 2=Rarely 3=Sometimes

KIPENGELE CHA III: FOMU YA MAHOJIANO YA MWANAFUNZI

Kodi ya shule:	**Jina la shule:**
Kodi ya wilaya:	**Jina la wilaya:**
Kitambulisho cha mwanafunzi:	**Tarehe yaa kuwatembelea:**
Miaka: **Mwaka wa kuzaliwa:** **Darasa:**	 **Jinsia:** ☐ **Mume** ☐ **Mke**

MAELEZO KUHUSU MRADI WA USAFI SHULENI
"Sasa ningependa kukuuliza maswali kidogo kuhusu kiwango cha kufikia maji na matumizi ya maji na usafi shuleni?
B1.Mnanawa mikono zenu mkiwa shuleni? 1=Ndio 2=La
B2Ikiwa ni ndio,ni wakati gani mnanawa mikono? 1=Kabla ya kula 2=Baada ya kutoka kwa choot 3=Mengine……
B3. Mkiwa shuleni,nyinyi hunawa mikono zenu wapi? 1 =Mfereji 2 = Karai 3 =Mikebe iliyotobolewa, 4 =Zengine.....
B4. Na je,marafiki zako hunawa mikono mkiwa shuleni 1=Ndio 2= La
B5. Na je,mnatumia choo mkiwa shuleni? 1=Ndio 2=La

B6. Na je,marafiki zako hutumia choo mkiwa shuleni? 1=Ndio 2=La .....
B7. Na je,kuna mahali shule imetenga kwa kunawa mikono baada ya kutoka chooni? 1=Ndio, 2=La
B8. Na je,mahali penyewe munaeza fikia wewe na marafiki zako? 1=Ndio, 2=La
B9. **Ikiwa ni ndio kwa swali la B7**,kuna sabuni mahali hapo? 1=Kila wakati, 2= Wakati mwengine, 3=Hakuna
B10. Na je,mkiwa shuleni wewe hunawa mikono kwa sabuni baada ya kutoka chooni? (inaeza kuwa pia kwa sabuni yake) 1=Kila wakati, 2=Wakati mwengine, 3=Hakuna
B11.**Ikiwa ni ndio kwa swali la B7,** je ulinawa mikono yako kwa sabuni na maji wakati wa mwisho ulivyoenda chooni? 1=Ndio, 2=La
B12.Na je, kuna maji ya kunywa shuleni? 1=Kila wakati, 2=Wakati mwengine, 3=Hakuna
B13.**Ikiwa ni kila wakati ama wakati mwengine kwa sawli la B12**, ukiwa shuleni, unatumia maji ya shule kunywa? 1=Kila wakati, 2=Wakati mwengine, 3=Hakuna
B14.Umepata mafunzo kuhusu afya shuleni?1=Ndio 2=La
B15.Ikiwa ni Ndio,ni aina gani ya mafunzo mliyopata? 1. Usafi wa mazingira…… 2. Usafi wa mwili…….. 3. Mengineyo……
B16.Nani hupeana mafunzo haya shuleni? 1.Walimu 2.Wanachama wa kilabu cha Afya shuleni

3.Mashirika yasiyo ya kiserikali 4. Mengineyo, elezea…….
B17.Na je, unafanya kulingana na mafunzo uliyopata? 1=Ndio 2=La
B18.Ikiwa ni Ndio, unafanya mara ngapi? 1=Kila mara 2=Mara chache 3=Wakati mwengine
B 19.Na je, unapeana maelezo hayo kwa marafiki/wazazi kuhusu mafunzo uliyopata? 1=Ndio 2=La
B20.Ikiwa ni ndio, ni mara ngapi unapeana habari hizi kwa marafiki/wazazi? 1=Kila mara 2=Mara chache 3=Wakati mwengine

SCHOOL INFORMATION AND DEMOGRAPHICS									
Date of visit:									
Ganze Sub County name:			**Ganze Sub County code:**						
Name of school:			**School code:**						
GPS Longitude:			**GPS Latitude**: (N/S) Negative ☐ Positive ☐ (tick as appropriate)						
School MoE code:			**Start of school term:** |					
School type: Day ☐ Boarding ☐			**Gender of pupils**: Mixed ☐ Boys ☐ Girls ☐						
Name of head teacher: **Name of second contact person (deputy head teacher or another teacher at school):**			**Head teacher phone number:** **Second contact phone number:**						
A. SCHOOL DEMOGRAPHICS	**ECD**	**P1**	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**
A1. Total boys enrolled:									
A2. Total girls enrolled:									
A3. Total boys present today:									
A4. Total girls present today:									
A5. Total male teachers:									
A6. Total female teachers:									
Include any other information that will help me in the project									
SCHOOL FEEDING PROGRAMME- SCHOOL MEALS TEACHER'S SECTION									
B1**.** Does the school have a school feeding programme? *Enter 1 =Yes and 2 = No* B2. If yes, which type of feeding programme?									

Home Grown School Meals Programme [__] Any Other [__] None [__]

B3. If yes to **B1.** What is the <u>main</u> source of water for use by pupils in this school?

Only enter one answer .....

1=Piped/tap water, 2=Borehole or well, 3=Rain water, 4=Stream, lake or river, 5=Bought, 6=Bottled water,

7=Others ..... *specify* [_____

B4. How many months of the year does the school **not** have water available for cooking?..... N

WATER and SANITATION FACILITIES

C1. Does the school have any of the following? Ask to see. ***Enter 1 =Yes and 2 = No***

Unlocked and accessible separate toilets for boys and girls.....

Hand washing facilities near the toilets.....

Water in hand washing facilities .....

Soap is available at the hand washing facility.....

Water available for drinking today.....

First Aid kit.....

If yes, what does it contain?

[_____

]

C2. If the school has hand washing facilities near the toilets, what type are they?

Only enter one answer.....

1 = tap water, 2 = hand wash basin, 3 = leaky tins, 4 = Others (Specify) [.....

C3. Is water available at the hand washing point?

Enter 1 =Yes and 2 = No

C4. Is soap available at the hand washing point?

Enter 1 =Yes and 2 = No

C5. What is the main source of water for drinking for pupils in this school?

Only enter one answer .....

1=Piped/tap water, 2=Borehole or well, 3=Rain water, 4=Stream, lake or river, 5=Bought, 6=Bottled water,

7=Others ..... *specify* [_____

C6. How many months of the year does the school **not** have water available for pupils to drink? ..... N

C7. Is the water used in the school treated ***Enter 1 =Yes and 2 = No***

If yes, how is it treated?..... [__]

How often is it treated?.....[__]

C8-C15: **Fill out latrine worksheet on final page**

SCHOOL HEALTH ACTIVITIES

D1. In the last 12 months, was the school involved in any of the following school health activities? ***Enter 1 =Yes and 2 = No***

Micronutrients [__]

Deworming [__]

Water and sanitation programme [__]

If yes, which ones [_____
_____]

Have any child been affected with sanitation related illness? If yes, which one [_____]

How many pupils have been affected with diarrhoea in the last 3 months? _____]

How many pupils have been affected with tungiasis in the last 3 months?_____]

How do you prevent sanitation related illness? [_____]

Any other programme, please specify_____]

Please provide details of the above programmes:

D2. Does the school have any of the following? ***Enter 1 =Yes and 2 = No***

Sanitation posters displayed in the school [__]

Behaviour change posters [__]

Other IEC material, please specify _____]

Please provide further details of the above:

D3.Does the school have clear forums where Hygiene messages are disseminated within the school? ***Enter 1 =Yes and 2 = No***

If yes, what methods are used for hygiene messages

1 = songs, 2 = drama, 3 = demonstrations, 4 = Lectures 5=Others (Specify) [_____]

Who disseminates this hygiene messages to schools? 1=NGOs 2=Health club members 3=Others,specify_____	

Appendix IV: Headteacher's Questionnaire

D 4: Disease morbidity/mortality and management (diarrhoea)
1. In the last **2 weeks**, has any pupil in the school had a diarrhoea? (*Note that diarrhoea is defined as the passing of stool 3 times or more in 24 hours whether it is watery, bloody, mucoid or water-wash like*) 1[ ] Yes 2[ ] No (If NO, proceed to **Q3**)
2. If YES, how old is the pupil who had diarrhoea? _____ 1[ ] Not applicable 2[ ] 0-5years 3 [ ] 6-17years 4[ ] 18-59years 4[ ] 60 and above
3. What do you usually do when a pupil is having diarrhoea? (*Tick all that are mentioned*) 1[ ] No action 2[ ] Buy medicines 3[ ] Give ORS 4[ ] Go to clinic/health facilities 5[ ] Give herbs 6[ ] Stop Feeding 7[ ] Continue Feeding 8[ ] Go to traditional healer 9[ ] Others (*specify):* _____
4. What do you think can be the cause of diarrhoea? (*Tick all that respondent mentions but do not influence)* 1[ ] Rain 2[ ] Dirty Hands 3[ ] Part of child's growth 4[ ] Black magic/witchcraft 5[ ] Germs 6[ ] Dirty food 7[ ] Poor hygiene 8[ ] Do not know 9[ ] Flies 10[ ] Dirty water 11[ ] Open defecation 12[ ]Other (specify)_____
5. How do you think diarrhoea can be prevented? (*Tick all what respondent*

mentions but never influence his/her responses.)

1[ ] Do not know 2[ ] Drink clean water 3[ ] Prepare food properly (cooking, washing)

4[ ] Latrine use 5[ ] Treating water 6[ ] Wash hands with water and soap/ash

7[ ] Covering food 8[ ] No open defecation 9[ ] Go to traditional healer

10[ ] Prayer 11[ ] Store water safely 12[ ] Others, specify:_____

D5: Fill in the table below (diarrhoel occurrence information)

Indicate information on those pupils who have suffered diarrhoea in the last two weeks

No.	Age	Gender	Class

Instructions: Fill out the worksheet below. Each line represents a latrine block (a natural grouping of latrines). If a block has one side for boys and one side for girls then enter it in as two separate blocks (one line for boys and one line for girls). If a single block has both latrines and urinals, then enter it in as two separate blocks (one line for latrines and one line for urinals). For C8 through C17 only enter data for **usable** latrines (ignore teacher latrine blocks, locked latrines, and latrines with full pits).

School Code:_____

C8 Number of latrines in block	C9 Number of **usable** latrines in block	C10 Assigned to: 1. Girls 2. Boys 3. Shared	C11 For grades: 1=All non-ECD 2=ECD 3=P1-P4 4=P5-P8 5=special needs	C12 Type of latrine 1=Waterbourne 2=VIP latrine 3=Ordinary pit 4=Urinal	C13 Number of usable latrines with doors that close	C14 Number of usable latrines with doors that lock from the inside	C15 Number of usable latrines with excessive bad smell	C15 Number of usable latrines with excessive flies	C16 Number of usable latrines with good structure (slab, walls & roof)	C17 Number of usable latrines that are clean

KIPENGELE CHA IV: SEKSHENI YA MWALIMU MKUU

MAELEZO NA TAKWIMU YA SHULE

Tarehe ya kutembelea:

Jina la taarafa:	**Kodi ya taarafa:**
Jina la shule:	**Kodi ya shule:** |
GPS Longitude:	**GPS Latitude**: : (N/S) Negative ☐ Positive ☐ (weka alama)
Kodi yausajili ya shule:	**Kuanza kwa muhula:**
Aina ya shule: Siku ☐ Bweni☐	**Gender of pupils**: Vijana ☐ Wasichana☐
Jina la Mwalimu mkuu: **Jina la naibu wa mwalimu mkuu:**	**Nambari ya simu ya mwalimu mkuu:** **Nambari ya simu ya naibu wa mwalimu mkuu:**

A. TAKWIMU ZA SHULE	**ECD**	**P1**	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**
A1. Jumla ya wavulana waliosajiliwa:									
A2. Jumla ya wasichana waliosajiliwa:									
A3. Jumla ya wavulana waliohudhuria siku hiyo:									
A4. Jumla ya wasichana waliohudhuria siku hiyo:									
A5. Jumla ya walimu wakiume:									
A6. Jumla ya walimu wakike:									

MRADI WA LISHE SHULENI-MWALIMU WA LISHE SHULENI

B1. Na je, kuna mradi wa lishe shuleni? *weka 1 =Ndio na 2 = La*

B2. Ikiwa ni ndio,ni mradi upi?

Mradi wa chakula kinachokuzwa shuleni [__]

Yeyote ile [__]

Hakuna [__]

B3.Ikiwa ni ndio kwa swali la **B1.** Maji ya kupikia watoto chakula hutoka wapi kwa shule hii?

Jaza jibu moja .....

1=Mfereji, 2=Kisima ama bwawal, 3=Mvua, 4=Mtaro, ziwa ama mto, 5=Kununua, 6=Ya chupa,

7=Mengineyo ..... *elezea* [_____

B4. Ni miezi ngapi kwa mwaka shule huwa bila maji ya kupikia?

VIFAA VYA MAJI NA USAFI

C1. Na je, shule inaweza kuwa vifuatavyo?Uliza uonyeshwe. *Weka **1 =Ndio** **na 2 = La***

Vyoo vilivyo na kufuli vya wavulana na wasichana [__]

Vifaa vya kunawa mikono karibu na choo [__]

Maji kwa vifaa hivyo [__]

Sabuni kwa vifaa hivyo [__]

Maji ya kunywa leo [__]

Kijisanduku cha huduma ya kwanza [__]

Ikiwa ni Ndio, Kijisanduki hicho kiko na nini?
[_____]

C2.Na ikiwa shule iko na vifaa vya kunawia mikono karibu na shule,ni aina gani?

Jaza jibu moja pekee .....

1 = Mfereji,2=Karai, 3 = Mikebe iliyotobolewa, 4 = Zinginezo (Elezea) [.....

C3.Na je, kuna maji ya kunawa mikono kwa kituo cha kunawisha mikono?

Weka1 =Ndio na 2 = La

C4.Na je, kuna sabuni katika kituo hicho cha kunawisha mikono?

*Weka **1 =Ndio na 2 = La***

C5. Na je, maji ya kunywa kwa wanafunzi hutoka wapi kwa shule hii?

Jaza jibu moja pekee

1=Mfereji, 2=Kisima ama bwawal, 3=Mvua, 4=Mtaro,ziwa ama mto, 5=Kununua, 6=Ya chupa,

7=Mengineyo..... *elezea* [_____

C6. Ni miezi ngapi kwa mwaka shule huwa bila maji ya kupikia?[__] Idadi ya miezi[__]

C7. Na je,maji yanayotumika shuleni,huwa yametibiwa *Weka **1 =Ndio na 2 = La***

Ikiwa ni Ndio, hutibiwa vipi?..... [__]

Hutibiwa mara ngapi?.....[__]

C8-C15: **Jaza fomu ya matumizi ya vyoo kwa ukurasa wa mwisho**

SHUGHULI ZA AFYA YA SHULE

D1. Katika miezi 12 iliyopita, shule hii imehusika na shughuli za afya ya shule?
Weka 1 =Ndio na 2 = La

Lishe bora [__]

Utawaji wa minyoo [__]

Mradi wa maji na usafi [__]

Ikiwa ni Ndio,Ni zipi [_____ _____]

Na je,kuna mtoto aliyeathirika na magonjwa yanayohusiana na

usafi?..... [__]

Ikiwa ni Ndio,ni yapi [_____
_____]

Ni wanafunzi wangapi walioathirika na kuendesha miezi mitatu iliyopita?
[_____]

Ni wanafunzi wangapi walioathirika nafunza miezi mitatu iliyopita?

[_____]

Na je, unaweza kingaje magonjwa yanayohusiana na usafi?[_____
_____]

Mradi wengine wowote,tafadhali elezea [_____
_____]

Tafadhali elezea kwa kina kuhusu miradi iliyozungumziwa hapo juu:

D2.Na je,shule iko na yafuatayo? ***Weka 1 =Ndio na 2 = La***

Mabango ya usafi yaliyowekwa kwa shule [__]

Mabango ya kubadili tabia [__]

Mabango mengine, tafadhali elezea
[_____]

Tafadhali angazia kwa kina uliyoyataja hapo juu:

D3.Na je, shule iko na mikakati mwafaka ambapo wanachama wa vilabu tofauti wanajumuika kupeana maelezo ama habari shuleni? ***Weka 1 =Ndiona 2 = La***

Ikiwa ni Ndio, ni njia gani wanachama hutumia kupeana kuhusu usafi

1 = Nyimbo, 2 = Michezo ya kuigiza, 3 = Maonyesho, 4 = Mikutano 5=Nyingine (Elezea [ ]

D 4: Ugonjwa, Maradhi / vifo na usimamizi (kuharisha)

1. Katika wiki 2 iliyopita, kuna mwanafunzi yoyote katika shule yake ambaye ameharisha? (Kumbuka kuhara hufafanuliwa kama kupitisha kinyesi mara 3 au zaidi ya masaa 24 kama ni ya maji maji, umwagaji damu) 1 [] Ndiyo 2 [] No (Kama NO, kuendelea na Q3)

2. Kama ni ndiyo, wanafunzi wanaohara ni wa rika gani? _____ 1 [] Haihusika 2 [] 0-5years 3 [] 6-17years 4 [] miaka 18-59 4 [] 60 na zaidi

3. Je, kwa kawaida nini wewe hufanya kwa mwanafunzi anaye? (taja jibu zozote) 1 [] Hakuna hatua 2 [] Kununua madawa 3 [] Kutumia ORS 4 [] kwenda kwa kliniki / vituo vya afya 5 [] Kutumia kienyeji 6 [] Acha Kulisha 7 [] Kuendelea Kulisha 8 [] Kwenda kwa mganga 9 [] Ingine (taja):

4. Unafikiri kuhara huletwa na nini?

1 [] Mvua 2 [] Mikono michafu 3 [] Mtoto anavyo kuwa 4 []uchawi

5 [] uchafu 6 [] chakula chafu 7 []usafi duni 8 [] Sijui

9 [] Nzi 10 [] maji machafu 11 []kujisaidia kiholela 12 [] Zingine (taja) _____

5. Jinsi gani unafikiri kuhara inaweza kuzuiwa? 1 [] Sijui 2 [] kunywa maji safi 3 [] Tayarisha chakula vizuri (kupikia, kufulia) 4 [] matumizi ya choo 5 [] Kutibu maji 6 [ ] Nawa mikono kwa maji na sabuni / ash 7 [] Kufunika chakula 8 [] Hakuna kujisaidia wazi 9 [] Nenda kwa mganga wa jadi

10 [] Maombi 11 [] Hifadhi maji salama 12 [] Mengine, fafanua: _____

D5: Matokeo ya ugonjwa ya kuhara

Tafadhali jaza nakala hii (Matokeo ya ugonjwa ya kuhara)

Jaza nakala hii kwa kutumie maelezo juu ya watoto ambao wamehara katika wiki mbili zilizopita

No.	Miaka	Jinsia	Darasa	

Maagizo: Jaza nakala hii.Kila mstari unasimamia makundi ya vyoo.Ikiwa *Block* moja itakuwa na upande wa wavulana na mwengine wa wasichana,basi weka kama *block* moja tofauti, moja ya wasichana. Ikiwa sehemu moja iko na vyoo vyote na mahali pa kukojolea,basi weka alama. Kuanzia swali la C8 hadi C17 orodhesha vyoo vinavyotumika pekee *(usihesabu vyoo vya walimu pamoja na vyoo vilivyo na mashimo).*

School Code:_____

C8 Idadi ya vyoo kwa *block*	C9 Idadi ya vyoo vinavyotumika kwa *block*	C10 Vilivyopewa kwa: 1. Wasichana 2.Wavulan 3.Vinatumika na wote	C11 Kuratibu: 1=Wasio katika chekechea 2=Chekechea 3=P1-P4 4=P5-P8 5=Walemavu	C12 Aina ya choo 1=Cha maji 2=Cha kawaida 3=Shimo 4=Kilicho na mahali spesheli pa kukojolea	C13 Idadi ya vyoo vinavyotumika vilivyo na milango inayofungika	C14 Idadi ya vyoo vinavyotumika bila	C15 Idadi ya vyoo vinavyotumika vilivyo na harufu mbaya	C15 Idadi ya vyoo vinavyotumika vilivyo na nzi wengi	C16 Idadi ya vyoo vinavyotumika vilivyo na miundo msingi mzuri (sakafu,kuta na paa)	C17 Idadi ya vyoo visafi vinavyotumikas

Appendix V: Interviewer Based Questionnaire for Guardians/Parents

Introduction

My name is **Judy Mwai**, I am a scientist working with KEMRI and a PhD student at JKUAT. I am conducting a study on Water, Sanitation and Hygiene Practices as Predictors of Diarrhoea Occurrence among School age Children in Ganze Sub County. The purpose of my visit is to get the information on these roles. I will appreciate the time and information you will share with me.

General Information:

Name of the town/village _____ Household No_____

Interviewer's Name_____ Study ID_____

Date_____

(A) Demographic information and Socio-economic information

a) Gender_____
b) Age _____
c) Marital status_____
d) Family size _____

(No. of people living in the household)

e) Level of Education_____
f) Occupation/Profession_____
g) Religion _____
h) Average total monthly income (Kshs)_____
i) Are there any of the following in your house

a) Fridge ☐ b)Television ☐ c) Car ☐

(B) Parents Knowledge on WASH

1. Have you heard any health/hygiene messages for the last 3 months?

a[ ] Yes b[ ] No (If NO, proceed to **Q5**)

2. If YES, can you tell me which hygiene messages you can recall?

a[ ] Not applicable b[ ] Use latrine for defecation c[ ] Dispose baby's feces to the toilet
d[ ] Bury feces e[ ] Clean & cover water containers f[ ] Water treatment (boil, chlorine)

g[ ] Use of ORS h[ ] Dispose garbage properly i[ ] Use mosquito nets

j[ ] Cover food k[ ] Prepare food hygienically l[ ] Wash hands with water and soap m[ ] Report cholera case n[ ] Stop open defecation o[ ] Bath regularly p[ ] Cleanliness around water point q[ ] Others (*specify*)-_____

3. From where did you hear this/these message/s?
a[ ] No Applicable b[ ] Government's health workers c[ ] Community Health Volunteers
d[ ] School age children e[ ] NGO staff f[ ] Church/Mosque
g[ ] Poster/flyer/leaflets h[ ] Radio i[ ] Community events
j[ ] Private groups k[ ] SMS/Phone l[ ] TV

m[ ] Clinic/hospital n[ ] Traditional leader o[ ]Others (*specify)*:_____

4. In which channel of communication or mechanisms do you prefer **most** to get information on health and hygiene or any information that you want to hear or learn? (*just tick the MOST preferred one)*

a[ ] Radio b[ ] Bulletin boards c[ ] Through church/mosque
d[ ] SMS/Mobile phone e[ ] Video showing f[ ] Public address system
g[ ] TV h[ ] Training/sessions/FGD i[ ] House visit
j[ ] Drama presentation k[ ] Drama presentation l[ ] Posters/pictures

m[ ] Flyers/brochures/printed materials n[ ]Others (*specify)*:_____

5. Have you or your household participated in any water, sanitation and hygiene program in your village?

a) Yes ☐ b) No ☐ c) Don't know ☐

6. If yes, how often do you participate in this water, sanitation and hygiene programmes?

a) Did it once

b) Monthly

c) 3 months

d) 6 months

e)Other, specify_____

7. What kind of water, sanitation and hygiene programs are they specifically?

a) Water management ☐

b) Sanitation ☐

c) Diseases associated with water ☐

d) Hygiene ☐

e) Behaviour change ☐

f) Don't know ☐

g) Other, specify_____

8. What are the diseases is in this area associated with water, sanitation and hygiene? *(Please tick in order of importance)*

a) Jiggers ☐

b) Malaria ☐

c) Diarrhoea ☐

d) Scabies ☐

e) Bilharzia ☐

e) Others (Specify) _____

9. What kind of problems do you experience on water, sanitation and hygiene in your village? (*tick all that applies*)

a) Lack of agencies to implement programmes ☐
b) Lack of follow ups by implementing agencies ☐
c) Scarce/No facilities in place ☐
d) No good will from the community ☐
e) Don't know ☐
f) Other, specify _____

10. Have you or your household participated in local water, sanitation and hygiene activities in your village?

a) Yes ☐ b) No ☐ c) Don't know ☐

11. If yes, what are these local activities? (*multiple response possible*)

i. Putting up simple latrines

a) Yes ☐ b) No ☐ c) Don't know ☐

ii. Protect water source

a) Yes ☐ b) No ☐ c) Don't know ☐

iii. Provide simple hand washing facilities

a) Yes ☐ b) No ☐ c) Don't know ☐

iv. Use of ash for disinfection

a) Yes ☐ b) No ☐ c) Don't know ☐

d) Other, specify _____

(B) WASH Practices at the Household Level

12. Do you have a latrine? (*Tick one*)

a) Yes ☐ b) No ☐

13. If Yes in 12, what type is your latrine? (*Tick one*)

a) Ventilated improved latrine ☐

b) Unimproved (unsanitary) latrine ☐

c) Flush toilet ☐

d) Open pit latrine ☐

e) Other, specify_____

14. If No, in 12 above, where do you defecate/go? (*Tick one*)

a) Neighbors' latrine ☐

b) Bush ☐

c) Special place in the compound ☐

d) Road side ☐

e) Other, specify_____

15. If No, in 12 above, why don't you have a latrine? (*Tick all that applies*)

a) No problem	☐	e) Lack of money	☐
b) Lack of knowledge	☐	f) Difficult to keep it clean	☐
c) No land to build latrine	☐	g) Soil or ground water problem	☐
d) Don't know	☐	h) Other, specify_____	

16. Do your family use anal cleansing material in the toilet?

a[ ] Yes b[ ] No c[ ] If NO, proceed to **Q18**

17. If yes, what kind of anal cleansing material is present?

a[ ] Toilet paper b[ ] Others (*specify):* _____

18. Kindly give me the key times you USUALLY wash your hands? (ONLY *tick what the respondent mentions*)

a[ ] Before eating b[ ]After latrine use c[ ] After handling baby's diaper/feces
d[ ] After eating e[ ] Before feeding child f[ ] Before food preparation

g[ ] After defecation h[ ] After handling rubbish i[ ] After handling animals

j[ ] Others (*specify*)_____

19. What do you usually use in washing hands? (*Tick the most commonly practiced*)

a[ ] Water only b[ ] Water and soap c[ ] Water and sand/leaves

d[ ] Water and ash e[ ] Others (specify)_____

20. If the answer in **19** is not **(water and soap)**, what is the MAIN factor that prevents your family from using soap?

a[ ] Not applicable b[ ] Negligence/laziness c[ ] Washing with soap takes time

d[ ] Expensive to buy soap e[ ] Water alone cleanses the hand

f[ ] Soap is not a practice even before g[ ] Others (*specify):* _____

21. OBSERVATION ONLY: Is there any hand washing facility available around the home?

a[ ] No available washing facility
b[ ] There are water and soap near or within the latrine (ONLY in household with latrine facility)
c[ ] There are water and soap at a designated hand washing area.
d[ ] There is ONLY water near or within the latrine (ONLY in household with latrine facility

e[ ] There is ONLY water at a designated hand washing area.

22. What is your main source of water for the household? (*Tick one*)

a) River ☐ d) Piped water ☐

b) Borehole ☐ e) Other, specify_____

c) Spring ☐

23. In your opinion, do you think the water is safe?

a) Yes ☐ b) No ☐

24. How far from your dwelling is the source of drinking water?

a[ ] within 500m b[ ] 500-1KM c [ ] 1KM-3KM d [ ] More than 3km

25. How many minutes do you spend in collecting water from the source? (back and forth)

a[ ] within 15 min b[ ] 15-30 minutes c [ ] 30min – 1 hour

d [ ] More than 1 hour

26. Who usually collects water for the family?

a[ ] Adult Men b[ ] Boys c [ ] Adult Women

d[ ] Girls e[ ] Being delivered f[ ] Others (*Specify)*

27. Do you store water for drinking in the household?

a) Yes ☐ b) No ☐

28. If yes, what do you store it in?

a) Clay water pot ☐
b) Bucket ☐
c) Drum/Barrel with tap ☐
d) Drum/barrel ☐
e) Jerry Can ☐
f) Aluminum Basin ☐
g) Other

29. OBSERVE the condition of the water containers for collection and storage.

a[ ] Clean b[ ] Not Clean c [ ] Others are clean while some are not

30. Do you treat water before use? (*Tick one*)

a) Yes ☐ b) No ☐

31. If yes, what method do you use for water treatment? (*Tick all that applies*)

a) Boiling ☐
b) Filtration ☐
c) Sedimentation ☐
d) Water Guard ☐
e) Solar ☐
f) Don't know ☐
g) Other, specify_____

32. If NO, why?

a[ ] Not applicable b[ ] It is expensive c [ ] We are used to the water already d[ ] Water is safe e[ ] Do not know how to treat

f[ ] Others (*specify):* _____

33. If you are paying for water, how much money in Kenya shillings do you spend per day?

a[ ] Not applicable b[ ] less than 10KES c [ ] 10-50KES

d[ ] 50-100KES e[ ] More than 100KES

34. How many liters of water does the entire household consume/use per day? (*note that standard 1 Jerry Can = 20L)*

a[ ] Less than 20L b[ ] 20-37L c [ ] 38-75L d [ ] more than 75L

35. Who is responsible for maintaining the water point? (*Tick one who USUALLY does the maintenance of the facility*)

a[ ] None b[ ] Water management committee c [ ] Village leaders

d[ ] Public Works e[ ] Community members/users f [ ] Owner/private

g[ ] Others (*specify):* _____

D) HEALTH RELATED FACTORS

(a) Assessment of occurrence of diarrhoea

36. Do you have knowledge on any disease associated with water, sanitation and hygiene when one practices open defecation?

a) Yes ☐ b) No ☐

37. If yes, which diseases

a) Diarrhoea ☐ c) Cholera ☐

b) Scabies ☐ d) Typhoid ☐

38. Have any member of your household suffered from diarrhoea disease in the last 2 weeks? (*Note that diarrhoea is defined as the passing of stool 3 times or more in 24 hours whether it is watery, bloody, mucoid or water-wash like*)

a) Yes ☐ b) No ☐

39. If YES, how old is the family member who had diarrhoea? _____

a[ ] Not applicable b[ ] 0-5years c [ ] 6-17years d[ ] 18-59years

e[ ] 60 and above

40. What do you usually do when a member of the family is having diarrhoea? (*Tick all that are mentioned*)

a[ ] No action b[ ] Buy medicines c[ ] Give ORS

d[ ] Go to clinic/health facilities e[ ] Give herbs f[ ] Stop Feeding

g[ ] Continue Feeding i[ ]Go to traditional healer j[ ] Others (*specify):* _____

41. In case you visited the health facility, how much KES did you use for treatment?

a) Less than Ksh 100 ☐ d) Ksh. 101-300 ☐
b) Ksh. 301-500 ☐ e) Ksh. 501-1000 ☐
☐
c) Over Ksh 1000

42. What do you think can be the cause of diarrhoea? (*Tick all that respondent mentions but do not influence)*

a[ ] Rain b[ ] Dirty Hands c[ ] Part of child's growth

d[ ] Black magic/witchcraft e[ ] Germs f[ ] Dirty food

g[ ] Poor hygiene h[ ] Do not know i[ ] Flies j[ ] Dirty water
k[ ] Open defecation l[ ]Other (specify)_____

43. How do you think diarrhoea can be prevented? (*Tick all what respondent mentions but never influence his/her responses.*)

a[ ] Do not know b[ ] Drink clean water c[ ] Prepare food properly (cooking, washing)

d[ ] Latrine use e[ ] Treating water f[ ] Wash hands with water and soap/ash

g[ ] Covering food h[ ] No open defecation i[ ] Go to traditional healer

j [ ] Prayer k[ ] Store water safely l[ ] Others, specify:_____

Thank you for your time and co-operation

KIPENGELE CHA V: MAHOJIANO NA WAZAZI

Kianzilishi

Mimi ni mwanasayansi kutoka kwa taasisi ya utafiti KEMRI. Utafiti wangu ni juu ya mambo yanayohusiana na maji na usafi wa mazingira na matokeo ya kiafya miongoni mwa wanafunzi katika shule za msingi, Ganze, kaunti ya Kilifi. Lengo la ziara yangu ni kupata taarifa juu ya mambo haya. Nami nitakushukuru kwa muda wako.

Maswala kuu

Jina la mji / kijiji _____ Nambari ya kaya _____

Jina la mhoji_____ Kifani ID_____

Tarehe_____

(A) Habari kuhusu idadi ya watu, kijamii na kiuchumi

j) Jinsia_____
k) Umri_____
l) Hali ya ndoa_____
m) Ukubwa wa familia _____

(Nambari ya wale wanaoishi kwenye kaya)

n) Kiwango cha Masomo_____
o) Dini _____
p) Mapato ya jumla kila mwezi (Kshs)_____
q) Je, una yeyote yafuatayo kwenye nyumba yako?

b) Friji ☐ b)Runinga ☐ c) Gari ☐

(A) Ufahamu kuhusu mradi wa maji na usafi wa mazingira

1. Na je,umeshawahi kusikia habari zozote kuhusu afya/ama usafi kwa muda wa miezi tatu iliyopita?

a[ ] Ndio b[ ] La

2. Ikiwa ni Ndio,unaeza niambia habari kuhusu usafi unazo kumbuka?

a[ ] Hakuna b[ ] Utumizi wa choo c[ ] Kutpa choo cha mtoto kwa choo d[ ] Kufukia kinyezi e[ ]Usafi na Kufunika vibuyu vya maji f[ ] Kutibu maji (Kuchemsha,kuweka dawa) g[ ] Kutumia ORS h[ ] Kutupa taka vizuri i[ ] Kutumia vyandarua vya mbu j[ ] Kufunika chakula k[ ] Kutayarisha chakula kwa njia safi l[ ] Kunawa mikono kwa kutumia sabuni na maji m[ ]Kutoa habari kuhusu tukio lolote la kuendesha n[ ] Kuzuia kuenda haja kubwa mahali peupe o[ ] Kuoga kila mara p[ ] Usafi karibu na eneo la maji q[ ] Zingine (*elezea*)_____

3. Na jee, habari hizi ulizipata kutoka wapi?

a[ ] Hakuna b[ ] Kwa wahudumu wa Serikali wa Afya c[ ] Kwa wahudumu wa Afya wa jamii

d[ ]Kwa wanafunzi e[ ] Kwa wafanyi kazi wa shirika lisilo la Kiserikali f[ ] Kwa kanisa/msikiti

g[ ] Kwa mabago/vijikaratasi h[ ] Radio i[ ] Katika Sherehe za jamii

j[ ]Kwa makundi ya kibinafsi k[ ] Kwa ujumbe mfupi/simu l[ ] Kwa runinga

m[ ] Kwa zahanati n[ ] Mganga wa kienyejio[ ] Kwengine(*elezea)*:_____

4. Na je,ni mfumo gani wa mawasiliano unapenda sana ili kupata maelezo kuhusu Afya nausafi ama maelezo yoyote unayotaka kusikia ama kufahamu? (*Chagua unayopendelea sana)*

a[ ] Radio b[ ] Mabango c[ ] Kupitia kanisia/msikiti

d[ ] Ujumbe mfupi/simu e[ ] Uonyeshaji wa Video f[ ] Mikutano ya umma

g[ ] Runinga h[ ] Mafunzo/FGD i[ ] Kutumbelea manyumba

j[ ] Michezo ya kuigiza k[ ] Michezo ya kuigiza l[ ] Mabango /michoro

m[ ] Vipeperushi/Vichapisho n[ ]Mengineyo(*elezea)*:_____

5. Na je,umeshawahi ama kuna mtu katika jamii yenu aliyehusika katika mradi wa maji na usafi kijijini?

a) Ndio ☐

b) La ☐

c) Sijui ☐

5. Ikiwa ni Ndio,ni mara ngapi unahusika katika mradi wa usafi?

a) Mara moja

b) Kila mwezi

c) Baada ya miezi tatu

d) Baada ya miezi sita

e)Mengineyo,elezea_____

6. Na je,ni miradi ipi ya maji na usafi hasa?

a)Usimamizi wa maji ☐

b) Usafi ☐

c) Magonjwa yanayo husiana na maji ☐

d) Usafi wa mwili ☐

e) Kubadili wa tabia ☐

f) Sijui ☐

g)Mengineyo,elezea_____

8. Na je,ni baadhi ya magonjwa yapi yanayohusiana na mradi wa maji na usafi wa mazingira katika maeneo haya? *(Tafadhali orodhesha ukizingatia umuhimu)*

a) Funza ☐

b) Malaria ☐

c) Kuendesha ☐

d) Upele ☐

e) Kichocho ☐

e) Zengine (Elezea)_____

9. Na je,ni changamoto zipi unazopitia katika mradi wa WASH kijijini mwako? (*chagua yanayoafikiana*)

a) Ukosefu wa mashirika ya kuendeleza miradi ☐

b) Ukosefu wa mashirika kutofuatilia ☐

c) Uhaba wa vifaa ☐

d) Ukosefu wa motisha kutoka kwa jamii ☐

e) Sijui ☐

f) Zingine, elezea _____

10. Na je, ushawahi ama jamii yako kuchukua hatua kuhusu kutafuta suluhisho dhidi ya matatizo ya mradi huu katika kijiji chako?

a) Ndio ☐

b) La ☐

c) Sina ufahamu ☐

11. Ikiwa ndio,ni suluhisho lipi? (*majibu zaidi yanaeza tarajiwa*)

i) Kujenga vyoo vya kawaida

a) Ndio ☐

b) La ☐

c) Sina ufahamu ☐

ii) Kukinga maji

a) Ndio ☐

b) La ☐

c) Sina ufahamu ☐

iii) Kutoa vifaa vya kunawa mikono

a) Ndio ☐

b) La ☐

c) Sina ufahamu ☐

iv)Utumizi wa jivu kama dawa

a) Ndio ☐

b) La ☐

c) Sina ufahamu ☐

e) Mengineyo,elezea _____

(B) Utekelezaji wa mradi wa maji na usafi wa mazingira

12. Na je,muko na choo? (*Chagua moja*)

a) Ndio ☐ b) La ☐

13. Ikiwa ni ndio kwa swali la 12, ni aina gani ya choo? (*Chagua moja*)

a) Choo cha kisasa ☐

b) Choo cha kawaida ☐

c) Choo cha maji ☐

d) Choo cha shimo ☐

e) vengine,elezea_____

14. Ikiwa hakuna, katika swali la 12, je,nyinyi huenda choo wapi? (*Chagua moja*)

a) Kwa majirani ☐

b) Kichakani ☐

c) Mahali maalum nje ya nyumba ☐

d) Kando ya barabara ☐

e) Kwengine,elezea_____

15. Ikiwa ni La kwa swali la 12, Ni kwa nini hamna choo? (*Chagua yote yanayohusika*)

a) Hakuna shida ☐

b) Ukosefu wa Elimu ☐

c) Ukosefu wa mahali pa kujengea choo ☐

d) Sijui ☐

e) Ukosefu wa pesa ☐

f) Ugumu wa kusafisha ☐

g) Shida ya mchanga kubonea au shida ya maji ☐

h) Mengineyo, Elezea_____

16. Na je, jamii yako hutumia kitu cha kujipangusia kila wakienda chooni?

a[ ] Ndio b[ ] La c[ ] Ikiwa ni LA,enda kwa swali la **18**

17. Ikiwa ni Ndio,ni aina gani?

a[ ] Karatasi ya chooni b[ ] Zengine (*elezea):* _____

Sehemu ya 2: Utekelezaji wa kunawa mikono

18. Tafadhali nipe wakati mwafaka ambao huwa unanawa mikono? *(Onyesha jawabu atakalo tu peana)*

a[ ] Kabla ya kula b[ ]Baada ya kutoka choo c[ ]Baada ya kushika kinyezi/diaper ya mtoto
d[ ] Baada ya kula e[ ] Kabla ya kulisha mtoto f[ ] Kabla ya kutayarisha chakula

g[ ] Baada ya kunya h[ ] Baada ya kushika takataka i[ ] Baada ya kushika mifugo

j[ ] Zengine (*elezea*)_____

19. Na je,unatumia nini kunawia mikono? (*Weka alama kwa utekelezaji unaotumika sana*)

a[ ] Maji peke yake b[ ] Maji na sabuni c[ ] Maji na mchanga/majani

d[ ] Maji na jivu e[ ] Zengine (elezea)_____

20. Ikiwa jibu kwa swali la **19** si **(maji na sabuni)**, ni mambo gani MUHIMU yanayozuia jamii yako kutotumia sabuni?

a[ ] Hakuna b[ ] Kukataa/Uvivu c[ ] Kunawa kwa sabuni huchukua muda

d[ ] Ni ghali kunua sabuni e[ ] Maji pekee husafisha mikono

f[ ] Sabuni si kawaida hata zamani g[ ] Sababu zingine (*elezea):* _____

21. KUANGALIA TU: Kuna kifaa chochote cha kunawishia mikono karibu na nyumba?

a[ ] Hakuna
b[ ] Kuna maji na sabuni karibu na choo (*ONLY in household with latrine facility*)
c[ ] Kuna maji na sabuni mahali kulikotengewa eneo la kunawishia mikono.
d[ ] Kuna maji peke yake karibu na choo (*ONLY in household with latrine facility*)

e[ ] Kuna maji peke yake mahali kulikotengewa eneo le kunawishia mikono.

22. Na je,maji ya kutumia kwa nyumba hutoka wapi? (*Chagua moja*)

a) Mto ☐ d) Mfereji ☐
☐
b) Kisima ☐ e) Kwengine, elezea_____
c) Chemichemi

23. Na je, yako umbali gani na nyumba?

a[ ] Karibu mita 500 b[ ] Kati ya mita 500 hadi kilomita moja c [ ] Kati ya kilomita 1 hadi 3 d [ ] Zaidi ya kilomita 3

24. Unatumia dakika ngapi kuchota maji kuenda na kurudi kutoka mahali unapochotea?

a[ ] Kati ya dakika 15 b[ ] Kati ya dakika 15 hadi 30 c[ ] Kati ya dakika 30 na saa limoja d [ ] Zaidi ya saa moja

25. Nani huchota maji ya jamii?

a[ ] Wanaume b[ ] Wavulana c [ ] Wanawake

d[ ] Wasichana e[ ] Kuna mtu huleta f[ ]Mengineyo(*Elezea)*

26. Na je,mnahifadhi maji ya kunywa kwa nyumba?

a) Ndio ☐ b) La ☐

27. Ikiwa ni ndio,mnayahifadhi wapi?

a) Chungu ☐
b) Ndoo ☐
c) Drum lililo na kifuniko ☐
d) Drum ☐
e) Kibuyu ☐
f)Karai ☐
g)Zengine

28. ANGALIA hali ya vibuyu vya maji vinavyotumika kuchotea na kuhifadhi maji.

a[ ] Ni safi b[ ] Si safi c [ ] Vyengine ni visafi ilihali vyengine si safi

29. Na je, unatibu maji kabla ya matumizi? (*Chagua moja*)

a) Ndio ☐ b) La ☐

30. Ikiwa ni Ndio,ni mbinu gani ya kutibu unayotumia? (*Chagua linalofaa*)

a) Kuchemsha ☐

b) Kuchuja ☐

c) Kuacha maji mpaka yatulie ☐

d) Water Guard ☐

e) Jua ☐

f) Sijui ☐

g) Zengine, elezea_____

31. Ikiwa hakuna, kwa nini?

a[ ] Haifai b[ ] Ni ghali c [ ] Tumezoea maji yakiwa hivyo

d[ ] Maji ni salama e[ ] Hatujui kutibu f[ ] Zengine (*elezea):* _____

32. Ikiwa unalipia maji,unatumia pesa ngapi kwa siku?

a[ ] Hakuna b[ ] Chini ya shilingi 10 c [ ] Kati ya shilingi 10 hadi 50 d[ ] Kati ya shilingi 50 hadi 100 e[ ] Zaidi ya shilingi 100

33. Na je,jamii yote hutumia lita ngapi za maji kwa siku? (*1 Jerikeni= 20L)*

a[ ] Chini ya lita 20 b[ ] Kati ya lita 20 hadi 37 c [ ] Kati ya lita 38 hadi lita 75 d [ ] zaidi ya lita 75

34. Ni nani hasa huhusika na usimamizi wa kituo cha maji? (*Chagua zinalofaa)*

a[ ] Hakuna b[ ] Kamati ya usimamizi wa maji c [ ] Wazee wa kijiji

d[ ] Wafanyi kazi wa umma e[ ] Wanachama wa jamii/watumiaji

f [ ] Mwenyewe/shirika la kibanfsi g[ ] Zengine (*elezea):* _____

(D) MAMBO YANAYO HUSIANA NA AFYA

(a) Uchunguzi wa kuchipuka kwa ugonjwa wa kuendesha

35. Na je,uko na ufahamu kuhusu ugonjwa wowote unaohusiana na mradi wa WASH wakati mtu anaenda choo kiholela holela?

a) Ndio ☐ b) La ☐

36. Ikiwa ni ndio,ni ugonjwa upi

Kuendesha	☐	Kipindupindu	☐
Upele	☐	Homa ya matumbo	☐

37. Na je,kuna mtu wa jamii yako ambaye ameugua kufuatia ugonjwa wa kuendesha kwa majuma mawili yaliyopita?

a) Ndio ☐ b) La ☐

(*Kumbuka, kuendesha hufahamika kama kupitisha choo kwa zaidi ya mara tatu au zaidi kwa muda wa masaa 24 ikiwa choo majimaji,kilicho na damu,makamasi au maji kabisa)*

38. Ikiwa ni NDIO, aliyeendesha alikuwa na miaka mingapi? _____

a[ ] Hakuna b[ ] Chini ya miaka 5 c [ ] Kati ya miaka 6 hadi 17
d[ ] Kati ya miaka 18 hadi 59 e[ ] Kati ya miaka 60 na zaidi

39. Na je, kuna mtu katika jamii yenu aliyefariki kwa sababu ya ugonjwa wa kuendesha kwa zaidi ya **mwezi mmoja** uliopita? (*Kuwa muangalifu unapouliza swali hili)*

a[ ] Ndio b[ ] La

40. Ikiwa ni Ndio, alikuwa na umri wa miaka ngapi? _____

a[ ] Hakuna b[ ] Chini ya miaka 5 c[ ] Kati ya miaka 6 hadi 17 d[ ] Kati ya miaka 18 hadi 59 e[ ] Kati ya miaka 60 na zaidi

41. Na je,ni hatua zipi mnazochukuwa endapo mtu katika jamii yenu amepatwa na ungonjwa wa kuendesha? (*Chagua zinalofaa)*

a[ ] Hakuna hatua yoyote b[ ] Kununa dawa c[ ] Kupeana ORS

d[ ] Kumpeleka katika kituo cha Afya/zahanati

e[ ] Kumpea miti shamba f[ ] Kusimamisha kumpea chakula g[ ] Kuendelea kumpa chakula i[ ] Kumpeleka kwa mganga wa kienyeji j[ ] Mengineyo (*elezea):* _____

42. Unadhani ni nini inaweza kuwa chanzo cha ugonjwa wa kuendesha? (*Chagua zile muhisika amesema)*

a[ ]Mvua b[ ] Mikono michafu c[ ] Ni sehemu ya kukuwa kwa mtoto d[ ] Uchawi e[ ] Viini f[ ] Chakula kichafu g[ ] Uchafu wa mwili h[ ] Sijui i[ ] Nzi j[ ] Maji machafu k[ ] Kukunya mahali peupe l[ ]Zengine (elezea)_____

43.Na jee,unadhani ugonjwa huu utazuiwa kwa njia gani? (*Chagua zile muhisika amesema)*

a[ ] Sijui b[ ] Kukunywa maji safi c[ ] Kutayarisha chakula vizuri (kupika,kuosha)

d[ ] Matumizi ya choo e[ ] Kutibu maji f[ ] Kunawa mikono kwa maji na sabuni/jivu

g[ ] Kufunika chakula h[ ] Kuzui kukunya mahali peupe i[ ] Kuenda kwa mganga wa kienyeji j [ ] Maombi k[ ] Kuhidhi maji vyema l[ ] Zengine, elezea:_____

44. Ikiwa ulienda hospitalini,alitumia shilingi ngapi kwa matibabu (*Chagua moja*)

a) Chini ya Ksh, 100 ☐
b) Kati ya Ksh. 301-500 ☐
c) Zaidi ya Ksh 1000 ☐
d) Kati ya Ksh. 101-300 ☐
e) Kati ya Ksh. 501-1000 ☐

Ahsante kwa muda na ushirikiano wako.

Appendix VI: Focus Group Discussion Guide

Date (day/month/year):____/____/____ Time focus-group discussion began: _:____

Name of facilitator: _____Time focus-group discussion ended: ___:____

Name of recorder: _____:_____Gender of group: male: _____ female: _____

Introduction

The moderator will inform every one that, it will be a free discussion and everyone will be free to participate. The members will introduce themselves before we start.

Questions

1. What are some of the common water and sanitation related illnesses affecting the community/school in order of importance?

a) Malaria b) Diarrhoea c) Bilharzias d) Jiggers e) Typhoid

2. What are the causes of water and sanitation related illnesses?

3. What are your suggestions to help in preventing this type of illnesses?

4. Could you tell us the practices of your community/school members with regard to,

a) Use of toilet facility, b) Water management, c) Hand washing practices, d) General hygiene

5. What are the challenges this community/school face with regard to water, sanitation and hygiene?

3. What significant change has improved with regard to water, sanitation and hygiene (water point/latrines) in community/school?

4. Do you normally participate in water, sanitation and hygiene programmes in the community/schools?

5. What kind of programmes are they?

6. Which agencies offer this kind of programmes?

7. Which ways can the community/school support this kind of programmes?

Thank you very much for your participation

SEHEMU YA VI: MUONGOZO WA MAWASILIANO YA KIKUNDI

Tarehe (day/month/year):____/____/____ Wakati focus-group discussion ilianza : _:____

Jina la mkufunzi: _____Wakati focus-group discussion iliisha: ___:____

Jina la aliye nakili: _____:_____

Jinsia ya Kundi: wanaume: _____ wanawake: _____

Utangulizi

Kiongozi atafahamisha kila mtu ya kuwa majadiliano haya yatakuwa huru na kwamba kila mtu ajisikie huru kushiriki.Wanachama watajitambulisha kabla ya kuanza.

Maswali

1. Na je, ni magonjwa gani muhimu yanayohusiana na usafi wa maji na usafi wa mwili yanayoathiri jamii/shuleni?

a) Malaria , b) Kuendesha, c) Kichocho, d) Funza , e) Homa ya matumbo, f) Ugonjwa wa ngozi

1. Ni nini husababisha ugonjwa unaohusiana na maji na usafi wa mwili?
2. Ni yapi maoni yako kuzuia aina ya magonjwa haya?

4. Unaweza kutufahamisha kuhusu mbinu zinazotumiwa na jamii/shule yako kuhusiana na,

a)Matumizi ya choo, b) Usimamizi wa maji, c) Unawaji wa mikono,d) Usafi wa kawaida

5. Na je, maji ya matumizi ya nyumba hutoka wapi?

6. Na je, ni nani alijenga kituo cha maji?

7. Na je, uliridhika na ujenzi wa kituo hicho cha maji?

8. Na je, ni mabadiliko gani muhimu yaliyoletwa na ujenzi wa vituo hivi vya maji/vyoo katika jamii/shule?

9. Na je, wewe huhusika na mradi huu wa WASH katika eneo hili?

10. Ni miradi gani? Na ni shirika gani huleta miradi hii?

Ahsante sana kwa kuhusika kwako

Appendix VII: Key Informant Interview Guide With the Key Persons

Introduction

I am conducting a study on Water, Sanitation and Hygiene Practices as Predictors of Diarrhoea Occurrence among School Age Children in Ganze Sub County.

The purpose of my visit is to get the information on these factors. I will appreciate the time and information you will share with me.

Guide:

a) Name of respondent (Optional)_____
b) Age _____
c) Gender _____
d) Designation. _____
e) Duration in the position _____

Main issues

B) Ministry of health officials

1. Do you know of water, sanitation and hygiene programmes targeting,

    a) School b) Community

2. In your opinion, what is the importance of water, sanitation and hygiene in your school?

3. What can be done to improve water, sanitation and hygiene uptake in schools? (*Probe)*

4. Are there diseases that affect pupils/community due to poor water, sanitation and hygiene?(*Probe*)

5. If yes, which ones? (*Probe further if diarrhoea is mentioned)*

6. What measures are in place to prevent such disease occurrences? (*Probe*)

C) Ministry of Education officials

1. Do you know of water, sanitation and hygiene programmes targeting,

a) School b) Community

2. Is there any kind of support your office gives to the schools with regard to water, sanitation and hygiene? (*Probe*)

8. If yes, what support does your office give to the schools with regard to water, sanitation and hygiene?
9. What in your opinion hinders the implementation of water, sanitation and hygiene activities in schools? *Probe*
10. Are there different support given to diffent schools i.e feeding and nonfeeding, monitoring of activities etc.

D) Ministry of Agriculture officials

1. Do you know of water, sanitation and hygiene programmes targeting,

a) School b) Community

2. Are there programs supporting school feeding through your ministry?
3. If yes, which programmes are these? (*Probe*)

4. What role do you play in these programmes as a ministry?

5. What are the challenges you face in the implementation of such programmes? (*Probe*)

6. In your own opinion how can these challenges be tackled? (*Probe*)

Closing Question:

Is there anything you wanted to say but did not get a chance to say?

Thank you for your participation

SURA YA VII: MUONGOZO WA KINA KUHUSU MAJADILIANO NA WAHUSIKA WAKUU

Utangulizi

Nafanya utafiti kuhusu mambo yanayohusiana na usafi wa maji na usafi na athari za kiafya kwenye watoto wa shule za misingi Ganze, kaunti ya Kilifi. Sababu ya kuwatembelea ni kuhakikisha nimepata maelezo kuhusu mambo haya.Nitashukuru sana kwa muda na maelezo mtakayojadili na mimi.

Muongozo:

a) Jina la anayejibu (Si lazima)_____ Miaka _____
b) Jinsia_____Kazi/Cheo/Kitengo. _____
c) Muda katika nafasi _____

Maswala muhimu

b) Maafisa wa wizara ya afya

3. Je,unajua ni pango gani yanayolenga maji,usafi na mazingira kwa,

a) Shule b)Jamii

2. Kwa maoni yako, ni nini umuhimu wa usafi katika shule/jamii yako?
3. Ni nini hasa kinaeza fanywa ili kuimarisha mradi wa usafi shuleni? (*Ulizia zaidi*)
4. Na je,kuna magonjwa yanayoshika wanafunzi kutokana na maji machafu na usafi wa mwili?(*Ulizia*)
5. Ikiwa ni Ndio,ni yapi? Ulizia uone kama kuendesha na tatizo la funza limegusiwa
6. Ni hatua gani zimeweekwa ili kukabiliana na kulipuka kwa magonjwa hayo? (*Ulizia*)

C) Maafisa wa Wizara ya Elimu

1. Je, unajua ni pango gani yanayolenga maji,usafi na mazingira kwa,

a)Shule b)Jamii

2. Je, kuna aina yoyote ya msaada ofisi yako inatoa kwa shule kwa kuzingatia usafi?

(Ulizia)

3. Kama jibu ni ndiyo, haya misaada ni yapi?

4. Kwa maoni yako,ni vitu gani vinazuia utekelezaji wa shughuli za usafi katika shule?

5. Ni aina gani ya msaada hutolewa kutoka kwa wizara yenu kwa hizi mashule,munafuatilia namna gani haya miradi?

D) Maafisa wa Wizara ya Kilimo

1. Je, unajua ni pango gani yanayolenga maji, usafi na mazingira kwa,

a)Shule b)Jamii

2. Je, kuna mipangokutoka kwa wizara yenu ya kusaidia kulisha shule?

3. Kama jibu ni ndiyo, haya mipango ni yapi? (ulizia)

4. Ni jukumu gani wewe hucheza katika kutekeleza haya mradi?

5. Je, ni changamoto zipi nyinyi hupitia kwa kutekeleza huu mradi?

6. Kwa maoni yako,

ni jinsi gani haya changamoto yanaweza kabiliwa? (ulizia)

Maswali ya kufunga:

Na je, uko na changio lolote ulilotaka kusema lakini labda ulikosa nafasi ya kuuliza?

Ahsante kwa kuhusika

Appendix VIII: School Observational Chart

SCHOOL OBSERVATION CHECKLIST

	SCHOOL PROFILE		
	TYPE OF SCHOOL		
	CLASS	No. of Male	No. of Female
	DATE		

ASSURANCE

Information obtained through the use of this observation checklist will be treated with utmost confidentiality.

ATTRIBUTES TO BE OBSERVED	Description of variables	
1. Demographics		
1.1 No. of pupils per class		
1.2 No.of pupils per school		
1.3 No. of classrooms per school		

2. Educational outcomes			
2.1 No. of pupils absent per class at the time of interview			
2.2 No.of pupils absent per class due to diarrhoea			
3.Environmental factors			
3.1 Mode of waste disposal			
3.2 Source of water			
3.3 Availability of water			
3.4 Proximity of water source to school			
3.5 Mode of water storage			
3.6 Availability of hand washing facilities			
3.7 Availability of soap at hand washing point			

TOTAL		

KIPENGELE CHA VIII: CHATI YA SHULE YA KUANGALIA ATHARI KUHUSU UGONJWA

ORODHA YA UKAGUZI			
	UTANGULIZI		
	NAMBARI YA UTAFITI		
	DARASA	Idadi ya wavulana	Idadi ya wasichana
	TAREHE		

HAKIKISHO

Maelezo yaliyobuniwa kutokana na ukaguzi huu yatachukuliwa kwa hali ya siri sana.

1. MAKATAA MUHIMU YA UKAGUZI	Maelezo ya viashiria	
1.1 Idadi ya wanafunzi walio kwa kila darasa		
1.2 Idadi ya wanafunzi kwa kila shule		
1.3 Idadi ya madarasa kwa kila shule		
2. Matokeo ya Elimu		
2.1 Idadi ya siku alizokosa kwa darasa		
2.2 Idadi ya siku alizokosa darasani kwa ajili ya ugonjwa ya kuhara		
3.Mambo ya mazingira		
3.1 Njia ya utupaji wa takataka		
3.2 Mahali maji hutoka		
3.3 Kupatikana kwa maji shuleni		
3.4 Jinsi ya kutega maji shuleni		
3.5 Aina ya matumizi ya maji ya shule		
3.6 Vifaa vya kunawisha mikono		
3.7 Sabuni katika kituo hiki cha kunawa mikono		
JUMLA		

Appendix IX: Names of Schools Implementing and Non Hgsmp Schools in Ganze, Sub County

No.	Home Grown School Meals Programme School	Non Home Grown School Meals Programme Schools
1.	Mayowe Primary School	Juhudi Primary School
2.	Mikuluni Primary School	Mdangarani Primary School
3.	Dulukiza Primary School	Palakumi Primary School
4.	Kafuloni Primary School	Katendewa Primary School
5.	Mirihini Primary School	Kahingoni Primary School
6.	Milore Primary School	Ziwani Primary School
7.	Mariani Primary School	Dida Primary School
8.	Tsangalaweni Primary School	Midodoni Primary School
9.	Migodomani Primary School	Kavitsoni Primary School
10.	Petanguo Primary School	Badomale Primary School
11.	Magogoni Primary School	Madamani Primary School
12.	Shaka Primary School	Mabirikani Primary School