Prevalence and factors associated with Diarrhoea among Children Under-five and Household adaptation Strategies in flash flood prone Bwaise II and III parishes, Kawempe Division, Kampala Uganda

By

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Dissertation submitted in partial fulfilment for the award of the Master’s degree in Public Health Disaster Management of school of Public Health, College of Health Sciences, Makerere University

November, 2018
DECLARATION

I David Kaptengan hereby declare that this research report has never previously been presented or published by another person or been accepted for any other award, except where due acknowledgement has been made in the text.

____________________________
Date: _02_/ _11_/ 2018

David Kaptengan
APPROVAL

This research report has been done under my supervision and is ready for submission to the board of examiners of Makerere University School of Public Health in partial fulfilment of the requirements for the award of Master of Public Health Disaster Management (MPHDM) of Makerere University.

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Dr. Robert Ntalo
DEDICATION

This dissertation is dedicated to my dear Mother Jesca Chemutai, my wife Philis Kaptengan and my brothers Dr. Alifas Yeko Mwanga, Stephen Mutei, Saul Chemayek and Dison Chemusto for their incredible support throughout my study.
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<thead>
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<th>Full Form</th>
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<tbody>
<tr>
<td>aORs</td>
<td>Adjusted Odds Ratios</td>
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<tr>
<td>CDC</td>
<td>Centre for Disease Control</td>
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<td>CDS</td>
<td>City Development Strategies</td>
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<td>cORs</td>
<td>Crude Odds Ratios</td>
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<td>CI</td>
<td>Confidence Interval</td>
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<td>DHO</td>
<td>District Health Officer</td>
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<td>DRM</td>
<td>Disaster Risk Management</td>
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<td>DRR</td>
<td>Disaster Risk Reduction</td>
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<td>EHP</td>
<td>Environmental Health Project</td>
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<td>H.H</td>
<td>Household</td>
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<tr>
<td>HIF</td>
<td>Hygiene Improvement Framework</td>
</tr>
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<td>ICRCS</td>
<td>International Committee of Red Cross and Red Crescent Societies</td>
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<td>IDNo</td>
<td>Identification Number</td>
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<tr>
<td>IEC</td>
<td>Information, Education and Communication</td>
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<tr>
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<td>Intergovernmental Agency for Development</td>
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<td>Intergovernmental Panel on climate change</td>
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<td>JMP</td>
<td>Joint Monitoring Program</td>
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<td>KCCA</td>
<td>Kampala Capital City Authority</td>
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<tr>
<td>MakSPH</td>
<td>Makerere University School of Public Health</td>
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<tr>
<td>MDPR</td>
<td>Ministry of Disaster Preparedness and Refugees</td>
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<td>MPHDM</td>
<td>Master of Public Health Disaster Management</td>
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<td>NCST</td>
<td>National Council of Science and Technology</td>
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<td>NGOs</td>
<td>Non-Governmental organizations</td>
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<td>Acronym</td>
<td>Full Form</td>
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<tr>
<td>OCHA</td>
<td>United Nations Office for Coordination of Humanitarian Affairs</td>
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<td>OHCEA</td>
<td>One Health Central and Eastern Africa</td>
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<tr>
<td>OPM</td>
<td>Office of the Prime Minister</td>
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<tr>
<td>OR</td>
<td>Odds Ratio</td>
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<tr>
<td>PI</td>
<td>Principal Investigator</td>
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<tr>
<td>RA</td>
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<tr>
<td>RAN</td>
<td>Makerere University, School of Public Health, Resilient African Network</td>
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<td>SD</td>
<td>Standard Deviation</td>
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<tr>
<td>U5</td>
<td>Under-fives</td>
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<tr>
<td>UDHS</td>
<td>Uganda Demographic and Health Survey</td>
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<td>UK</td>
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<td>United Nations</td>
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<td>UNCST</td>
<td>Uganda National Council for Science and Technology</td>
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<td>Uganda National Meteorological Authority</td>
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<td>UNDP</td>
<td>United Nations Development Program</td>
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<td>UNICEF</td>
<td>United Nations Children's Fund</td>
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<td>URC</td>
<td>Uganda Red Cross</td>
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<tr>
<td>USA</td>
<td>United States of America</td>
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<tr>
<td>USAID</td>
<td>United States Agency for International Development</td>
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<tr>
<td>WASH</td>
<td>Water Sanitation and Hygiene</td>
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<tr>
<td>WHO</td>
<td>World Health Organization</td>
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<tr>
<td>WMO</td>
<td>World Meteorological Organization</td>
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<td>WSP</td>
<td>Water and Sanitation Program</td>
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<td>WSPs</td>
<td>Water Safety Plans</td>
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<tr>
<td>WSSCC</td>
<td>Water Supply and Sanitation Collaborative Council</td>
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</table>
OPERATIONAL DEFINITIONS

Adaptation: Purposeful and ongoing adjustments/response, made by households to reduce episode of diarrhoea.

Caretaker: An individual who may or may not be the head of a household but cares for a child under five years (0-59 months) of age.

Diarrhoea: Passage of three or more loose stools over 24 hours period or more frequently than normal for a child under five years.

Fields: Outdoors/ the yard around a house.

Flash flood: Overwhelming amounts of water in normally dry land area within few minutes to few hours of excessive rainfall.

Flash flood prone area: An area commonly experiencing flash floods

Fluids: Water used for drinking or cooking.

Household: All persons living under one roof or occupying a separate housing unit, having either direct access to the outside (to a public area) or a separate cooking facility.

Prevalence of Diarrhoea: Proportion of children under five years of age in Bwaise who have experienced diarrhoea episode in the last six months.

Strategies: Approaches developed by households to reduce the effects of flash floods on children under five years.

Under-five: A child below the age of five years (0-59 months).
ABSTRACT

Introduction
Diarrhoea remains a major cause of morbidity and mortality among U5 in Uganda with prevalence of 20%. Bwaise has poor sanitation and hygiene coupled with frequent flash floods have increased prevalence of diarrheal diseases, hence residents adapted by building raised pit latrines to alleviate the burden of diarrhoea among U5.

Objective
To determine the prevalence and factors associated with diarrhoea among U5 and household adaptation strategies in Bwaise II and III parishes prone to flash floods in Kawempe division, Kampala.

Methods
Cross sectional study was conducted in Bwaise parishes II and III of Kawempe division, significantly vulnerable to floods. The study population was children U5. The sample size was 300 respondents with diarrhoea among U5 being the outcome variable. Only quantitative methods were used. Logistic regression model was used to determine factors associated with diarrhoea among U5. Data was entered using Epidata version 3.1, and analysed using Stata version 13.

Results
More than half 59.3% (178/300) of U5 had a diarrheal episode. The odds of diarrhoea among U5 were; 2.62 times greater with >2 children U5 [aOR=2.62, 95% CI= (2.38-17.84)], 2.18 times higher with uncovered drinking water [aOR=2.18, 95% (CI=1.07-4.42)], 15.21 times higher in lacking hand washing facility [aOR=15.21, 95% (CI=4.04 - 57.25)], 0.4 times lower among U5 where soap isn’t used in washing baby after defecation [aOR = 0.40, 95% CI (0.16 - 0.94)], and 9.72 times higher among U5 defecating in the polythene bag [aOR=9.72, 95% (CI=1.37-69.02)]. Majority 93.7% (281/300) maintained hygiene and 87.3% (262/300) boil drinking water

Conclusion
The prevalence of diarrhoea among U5 was higher than the national average. Significant predictors of diarrhoea among U5 include; many children U5 in the household, uncovered drinking water containers, unsafe disposal of children’s faeces, lack of hand washing facility, unwashed hands with or without soap and higher frequency of flash floods. Majority adapted by maintaining hygiene and boiling drinking water. The Ministry of Health should promote hand-washing coverage to prevention diarrhoea among U5 in Bwaise.
CHAPTER ONE

1.0 INTRODUCTION

Worldwide, an estimated 4 billion episodes of diarrhoea occur annually and more than half of these occur in children under five years - main victims of water and sanitation – related illness and diarrheal diseases. According to Centre for Diseases Control (CDC), diarrhoea remains the second leading cause of death among children under five globally and accounts for 1 in 9 child deaths worldwide (CDC, 2012). In developing countries, diarrhoea accounts for the deaths of nearly 1.6 million children under five every year. According to World Health Organization, the exposure of children under five years to such risks is mainly due to less-developed immunity and their play behaviour that brings them into contact with pathogens. WHO report continues to show that 644,717 children under 5 died from diarrheal diseases alone in 2011 (WHO, 2013).

The Intergovernmental Panel for Climate Change (IPCC) projected that climate change will likely increase the burden of diarrheal diseases in low-income countries by approximately 2-5% by 2020 (IPCC, 2007). In addition, a Joint Monitoring Programme (JMP) report of UNICEF /WHO 2015, shows that around 180,000 children under five years old die every year and in Sub-Saharan Africa, roughly 500 a day die due to diarrheal diseases linked to inadequate water, sanitation and hygiene (WASH), (UNICEF and WHO, 2015)

According to the Uganda Demographic and Health Survey (UDHS) report of 2016, diarrhoea remains a major cause of morbidity and mortality among children under five years in Uganda with a national prevalence of 20% (UDHS, 2016). The prevalence of diarrhoea varies seasonally by peaking at the end of rainy season as exposure to diarrhoea causing agents is frequently related to the use of contaminated water and unhygienic practices in food preparation and disposal of excreta (UDHS, 2011). According to the United States Agency for International Development (USAID) report of 2014.

A numbers of factors have been found to be associated with occurrence of diarrhoea in children in the developing world. According to Ssenyonga and colleagues, diarrhoea is dependent on level of poverty of the family, and the community as a whole, including socio-economic characteristics (Ssenyonga et al. 2009). Flash flooding increases the prevalence and frequency of outbreaks of
diarrheal diseases in areas with poor sanitation and infrastructure which is the case in many parts of Uganda like Bwaise (USAID, 2014). The households in Bwaise have intervened to reduce the burden of diarrheal diseases by building raised pit latrines and emptying them during flooding seasons but the burden has remained high with increased hospitalization of children under five due to diarrheal disease. This research therefore was conducted to determine the prevalence and factors associated with diarrhoea among children under-five and household adaptation strategies in Bwaise II and III parishes prone to flash floods in Kawempe division, Kampala.

1.2 BACKGROUND

Uganda has witnessed a number of flash floods that have culminated into loss of life, property and displacements (Boas and Hatloy, 2006). Though no one is immune to diarrheal diseases, children are particularly more vulnerable. Kampala experiences frequent flash floods in the surrounding low lying areas especially in Bwaise which United Nations Development Program (UNDP) referred to it as Uganda’s representative ‘hot spot’ (UNDP, 2012).

Cities and towns are experiencing flash floods due to high percentage of their surface areas being concrete with car parks, streets, roofs and air fields that increase the occurrence of sudden runoff that are difficult if not impossible to forecast (Jha et al., 2012). Government outlays analysis report of 2010/11 Financial Year (FY) indicates that Kampala capital city has the most inhabitants living in low lying areas of reclaimed swamps, prone to flooding during heavy rains. Flash flooding increases the prevalence and frequency of outbreaks of diarrheal diseases in areas with poor sanitation and infrastructure which is the case in many parts of Uganda like Bwaise (USAID, 2014). Bwaise being a low lying area, with poor sanitation and hygiene coupled with frequent flash floods have increased prevalence and occurrence of outbreaks of diarrheal diseases and always higher than the national average (UDHS, 2011). Most affected are the children under five years of age.

Lwasa and colleagues found out that, Bwaise is a low-lying swampy area among the slums housing over 50% of the urban poor population in Kampala with illegal settlements susceptible to floods (Lwasa et al. 2009). The 2011 Uganda Demographic and Health Survey (UDHS) shows that diarrhoea is a major cause of morbidity and mortality among young children under five years of age. A number of interventions have been done to minimize the burden of diarrheal diseases in
Bwaise such as community health interventions including Water Sanitation and Hygiene (WASH) services. Despite all these interventions, the burden of diarrheal diseases among children under five has remained high and the factors for such high prevalence during flash floods has not been fully explored.

The loss of young life in Bwaise, Kampala due to diarrhoea is devastating, and it is even more tragic for being almost entirely preventable. It is well known, for example, that more than 80% of the cases of diarrhoea worldwide are the result of faecal-oral contamination. Even as considerable progress has been made in Uganda in the last 20 years in the management of diarrhoea, especially through oral rehydration programs, corresponding with a decline in morbidity and mortality, the current national prevalence of diarrhoea among children under five is still high at 20% and its associated negative consequences remain almost unabated (UDHS, 2016).

Despite joint interventions by Ministry of Health (MOH) and Ministry of Disaster Preparedness and Refugees (MDPR) such as using warnings about heavy rains that would cause flooding and damage facilities like pit latrines in many parts including Bwaise, and this would lead to incidence of diarrheal diseases. The burden of diarrheal diseases among children under five remains high. It has been shown that whenever it rains in Bwaise, the residents simply dig trenches and empty their latrines to minimize contaminated water entering into houses (Musoke 2011). But still diarrhoea episodes have resulted into more hospitalizations and death of many children under five among households in Bwaise.

According to recent study in Kampala, the residents in Bwaise have adapted to floods by adding bricks and stones to elevate their beds from floods (Ajambo, 2013, Musoke, 2011). Uncertainty surrounds the predicted future rainfall expected to increase yet repeating past mistakes can have disastrous consequences for the present and the future.

So long as children under five years continue to be exposed to diarrhoea pathogens, they will continue to contract diarrhoea, hence this research was conducted to determine the prevalence and factors associated with diarrhoea among children under-five as well as household adaptation strategies in Bwaise II and III parishes prone to flash floods in Kawempe division, Kampala.
CHAPTER TWO
2.0 LITERATURE REVIEW

According to the UDHS, diarrhoea is a major cause of morbidity and mortality among young children and exposure to diarrhoea-causing agents is frequently related to the use of contaminated water and to unhygienic practices in food preparation and disposal of excreta (UDHS, 2011). Diarrhoea is the passage of three or more loose stools over 24 hours period or more frequently than normal for a child under five years (WHO, 2010).

According to the Ministry of Disaster Preparedness and Refugees (MDPR) report 2011, Uganda experiences flash floods seasonally and usually occurs in periods of intense rainfall, common in some urban areas like Kampala low lying areas, along river banks and close to swamps. Besides causing death due to drowning, floods destroy public health facilities such as water sources and health facilities, triggering outbreaks of water borne diseases hence compounding community vulnerability to health hazards (MDPR, 2011).

According to Intergovernmental Panel for Climate Change (IPCC), it is said that by year 2030, between 75 and 250 million people in Africa will be exposed to increased water stress due to an increase in the frequency and intensity of hydro-meteorological events such as floods (IPCC, 2013, IPCC, 2007), which can be very disastrous for children. As the world’s population continues to grow and as climate changes, diarrheal diseases among U5 are expected to worsen (Erik W. and Kjell A, 2010). However, that trend can be changed if the prevalence and the factors associated with diarrhoea among children U5 as well as adaptation strategies developed by households are understood.

2.1 Flooding and its impact on the population

The number of people affected resulting from flooding is on the rise at an alarming rate (Pachauri, 2009). Climate Vulnerability Monitor shows that flooding induced by climate change is globally estimated to be responsible for an average 3,000 deaths per year and 10 billion dollars estimated in economic losses (Save the children, 2013). Research findings by Rahman, shows that flood affects children by causing difficulty in mobility, increases risk for living at houses, and erosion...
of social assets such as neighbourhood, brotherhood and bondage of kinship as well as spread of water borne diseases with increased health hazards (Rahman, 2014).

According to Walker and colleagues, children’s experiences on floods suggests that, they already have complex routines and social relations which are disrupted in a number of ways like The children who were flooded at school and at home experienced extra pressures in coping during the recovery process of the floods and it is therefore important to contextualize the floods within the rest of their lives (Walker et al. 2010). They further emphasized that the cities themselves are characterized by high levels of socio-economic deprivation and many children come from low income households with further impact on the family’s ability to recover (Walker et al. 2010)

Floods have large social consequences for households and individuals. The immediate impacts of flooding include loss of human life and deterioration of health conditions owing to waterborne diseases (Alderman et al. 2012). The emergency appeal report under the International Committee of Red Cross and Red Crescent Societies (ICRCS) indicates that more than 20,000 households were severely affected, displacing 58,000 people, contaminating water sources, collapsing latrines and led to the outbreak of waterborne diseases, including cholera. (ICRCS, 2009 and OCHA-Uganda, 2008)

Flash floods are known to have direct effects that relate to material damage and direct effect on people, indirect damages relate to disruptions and costs arising from flood while social consequences relate to psychological effects of a long term nature (Marka et.al, 2004). Children require special attention in the design and implementation of any humanitarian response. According to the Children’s Act, section 1 of the 1995 constitution of the republic of Uganda, a child is a person bellow eighteen years of age, and they are physically vulnerable to death, injury, illness, and abuse as a result of disasters (Peek, 2008).

2.2 Prevalence of diarrhoea among children under five during flash floods

According to the 2011 and 2016 Uganda Demographic and Health Survey (UDHS), the prevalence of diarrhoea among children under the age five was 23% and 20% respectively. It further shows that diarrhoea was a major cause of morbidity and mortality among young children (UDHS, 2011). In addition, United States Agency for International Development (USAID) report, indicates that
diarrheal diseases are endemic in certain parts of Uganda such as the Kampala slums, and the burden remains unclear (USAID, 2014).

Following a report from the Uganda National Meteorological Authority (UNMA) together with the Intergovernmental Agency for Development (IGAD), Regional Climate Application and Prediction Centre and the World Meteorological Organization (WMO) in 2015, the Ministry of Health (MOH), issued warnings about heavy rains that would cause flooding at varying levels in some areas including Kampala. The warning further indicated that Some Health facilities would likely be damaged and that many pit-latrines would be flooded in the affected areas hence incidence of diarrheal diseases like cholera and dysentery would raise to outbreak levels in about 33 of the 112 districts and hence such foreseen scenarios would lead to increased demand for health services (MOH, 2015).

The Ministry of Health (MOH), issued a warning in Kampala on 16th October 2015, about heavy rains that would cause flooding in about 33 districts including Kampala. The warning indicated that some health facilities would likely be damaged and that many pit-latrines would be flooded and this would lead to incidence of diarrheal diseases like cholera and dysentery raising an outbreak and hence such foreseen scenarios would lead to increased demand for health services (MOH, 2015).

Centre for Disease Control (CDC) report indicates that there is health risk of diarrheal disease from eating or drinking anything contaminated with flood water (CDC, 2008). A study of flood-related mortality in Nepal found out that, the death rate of children was double that of adults (Rasmus, 2013). In addition, according to Greig and colleagues, finding ways of engaging effectively with children in disasters is an area that requires more attention (Greig et al. 2012, and Peek, 2008).

2.3 Factors associated with diarrhoea among children under-five

A numbers of factors have been found to be associated with occurrence of diarrhoea in children in the developing world. For example, according to Ssenyonga and colleagues, diarrhoea is dependent on level of poverty of the family, and the community as a whole, including socio-economic characteristics - education level of the parents/caretakers, infant feeding and food preparation practices (Ssenyonga et al. 2009).
According to the World Health Organization (WHO) report 2014, the risk factors that expose children during flooding are; lack of barriers to control exposure of children to floodwater, lack of adequate close supervision for infants and children, and low awareness of contaminated water dangers. The Ministry of Health (MOH), Environmental Health Division provides leadership in mapping out and implementation of water and sanitation strategies and collaborating with UNICEF to develop policy guidelines for water and sanitation to improve household sanitation through home visits, community led campaigns, capacity building, water quality assessment, solid, liquid and food safety and hygiene (USAID, 2014).

World Health Organization (WHO) estimated that 502,000 diarrhoea deaths were attributable to inadequate drinking-water, and 280,000 deaths were caused as a result of inadequate sanitation and a further 297,000 deaths were likely to have resulted from inadequate hand washing practices and yet it could be prevented through better water, sanitation and hygiene (WHO, 2014).

According to the UDHS report of 2011, observance and promotion of basic hygiene is fundamental good public health concern. Hand washing with a detergent ensures that the transmission of germs is restricted, especially among children who are more prone than adults to diarrhoea and other childhood illnesses (UDHS, 2011).

Plan International UK Report of 2010, emphasized the need for further research into children and disasters and how best to safeguard their survival, development and participation so that parties involved in disaster relief particularly the United Nations (UN) and member governments can mitigate the effects. The emphasis according to Plan UK is to safeguard all rights of children throughout disasters and take account of the special needs and vulnerabilities of children, and their special capacities to be independent strong survivors capable of producing useful knowledge and actively contributing to disaster relief, recovery and preparedness efforts to ensure their well-being during disasters (Plan-UK, 2010).
2.4 Household adaptation strategies to protect children U5 against diarrhoea

The Joint Publication report 8 authored by UNICEF and others in 2004, highlights guidelines for household and community levels and shows that, the critical times for maximum effect on diarrheal disease reduction include: After defecation, after handling child’s faeces, or cleaning a child’s bottom, before feeding others, before eating and before preparing food. It also indicates that the ways to prevent diarrhoea includes using soap or detergent to wash hands, using toilet facility to defecate, depositing of children’s faeces in toilet facility or burying them, drinking clean water, storing water safely, treating water (boil, filter, chlorinate), preparing and protecting food hygienically, depositing of garbage in a pit, breast feeding babies in general (especially until 6-months old and not offering other food/drink before 6 months), Getting measles vaccination, Taking vitamin A and practicing good nutrition (EHP et al, 2004).

According to Onigbogi and colleague 2014, drinking water sometimes gets contaminated during storage in household vessels and therefore improvement in the design of household water storage vessels can greatly reduce this risk of diarrheal disease and can help to preserve water quality after treatment. Handling and treatment ensures improvement in water quality implying that interventions aimed at providing storage containers and treatment materials especially in the poor resource settings should be encouraged.

According to UNICEF report, hand washing can prevent the transmission of a variety of pathogens, hence may be more effective than any single vaccine, yet globally, hands are washed with soap on less than 20% of the occasions when they should be (UNICEF, 2008). The use of sanitation facilities in Uganda between 1999 – 2015 as per the Joint Monitoring Program (JMP) report of UNICEF/WHO 2015 indicates that, there is limited or no progress in the use of sanitation facilities with 13% proportion of the 2015 population, yet it gained access since 1990 (UNICEF and WHO, 2015).

Action Aid International report indicates that, different interventions have been made to reduce risks of children during floods. Urban dwellers in Africa deal with flood events in a variety of ad hoc ways by creating barriers in homes using blocks, furniture, stones on which they put valuable items (Adelekan, 2010; Douglas et al, 2008, Action Aid International, 2006). According to recent
study in Kampala, the residents in flood prone areas have adapted by adding bricks and stones to elevate their beds from floods (Ajambo, 2013, Musoke, 2011).

Research done by Manun’Ebo and colleagues revealed that asking people about their hand washing behaviour consistently generates prevalence of hand washing practice that are much higher than observed behaviour. (Manun’Ebo et al. 1997). United Nations Office for Coordination of Humanitarian Affairs (OCHA) in Uganda recommends that, the opportunities for mitigating disaster risk by reducing vulnerabilities should be prioritized in order to reduce the potential negative impact of future flooding and a stronger focus on reinforcing community coping capacities to improve future responses (OCHA-Uganda, 2008).

A study done on Bwaise floods shows that; flash floods have prompted the residents to reduce the prevalence of diarrhoea episodes by building raised pit latrines (Ajambo, 2013). A study by Fulton and colleagues found that the increased runoff requires integrating climate change into City Development Strategies (CDS) so as to have systems for managing flash floods since they can develop at a very rapid rate with little or no warning (Fulton et al., 1998). Research has shown that protection of children in emergencies is important to ensure that interventions aimed at protection do not cause further harm or make children more vulnerable, and that they meet the specific needs of different groups, covering protection gaps as best as possible (Martin, 2010).

According to Action Aid international, both slum dwellers and local governments believe that constant clearance of the drainage channels would prevent the flow of water from other parts of the city and that standard drainage facilities along major streets would help to solve the flood problem. Slum dwellers used sand to raise the entire area to a higher level, while others planned to quit the place with reason that it is horrible to live in. The report specified that, responses to flooding in the slums of Nairobi included: bailing water out of houses to prevent damage to belongings; placing children initially on tables and later relocating them to nearby unaffected dwellings (Action Aid International, 2006).
CHAPTER THREE
3.0 STATEMENT OF THE PROBLEM
Diarrhoea is a major cause of morbidity and mortality among U5 in Uganda (UDHS, 2011) posing a big challenge to residents in Bwaise parishes - low-lying swampy area housing over 50% of the urban poor population in Kampala with illegal settlements susceptible to floods (Lwasa et al. 2009). Bwaise parishes have a prevalence of diarrheal diseases for children U5 higher than the national average of 20% due to poor water supply and sanitation and low coverage of latrine facilities exacerbated by frequent flash floods (UDHS 2016). As a result, many people in Bwaise especially U5 have been hospitalized and others lost their lives due to diarrhoeal diseases such as cholera, dysentery and Typhoid yet diarrhoea is entirely preventable disease according to WHO (2010). Since Bwaise is also low lying area, when it rains all wastes including faecal matter contaminates flood water find its way into people’s homes and compounds. Factors like level of poverty of the family, and the community as a whole, including socio-economic characteristics - education level of the parents/caretakers, infant feeding and food preparation practices have been found to be associated with occurrence of diarrhoea among U5 in Bwaise (Ssenyonga et al. 2009). A study by Musoke (2011) found out that some residents in Bwaise tend to empty their toilets and this increases the risk of contamination of water sources and therefore outbreaks of diarrhoea.

A number of strategies have been implemented to check on the ever increasing burden of diarrheal disease such as promotion of oral rehydration programs, in the management of diarrhoea by the Ministry of Health. Some NGOs have implemented community health interventions such as promotion of WASH services like hygiene education, establishing more sanitation facilities and community hand washing facilities. There has also been joint interventions by Ministry of Health (MOH) and Ministry of Disaster Preparedness and Refugees (MDPR) such as using warnings about heavy rains that would cause flooding and damage facilities like pit latrines in many parts including Bwaise, and possibly lead to incidence of diarrheal diseases. Despite all these interventions, the burden of diarrheal diseases among U5 has remained high and the factors for the surge have not been fully explored. The findings of this study may provide background information for policy development towards protecting children U5 against diarrheal diseases among households in flash flood prone areas by determining the prevalence and factors associated with diarrhoea among U5 as well as household adaptation strategies in Bwaise II and III parishes prone to flash floods in Kawempe division, Kampala.
3.1 Justification of the Study

Many people especially children under five years of age have been hospitalized or lost their lives due to diarrhoea exacerbated by the flash floods in Bwaise. The findings of this study are therefore expected to provide evidence base to guide the design of appropriate strategies that can mitigate the prevalence of diarrhoea among children U5 years exacerbated by flash floods.

This study will also guide in laying strategies that may contribute towards realization of the sustainable development goals (SDGs) related to sanitation in urban areas especially SDG 3 (good health and wellbeing) and SDG 6 (clean water and sanitation).

The results generated provides background information for policy development towards protecting children under five years against diarrheal diseases among households in flash flood prone areas. The findings serve as a primer for decision and policy makers, technical specialists, central, regional and local government officials, and concerned stakeholders in the community sector, civil society and Non-Governmental Organizations (NGOs).
3.2 Conceptual framework of how diarrhoea among U5 is exacerbated by flash floods

Adapted from EHP, UNICEF/WES USAID, World Bank/WSP, WSSCC) 2004 *Joint Publication 8, The Hygiene Improvement Framework (HIF), page 6*
3.3 Explanation of conceptual framework

From the original causal agent - Flash floods exposes faeces carrying the bacteria, viruses, and protozoa that cause diarrhoea. The direct and indirect means or “paths” by which children under-five years come in contact with faeces in their environment is exacerbated by flash floods.

The bacteria, viruses, and protozoa that cause diarrhoea can make their way to the host (children under-five years) via five different but often intersecting paths:

- **a) Fluids.** Fluids refer to the water used for drinking or cooking. The children under-five (host) can either drink contaminated water directly or eat food that has been washed in Flash flood (contaminated) water and the outcome is diarrhoea.
- **b) Fields.** Children under five years often defecate outdoors, in the yard around a house. This exposes the microorganisms in faeces to flash floods, to flies, and to food - hence it can infect the host (in these case- children under 5).
- **c) Food.** Food can be contaminated by flies, by microorganisms present on the utensils used to prepare it or in the preparation area itself, by contact with contaminated water (flash flood water), or by contact with contaminated fingers.
- **d) Flies.** Flies touch down on faeces and transmit the bacteria, protozoa, and viruses in faeces to food, water, utensils, the preparation area, or directly to the mouth of the child.
- **e) Fingers.** Fingers can become contaminated by unhygienic cleansing practices and pass disease agents to the child (host) directly or by contaminating food or water.

Improved sanitation (safely disposing faeces) blocks the paths between faeces and fluids, between faeces and fields, and between faeces and food. A simple latrine that is minimally maintained can also block the pathway between faeces and flies, either by keeping flies away from faeces or by keeping flies that have had contact with faeces away from people.
Improved water quality (through water supply improvements, household water treatment such as boiling, and safe storage of drinking water – covered containers) makes water safe to drink and safe to use in all aspects of food preparation but only if that water stays clean and is not contaminated via other pathways.

Increased water quantity allows the family to wash food more thoroughly during preparation, wash food preparation surfaces and utensils more thoroughly and frequently, and to bathe and wash hands more thoroughly. These activities can block a number of the paths to contamination, including most of those involving fingers and flies and most having to do with food, but if the water thus made available remains contaminated, then merely having more of it is not the answer.

Increased hand washing; if done correctly at critical times, blocks all the pathways that directly or indirectly involve the fingers.
3.4 Research Questions

1. What is the prevalence of diarrhoea among children under five years in flash flood prone area of Bwaise II and II parishes, Kawempe division?

2. What individual factors are associated with diarrhoea among children under five years in flash flood prone area of Bwaise II and II parishes, Kawempe Division?

3. What household and environmental factors are associated with diarrhoea among children under five years in flash flood prone area of Bwaise II and II parishes, Kawempe Division?

4. What household adaptation strategies are being used to protect children under-five years from diarrheal diseases in flash flood prone area of Bwaise II and II parishes, Kawempe Division?
CHAPTER FOUR

4.0 GOAL AND OBJECTIVES

4.1 General Objective

To determine the prevalence and factors associated with diarrhoea among children under-five and household adaptation strategies in Bwaise II and III parishes prone to flash floods in Kawempe Division, Kampala.

4.2 Specific Objectives

• To determine the prevalence of diarrhoea among children under five years in flash flood prone area of Bwaise II and II parishes, Kawempe Division.

• To determine the individual factors associated with diarrhoea among children under five in flash flood prone area of Bwaise II and II parishes, Kawempe Division.

• To establish the household and environmental factors associated with diarrhoea among children under five years in flash flood prone area of Bwaise II and II parishes, Kawempe Division.

• To establish household adaptation strategies to protect children under-five years from diarrheal diseases in flash flood prone area of Bwaise II and II parishes, Kawempe Division.
CHAPTER FIVE

5.0 METHODOLOGY

5.1 Study area

The study was conducted in Bwaise parish II and parish III of Kawempe division, Kampala low-lying swampy location which makes it significantly vulnerable to flooding hence, the two out of the 19 parishes are always worst hit by flash floods in the division. Bwaise parishes II and III are strategically selected because they are located in a low-lying area (Lwasa et al, 2009) and it is a reclaimed wetland with a high water table. Bwaise is a most vulnerable area to flash floods in Kampala city (Ajambo, 2013).

5.2 Study design

This was a cross sectional study that employed quantitative data collection methods. This was considered to be an appropriate and feasible design in determining the prevalence of diarrhoea and associated factors among children under five years as well as household adaptation strategies to protect children under-five in flash flood prone area of Bwaise II and II parishes, Kampala. Data was collected within a one month period (September 2016).

5.3 The study population

These were children under five years of age in the flood prone Bwaise parish II and III in Kawempe Division, Kampala. The respondents involved the mothers or caretakers of the children under five.

5.4 Sample size calculation

The sample size was determined based on the Kish Leslie (1965) formula for cross-sectional studies in which the outcome was prevalence.

\[ n = \frac{Z^2PQ}{\delta^2} \]

Where

\( n \)– Sample size

\( Z^2 \) - The standard normal deviate at 95% confidence (1.96)

\( P \) - Estimated prevalence of diarrheal disease among Under-fives U5 is 23% [UDHS, 2011]
\[ Q - 100\% - P \text{ (or 1-P)} \]

\[ \delta^2 - \text{Maximum error estimated (5\%)} \]

Substituting into this formula translated to a minimum sample of 272 respondents

Considering an estimated non-response rate of 10\%, brought the final sample size to 300 respondents

5.5 Study Variables and their Measurement

Based on the reviewed literature, several interrelated variables were suspected to result into diarrheal diseases among children U5 in flood prone low lying areas and were considered as below.

5.5.1 Dependent Variables

The dependent/outcome variable in this study was the episode of diarrheal disease in flash flood prone area of Bwaise II and II parishes. Respondents were asked whether they had a child or children under five years who experienced an episode(s) of diarrhoea in the last six months.

5.5.2 Independent Variables

The independent variables included: individual, household and environment factors. These involved asking the frequency of occurrence of flash floods, where children normally defecate, whether they had a toilet facility, had a hand washing facility; covered their drinking water containers, used soap when washing baby’s bottom and after handling child’s stool, ever emptied their pit latrine and type of anal cleansing material. These were measured by calculating the frequencies and disaggregating them with diarrhoea episode.

Adaptation strategies were measured by asking whether they; bailed water out of house, constant clearance of drainage channel, digging trenches around the house, maintaining hygiene during food preparation and storage, emptying the pit latrine, raising the bed with stones, using sandbags to raise the area, temporarily moving away during flash floods, and whether they were boiling drinking water. These were assessed by getting the frequencies of Yes and No.
5.6 Sampling Procedures

Bwaise parish II and III in Kawempe division were purposively selected because literature showed that, they were located in a low-lying area (Lwasa, 2005) which was reclaimed from the wetland, and also known to have a high water table making it one of the most vulnerable areas to flash floods in Kampala city (Ajambo, 2013).

Bwaise Parish II had a total of a list of all villages in the two (2) parishes were generated respectfully with the help of LC.I chairperson or representative. Five (5) villages were then selected per parish using simple random sampling.

At the centre of the village located with the help of the LC.I chairperson. The directions North, East, South & West (N, E, S and W respectively) were written on pieces of paper and were folded, then simple random sampling was done to determine the household and the direction to follow, until the end of the village was reached in that direction. After reaching the end of the village, similar procedure would be done at the centre of the village and the new direction would indicate the new direction and the new household until the required sample of households was reached for that particular village.

In each of the directions, households with at least one child under 5 years of age were eligible for the study. If a respondent in the selected household was found to be absent, critically ill or having no child within the study age bracket, the next household in that direction was selected. If the household selected had more than one respondent having a child within the study age bracket, then simple random sampling was used to pick one.

5.7 Inclusion Criteria

Caretakers/mothers who had stayed for at least 6 months prior to the study were included in the study. Mothers or caretakers with children U5 years in Bwaise Parish II and III, who consented were included in the study.

5.8 Exclusion Criteria

Mothers or caretakers with children U5 years who were unable to communicate well either being not of sound mind (mentally ill), and those who were very sick did not participate in the study.
5.9 Data Collection

Collection of data was done in mid-September 2016 and ended in the same month. Six research assistants (RA) participated in the data collection process.

In order to collect the data for this project, a quantitative method was applied using semi structured questionnaires to gather primary data on household characteristics, prevalence of diarrhoea among children U5 and its associated factors and household adaptation strategies to protect children from diarrheal diseases during flash floods.

5.10 Quality control

Research Assistants were trained on the study protocol, tools and confidentiality, after which pre-testing of data collection tools was done one-day later. The research assistants pretested the tools under the supervision of the Principal Investigator (PI). The information collected by data collectors were reviewed and any identified errors were corrected.

Data was collected, reviewed and edited at the end of each day by the PI and the R/A at the end of the field site. This made possible the correction of mistakes and any missing data this and ensured quality throughout the data collection process.

5.11 Data management and analysis

5.11.1 Plan for Data Management

For confidentiality reasons, only unique Identification Numbers (IDNo) and name-Identification key codes were used and kept in a secure file by the data manager. The paper data collection forms and soft copy files were also kept safe in a password-protected folder.

5.11.2 Data Analysis

Quantitative data collected was edited, checked for consistency, and the variables were coded. Data was double entered in EpiData Version 3.1 software. Frequencies and cross tabulations were done to check for missed variables and errors identified were corrected by revisiting the original questionnaires. Analysis was done using Stata version 13 statistical software (Statacorp Texas; USA).
Descriptive statistical analysis was performed to generate the frequencies, mean scores, and Standard deviation for socio-demographic characteristic and frequencies for adaptation strategies employed by households to safeguard their children under five during flooding seasons.

In bi-variable analysis, relationships/association between diarrheal disease and each of the independent factors was assessed using Stata to generate crude Odds Ratios (cORs) and their 95% confidence intervals. Multi-variable analysis was applied to variables that were significant after bivariate analysis. Stepwise logistic regression model was also used to analyse the independent predictors of diarrhoea in children U5s and P-values of less than 0.05 at 95% confidence level. For all variables which showed association at bivariate level, adjusted odds ratios (aORs) at 95% confidence interval were computed by logistic regression to assess for any confounding or effect modification. P-values of ≤ 0.05 was considered statistically significant. The statistical results were then presented in tables and pie chart as were deemed appropriate.

5.12 Ethical Considerations

5.12.1 Ethical Review and Approval

Ethical Approval to conduct this study was obtained from Makerere University, School of Public Health Higher Degrees Research and Ethics Committee (HDREC) and Uganda National Council for Science and Technology HS 3003 (UNCST). Permission was also sought from Kampala Capital City Authority (KCCA) and the local authorities of Kawempe Division before conducting the study.

5.12.2 Informed Consent

Written informed consent of all respondents was obtained before data collection. This was done by first explaining the aims and process of the study orally

5.12.3 Confidentiality

Confidentiality was maintained for information collected from all study respondents. Respondents’ involvement in the study was voluntary. Each respondent was informed about the objective of the study, and privacy during administering of the study tools was ensured.
CHAPTER SIX

6.0 RESULTS

Data was collected in September, 2016. The number of participants sampled was 300 and we had a 100% response rate in this study.

6.1 Socio-demographic characteristics

Most 73.0% (219/300) of the respondents were mothers and 78.3% (235/300) of them had one to two children under the age five in the household. More than half, 51.0% (153/300) were married with mean age of respondents being 29.8 years (SD = ± 9.63). Majority 75.3% (226/300) of respondents were tenants and 66.0% (198/300) were business people. Less than half 43.0% (129/300) had attained secondary education while 47.7% (143/300) had stayed in the area for more than 2 years (Table 1).
<table>
<thead>
<tr>
<th>Variable</th>
<th>Categories</th>
<th>Frequency (n = 300)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respondent type</td>
<td>Mother</td>
<td>219</td>
<td>73.0</td>
</tr>
<tr>
<td></td>
<td>Care taker</td>
<td>81</td>
<td>27.0</td>
</tr>
<tr>
<td>Age of the respondents (years)</td>
<td>14-25</td>
<td>109</td>
<td>38.0</td>
</tr>
<tr>
<td></td>
<td>26-40</td>
<td>213</td>
<td>71.0</td>
</tr>
<tr>
<td></td>
<td>41-55</td>
<td>51</td>
<td>17.0</td>
</tr>
<tr>
<td></td>
<td>56-above</td>
<td>24</td>
<td>8.0</td>
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<tr>
<td></td>
<td>Don’t know</td>
<td>12</td>
<td>4.0</td>
</tr>
<tr>
<td>Marital status</td>
<td>Married</td>
<td>153</td>
<td>51.0</td>
</tr>
<tr>
<td></td>
<td>Single</td>
<td>87</td>
<td>29.0</td>
</tr>
<tr>
<td></td>
<td>Widower/widow</td>
<td>21</td>
<td>7.0</td>
</tr>
<tr>
<td></td>
<td>Separated</td>
<td>25</td>
<td>8.3</td>
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<tr>
<td></td>
<td>Never married</td>
<td>11</td>
<td>3.7</td>
</tr>
<tr>
<td></td>
<td>Divorced</td>
<td>03</td>
<td>1.0</td>
</tr>
<tr>
<td>Landlord or Tenant</td>
<td>Landlord</td>
<td>74</td>
<td>24.7</td>
</tr>
<tr>
<td></td>
<td>Tenant</td>
<td>226</td>
<td>75.3</td>
</tr>
<tr>
<td>Duration of stay</td>
<td>Less than a year</td>
<td>69</td>
<td>23.0</td>
</tr>
<tr>
<td></td>
<td>One to two years</td>
<td>76</td>
<td>26.5</td>
</tr>
<tr>
<td></td>
<td>More than 2 years</td>
<td>143</td>
<td>47.7</td>
</tr>
<tr>
<td></td>
<td>Don’t know</td>
<td>12</td>
<td>4.0</td>
</tr>
<tr>
<td>Level of education</td>
<td>None</td>
<td>34</td>
<td>11.3</td>
</tr>
<tr>
<td></td>
<td>Primary</td>
<td>115</td>
<td>38.3</td>
</tr>
<tr>
<td></td>
<td>Secondary</td>
<td>129</td>
<td>43.0</td>
</tr>
<tr>
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<td>Tertiary</td>
<td>22</td>
<td>7.3</td>
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<td>Religion</td>
<td>Christian</td>
<td>185</td>
<td>61.7</td>
</tr>
<tr>
<td></td>
<td>Muslim</td>
<td>109</td>
<td>36.3</td>
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<tr>
<td></td>
<td>Other</td>
<td>5</td>
<td>1.7</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>1</td>
<td>0.3</td>
</tr>
<tr>
<td>Children under 5</td>
<td>1-2 children</td>
<td>235</td>
<td>78.3</td>
</tr>
<tr>
<td></td>
<td>&gt;2 children</td>
<td>65</td>
<td>21.7</td>
</tr>
<tr>
<td>Source of main income</td>
<td>Casual labourer</td>
<td>34</td>
<td>11.3</td>
</tr>
<tr>
<td></td>
<td>Business/trade</td>
<td>198</td>
<td>66.0</td>
</tr>
<tr>
<td></td>
<td>Civil servant/ salary</td>
<td>19</td>
<td>6.3</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>49</td>
<td>49.33</td>
</tr>
</tbody>
</table>
6.2 Prevalence of diarrhoea among children under 5 years

More than half 59.3% (178/300) of the households had a diarrheal episode among children under five years of age within 6 months prior to the study (Fig 1).

Fig 1: Prevalence of diarrhoea among children under 5 years

6.3 Individual factors related Diarrhoea among Children under 5 years in Bwaise

The odds of diarrhoea among children under five years in the last 6 months prior to the study were 2.62 times higher among households having more than two (2) children under five years of age (aOR=2.62, 95% CI= (2.38-17.84)) than among households that had one or two children under five years of age.

Other individual factors like age of respondent, marital status, religion, level of education and source of income were not statistically significant at 95% confidence interval (Table 2)
Table 2: Individual factors associated with diarrhoea among U5 years in Bwaise

<table>
<thead>
<tr>
<th>Variable</th>
<th>Categories</th>
<th>Diarrhoea under 5</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Yes (%)</td>
<td>No (%)</td>
<td>cOR</td>
<td>aOR</td>
</tr>
<tr>
<td>Respondent type</td>
<td>Mother</td>
<td>129 (58.9)</td>
<td>90 (41.1)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Care taker</td>
<td>49 (60.5)</td>
<td>32 (39.5)</td>
<td>1.05 (0.62-1.76)</td>
<td></td>
</tr>
<tr>
<td>Age of respondent</td>
<td>11-25</td>
<td>64 (58.7)</td>
<td>45 (41.3)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>26-40</td>
<td>88 (60.3)</td>
<td>58 (39.7)</td>
<td>1.07 (0.64-1.77)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>41-55</td>
<td>10 (50.0)</td>
<td>10 (50.0)</td>
<td>0.70 (0.27-1.82)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>56 and above</td>
<td>16 (64.0)</td>
<td>09 (36.0)</td>
<td>1.17 (0.47-2.91)</td>
<td></td>
</tr>
<tr>
<td>Duration of stay (Years)</td>
<td>&lt; 1</td>
<td>31 (46.3)</td>
<td>36 (53.7)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1-2</td>
<td>51 (67.1)</td>
<td>25 (32.9)</td>
<td>1.60 (0.84-3.03)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt; 2</td>
<td>89 (61.4)</td>
<td>56 (38.6)</td>
<td>0.94 (0.54-1.64)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Don’t know</td>
<td>07 (58.3)</td>
<td>05 (41.7)</td>
<td>1.05 (0.31-3.59)</td>
<td></td>
</tr>
<tr>
<td>Level of education</td>
<td>None</td>
<td>24 (70.6)</td>
<td>10 (29.1)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Primary</td>
<td>67 (58.3)</td>
<td>48 (41.7)</td>
<td>0.57 (0.25-1.31)</td>
<td>0.52 (0.22-1.36)</td>
</tr>
<tr>
<td></td>
<td>Secondary</td>
<td>68 (52.7)</td>
<td>61 (47.3)</td>
<td>0.46 (0.21-1.05)</td>
<td>0.48 (0.18-1.08)</td>
</tr>
<tr>
<td></td>
<td>Tertiary</td>
<td>19 (86.4)</td>
<td>03 (13.6)</td>
<td>2.64 (0.64-10.96)</td>
<td>2.71 (0.58-10.85)</td>
</tr>
<tr>
<td>Religion</td>
<td>Christian</td>
<td>110 (59.5)</td>
<td>75 (40.5)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Muslim</td>
<td>64 (58.7)</td>
<td>45 (41.3)</td>
<td>0.96 (0.59-1.55)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>03 (60.0)</td>
<td>02 (40.0)</td>
<td>1.01 (0.16-6.19)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>-</td>
<td>01 (100)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Children under 5</td>
<td>1-2 children</td>
<td>130 (55.7)</td>
<td>104 (44.3)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>&gt;2 children</td>
<td>47 (72.3)</td>
<td>18 (27.7)</td>
<td>2.09 (1.14-3.81)*</td>
<td>2.62 (2.38-17.84)</td>
</tr>
<tr>
<td>Source of main income</td>
<td>Agriculture</td>
<td>28 (82.4)</td>
<td>06 (17.6)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Business/trade</td>
<td>116 (58.6)</td>
<td>82 (41.4)</td>
<td>0.31 (0.12-0.80)*</td>
<td>0.55 (0.01- 23.21)</td>
</tr>
<tr>
<td></td>
<td>Civil servant</td>
<td>11 (57.9)</td>
<td>08 (42.1)</td>
<td>0.31 (0.09-1.09)</td>
<td>29.54 (0.05-18.44)</td>
</tr>
<tr>
<td></td>
<td>or salary</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>16 (61.5)</td>
<td>10 (38.5)</td>
<td>0.36 (0.11-1.16)</td>
<td>2.27 (0.02- 287.22)</td>
</tr>
<tr>
<td></td>
<td>Don’t know</td>
<td>07 (30.4)</td>
<td>16 (69.6)</td>
<td>0.1 (0.03-0.34)*</td>
<td>0.00 (0.00-1.69)</td>
</tr>
</tbody>
</table>

COR = Crude odds ratio, AOR = Adjusted odds ratio, CI = Confidence Interval, *p<0.05
6.4 Household and Environmental factors associated with diarrhoea among U5

The odds of diarrhoea in children under five years of age in the last 6 months prior to the study were 2.18 times higher among households having drinking water storage containers not covered \[\text{aOR}=2.18, 95\% \text{ CI}=1.07-4.42\] than among households that were covering their drinking water storage containers.

Frequency of flooding was also associated with diarrhoea among children under five year. For example the odds of diarrhoea in children under five years of age in the last 6 months prior to the study were 4.02 times higher among households having flash flooding three times and more in a year \[\text{aOR}= 4.02, 95\% \text{ CI} (1.12-14.47)\], than among households that had flash flooding once in a year. The odds of diarrhoea in children under five years of age in the last 6 months prior to the study were 3.08 times higher among households having flash flooding three times and more in a year \[\text{aOR}=3.08 \text{ CI (1.07-8.82)}\] than among households that had flash flooding once in a year.

The odds of diarrhoea episode in children under five years of age in the last 6 months prior to the study were 15.21 times higher among households lacking hand washing facility \[\text{aOR}=15.21, 95\% \text{ CI}=4.04 - 57.25\] than among households that had the hand washing facility available.

The odds of diarrhoea episode among children under five years of age in the last 6 months prior to the study were 0.4 times lower among households that do not use soap when washing baby’s bottom after defecation \[\text{aOR} = 0.40, 95\% \text{ CI} (0.16 - 0.94)\] than among households that that use soap when washing baby’s bottom after defecation.

Regarding disposal of children’s faeces, the odds of diarrhoea in children under five years of age in the last 6 months prior to the study was 9.72 times higher among children under five year of age who defecated in the polythene bag \[\text{aOR}=9.72, 95\% \text{ CI}=1.37-69.02\] than those who defecated in the house. Defecating in the potty and the backyard was not significant at 95% confidence interval.

Having a toilet and type of anal cleansing materials were not predictive for diarrhoea among children under 5 at 95% confidence interval (Table 3)
Table 3: Household and environmental factors associated with diarrhoea in among U5

<table>
<thead>
<tr>
<th>Variable</th>
<th>Categories</th>
<th>Diarrhoea among U5</th>
<th>cOR</th>
<th>aOR</th>
<th>P. value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Yes (%)</td>
<td>No (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency of flooding in a year</td>
<td>Once a year</td>
<td>10 (41.7)</td>
<td>14 (58.3)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Twice a year</td>
<td>48 (52.2)</td>
<td>44 (47.8)</td>
<td>1.40 (0.62-3.15)</td>
<td>3.08 (1.07-8.82)</td>
</tr>
<tr>
<td></td>
<td>3 or more times a year</td>
<td>99 (67.2)</td>
<td>43 (30.3)</td>
<td>2.90 (1.30-6.48*)</td>
<td>4.02 (1.12-14.47)</td>
</tr>
<tr>
<td></td>
<td>Don’t know</td>
<td>03 (100)</td>
<td>0 (0.0)</td>
<td>1 (empty)</td>
<td></td>
</tr>
<tr>
<td>Availability of toilet facility</td>
<td>Yes</td>
<td>175 (59.1)</td>
<td>121 (40.9)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>03 (75.0)</td>
<td>01 (25.0)</td>
<td>2.09 (0.21-20.30)</td>
<td></td>
</tr>
<tr>
<td>Containers covered</td>
<td>Yes</td>
<td>110 (54.2)</td>
<td>93 (45.8)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>66 (68.0)</td>
<td>31 (32.0)</td>
<td>1.85 (1.1-3.10)*</td>
<td>2.18 (1.07-8.82)</td>
</tr>
<tr>
<td>Drinking water treated</td>
<td>Yes</td>
<td>168 (59.8)</td>
<td>113 (40.2)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>10 (52.6)</td>
<td>09 (47.4)</td>
<td>0.75 (0.30-1.91)</td>
<td></td>
</tr>
<tr>
<td>Method used for treating water</td>
<td>Boiling</td>
<td>156 (59.5)</td>
<td>106 (40.5)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Chlorination</td>
<td>19 (90.5)</td>
<td>02 (9.5)</td>
<td>7.5 (1.72-32.76)*</td>
<td>2.63 (0.51-13.61)</td>
</tr>
<tr>
<td></td>
<td>Sieve thru. cloth</td>
<td>04 (50.0)</td>
<td>04 (50.0)</td>
<td>0.66 (0.16-2.71)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Water filter / ceramic</td>
<td>01 (50.0)</td>
<td>01 (50.0)</td>
<td>0.67 (0.04-10.83)</td>
<td></td>
</tr>
<tr>
<td>Use soap when washing baby’s bottom</td>
<td>Yes</td>
<td>43 (69.3)</td>
<td>19 (30.7)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>112 (53.9)</td>
<td>96 (46.1)</td>
<td>0.52 (0.28-0.94)*</td>
<td>0.40 (0.16-0.94)</td>
</tr>
<tr>
<td>Use Soap when washing child’s hands</td>
<td>Yes</td>
<td>43 (71.7)</td>
<td>19 (28.3)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>112 (53.3)</td>
<td>98 (46.7)</td>
<td>0.45 (0.24-0.84)*</td>
<td>0.57 (0.24-1.35)</td>
</tr>
<tr>
<td>Where children normally defecate</td>
<td>In the house</td>
<td>8 (44.9)</td>
<td>10 (55.6)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>In the potty</td>
<td>48 (57.8)</td>
<td>35 (42.2)</td>
<td>1.55 (0.58-4.16)</td>
<td>1.20 (0.26-5.68)</td>
</tr>
<tr>
<td></td>
<td>Polythene</td>
<td>18 (85.7)</td>
<td>3 (14.3)</td>
<td>7.46 (1.40-39.73)*</td>
<td>9.72 (1.37-69.02)</td>
</tr>
<tr>
<td></td>
<td>Toilet / Latrine</td>
<td>86 (63.7)</td>
<td>49 (36.3)</td>
<td>0.26 (0.09-0.66)*</td>
<td>1.36 (0.29-6.42)</td>
</tr>
<tr>
<td></td>
<td>In the back yard</td>
<td>19 (44.2)</td>
<td>24 (55.8)</td>
<td>1.29 (0.45-3.74)</td>
<td>1.04 (0.19-5.73)</td>
</tr>
<tr>
<td>Type of anal cleansing material for children</td>
<td>Toilet paper</td>
<td>75 (62.5)</td>
<td>45 (37.5)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Newspaper</td>
<td>86 (55.8)</td>
<td>68 (44.2)</td>
<td>0.72 (0.44-1.17)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Water</td>
<td>12 (66.7)</td>
<td>06 (33.3)</td>
<td>1.44 (0.48-4.35)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rag</td>
<td>04 (50.0)</td>
<td>04 (50.0)</td>
<td>1.80 (0.35-9.30)</td>
<td></td>
</tr>
<tr>
<td>Ever emptied latrine</td>
<td>Yes</td>
<td>126 (58.6)</td>
<td>89 (41.4)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>45 (60.8)</td>
<td>29 (39.2)</td>
<td>1.1 (0.64-1.88)</td>
<td></td>
</tr>
<tr>
<td>Availability of hand washing facility</td>
<td>Yes</td>
<td>160 (60.6)</td>
<td>104 (39.4)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>18 (50.0)</td>
<td>18 (50.0)</td>
<td>8.60 (4.75-15.56)*</td>
<td>15.21 (4.04-57.25)</td>
</tr>
</tbody>
</table>

COR = Crude odds ratio, AOR = Adjusted odds ratio, CI = Confidence Interval, *p<0.05
6.5 Household adaptation strategies to protect U5 from diarrheal diseases in Bwaise

The adaptation strategies to protect children under five years of age from diarrheal diseases included 93.7% (281/300) indicated that maintaining hygiene was the best precaution during food preparation and storage as a mechanism to protect children U5 from diarrheal diseases while 87.3% (262/300) indicated boiling their drinking water as a means to ensure safe water for drinking during and after flash flooding. However, many 63.13% (101/300) respondents had thought of moving away from the area that floods with its associated effects but did not know the period to quit. Concerning knowledge for preventing diarrheal diseases among children under five, a good number 33% (99/300) of respondents never had any knowledge. Thirty two percent 32% (96/300) of the respondents intended to bail water out of their house during flash flooding, and 22.7% (68/300) of the respondents raised the bed with stones to prevent contact between flood water and their children U5 (Table 4).

Table 4: Household adaptation strategies to protect U5 from diarrhoea

<table>
<thead>
<tr>
<th>Variable</th>
<th>Categories</th>
<th>Frequency (n=300)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning to quit the place</td>
<td>Yes</td>
<td>160</td>
<td>53.3</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>140</td>
<td>46.7</td>
</tr>
<tr>
<td>Bailing water out of the house</td>
<td>Yes</td>
<td>96</td>
<td>32.0</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>204</td>
<td>68.0</td>
</tr>
<tr>
<td>Constant clearance of drainage channel</td>
<td>Yes</td>
<td>18</td>
<td>6.0</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>282</td>
<td>94</td>
</tr>
<tr>
<td>Using sandbags to raise the area</td>
<td>Yes</td>
<td>20</td>
<td>6.7</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>280</td>
<td>93.3</td>
</tr>
<tr>
<td>Digging trenches</td>
<td>Yes</td>
<td>18</td>
<td>6.0</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>282</td>
<td>94</td>
</tr>
<tr>
<td>Temporarily move away</td>
<td>Yes</td>
<td>21</td>
<td>7.0</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>279</td>
<td>93.0</td>
</tr>
<tr>
<td>Raising the bed with stones</td>
<td>Yes</td>
<td>68</td>
<td>22.7</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>232</td>
<td>77.3</td>
</tr>
<tr>
<td>Pit latrine emptied after flash floods</td>
<td>Yes</td>
<td>215</td>
<td>74.7</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>74</td>
<td>24.7</td>
</tr>
<tr>
<td>Boiling drinking water</td>
<td>Yes</td>
<td>262</td>
<td>87.3</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>38</td>
<td>0.6</td>
</tr>
<tr>
<td>Applying water guard to drinking water to make it safe</td>
<td>Yes</td>
<td>11</td>
<td>3.7</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>289</td>
<td>96.3</td>
</tr>
<tr>
<td>Maintaining hygiene during food preparation and storage</td>
<td>Yes</td>
<td>281</td>
<td>93.7</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>19</td>
<td>6.3</td>
</tr>
</tbody>
</table>
CHAPTER SEVEN

7.0 DISCUSSIONS OF RESULTS

7.1 Key study Findings

Most 73.0% (219/300) of the respondents were mothers. More than half 59.3% (178/300) of the households had a diarrheal episode among U5 within 6 months prior to the study.

- The odds of diarrhoea among U5 in the last 6 months prior to the study was;
  - 2.62 times greater among households having >2 children U5 [aOR=2.62, 95% CI= (2.38-17.84)],
  - 2.18 times higher among households that were not covering drinking water storage containers [aOR=2.18, 95% (CI=1.07-4.42)],
  - 15.21 times higher among households lacking hand washing facility [aOR=15.21, 95% (CI=4.04 - 57.25)],
  - 0.4 times higher among households that do not use soap when washing baby’s bottom after defecation [aOR = 0.40, 95% CI (0.16 - 0.94)], and
  - 9.72 times higher among those who defecated in the polythene bag [aOR=9.72, 95% (C1=1.37-69.02)] than those who defecated in the house.

- Majority 93.7% (281/300) of the households adapted to the threat of diarrhoeal diseases by maintaining hygiene during food preparation and storage while

- Many 87.3% (262/300) of the households studied boil water to ensure safety for drinking.

7.2 The Prevalence of diarrhoea among children under five years in Bwaise

More than half (59.3%) of the households had ever had a child suffer from diarrhoea in the last six months. Our findings indicate that in the household studied, the prevalence of diarrhoea was higher than the national average provided by 2016 Uganda Demographic and Health Survey (UDHS), which found out that the prevalence of diarrhoea among children under the age five was 20% (UDHS, 2016). The higher prevalence in the current study can be partly attributed to the fact that the prevalence was ascertained over a 6 months period which was not the case with UDHS study where diarrhoea prevalence was ascertained over a two weeks period. The findings however collaborate with findings done in a similar setting in India where the overall prevalence rate of
diarrhoea was high at 55.6% (Joshi et al. 2012). Such high rate of childhood diarrhoea, despite considerable improvements in water sources and sanitation facilities, indicates the need for more attention.

**7.3 Individual factors associated with Diarrhoea among U5 in Bwaise**

The odds of diarrhoea among children under five years in the last 6 months prior to the study were 2.62 times higher among households having more than two (2) children under five years of age (aOR=2.62, 95% CI= (2.38-17.84)) than among households that had one or two children under five years of age. The study findings are consistent with studies done in similar settings in Ethiopia and Pakistan (Mengistie et al, 2013; Arif et al, 2012) where by having a bigger number of children in the family was a significant predictor of diarrhoea than in households with fewer children. This is probably due to the incapability of the caregiver to care equally for a large number of children hence not enough care is allocated to each child (El-Gilany et al, 2005). It is possible to suggest that child birth spacing might have a positive influence on prevention of diarrhoea. (Mengistie et al., 2013).

**7.4 Household and environmental factors associated with diarrhoea in U5s in Bwaise**

The odds of diarrhoea in children under five years of age were 2.18 times higher among households having drinking water storage containers not covered [aOR=2.18, 95% (CI=1.07-4.42)] than among households that were covering their drinking water storage containers. The findings are consistent with studies done in similar settings in Nigeria (Onigbog1 and Ogunyemi, 2014) where by covering drinking water storage containers helps to mitigate the chances of contaminants, flies and other vectors from entering into the water and eventually contaminating it. Uncovered water storage containers provide a greatest opportunity for entry of contaminants into the water which can potentially be disease causing organisms (Mintz E, et al. 1995). It is therefore vital to have an adequate sensitization and training of households of Bwaise about the significance of covering water storage containers as part of the methods of prevention of diarrheal diseases.

Hand washing with or without soap is a major way of reducing the occurrence of childhood diarrheal. Recent research in Bangladesh (Luby et al, 2011) found out that hand washing with water alone can significantly reduce childhood diarrhoea.
In this study, there was a significant positive association between the availability of hand washing facility with childhood diarrhoea, for example; the odds of diarrhoea in children under five years of age was 15.21 times higher among households that lacked a hand washing facility (aOR=15.21, 95% CI=4.04 - 57.25) than among households that hand washing facility available. Mengistie and colleagues found that lack of hand washing facility was a significant predictor of diarrhoea in children under 5 (Mengistie et al, 2013). A hand washing facility is a key ingredient in the observance of hand washing and therefore vital to promote the notion/concept of hand washing in Bwaise which include among others constructing tippy taps and other hand washing facilities.

Regarding disposal of children’s faeces, the odds of diarrhoea among children under five year of age in the last 6 months prior to the study was 9.72 times higher among those who defecated in the polythene bag [aOR=9.72, 95% (CI=1.37-69.02)] than those who defecated in the house. Probably, defecating in the house increases exposure of faecal matter to contaminants like flies and hence increased exposure to children under five than when they defecate in the polythene bag. Research shows that unsafe disposal of children’s faeces may be an important contaminant in household environments, posing great risk of exposure to young children (Gil et al.; 2004). UNICEF connotes that the safest way to dispose children’s faeces is by toilet or latrine (WSP, 2014). It is clear that sanitation and hygiene interventions are therefore protective of diarrhoea among children under five and therefore should be promoted.

Frequency of flooding was also associated with diarrhoea in under five years, for example the odds of diarrhoea episode among children under five years whose households had experienced flash flooding three times and more in a year (aOR= 4.02 95% CI (1.12-14.47)), and twice a year (aOR=3.08 95% CI (1.07-8.82) were 4.02 times and 3.08 times respectively higher than those who had experienced flash floods once in a year. This is because floods destroy public health facilities such as water sources and health facilities, triggering outbreaks of water borne diseases hence compounding community vulnerability to health hazards (MDPR, 2011).

Statistical analysis did not show any association between having a toilet facility and the type of anal cleansing material for children under five years and the occurrence of diarrhoea. This is because, similar research done in Ghana showed that, in the absence of water and toilet facilities, children whose mothers were less educated were the most vulnerable to diarrhoea (Gyimah Obeng, 2003).
7.5 Households adaptation strategies to protect U5s from diarrhoea during flash floods

Concerning the adaptation strategies to protect children and family from diarrheal diseases, majority of the respondents boiled their water as a means of ensuring safe water for drinking during flash flooding. These findings are consistent with a study done by Cohen and Colford, 2017, that found out that boiling is the most prevalent household water treatment method.

Maintaining hygiene during food preparation and storage as the best precaution against diarrheal diseases. This was in line with study conducted in Thailand (Calistus and Alessio, 2009) whose finding showed that unsafe and poor hygiene during food preparation for children whose immunity was not well developed was associated with diarrheal morbidity. Findings indicated the risk of developing diarrhoea was high among children U5 whose mothers/caretaker were not maintaining hygiene.

Emptying the pit latrines is one of the hygienic methods of preventing contact with faecal matter in areas of poor sanitation and hygiene exacerbated by flash floods. This was in line with a study done in Dar Es Salaam, Tanzania (Marion et al. 2015) whose findings showed that the biggest problem related to household sanitation was full latrines due to lack of emptying services. Findings indicated that emptying the pit latrine is one of the important methods of reducing diarrhoea episode among children U5 after the flash prone areas of Bwaise.
7.6 Study limitations

Given that this was a cross sectional study, it is difficult to conclude on the cause-effect relationship.

Since the study was done considering that it is a flash flood prone area, the variable measured might have changed or been different at the time of occurrence of floods and occurrence of diarrhoea.

There might have been some recall bias since it required respondents to remember episode of diarrhoea in the last six months. So interpretation of the findings needs to consider these limitations.

The study could not have fully explored the adaptation strategies by households since the qualitative component like Key Informant Interviews (KII) and Focus Group Discussions (FGDs) were not employed.

7.7 Dissemination of findings

The findings of the study will be presented to the school of graduate studies Makerere University as a dissertation for the award of Master of Public Health Disaster Management (MPHDM) and feedback will be given to the local leaders and the community. This thesis will be published in peer reviewed journal and a copy will be given to One Health Central and Eastern Africa (OHCEA), the sponsor of the study.
CHAPTER EIGHT

8.0 CONCLUSIONS AND RECOMMENDATIONS

8.1 CONCLUSIONS

Prevalence of diarrhoea among U5 during flash floods

The prevalence of diarrhoea among children under the age five was 59.3% and was higher than the national average provided by 2016 Uganda Demographic and Health Survey (UDHS) which was 20%.

Individual factors associated with diarrhoea among children U5 in Bwaise

Having a bigger number of children under five years of age in the household is a significant predictor of diarrhoea than in households with fewer children U5.

Household and Environmental factors associated with diarrhoea among U5 in Bwaise

The household and environmental factors that were associated with diarrhoea among children U5 in the flash flood prone Bwaise parishes were; Areas with frequent flash floods, uncovered drinking water storage containers, unsafe disposal of children’s faeces (such as in polythene bags), lack of a hand washing facility in a household and households that do not practice hand washing after defecating and handling child’s stools

Household adaptation strategies to protect children U5 from diarrheal diseases

Majority of the households in Bwaise have adapted to the threat of diarrheal diseases among children under five by; boiling drinking water to ensure safety for drinking during in flood prone areas, maintaining hygiene during food preparation and storage and emptying pit latrines to reduce the risk of diarrhoea among children under five years.
8.2 RECOMMENDATIONS

The Ministry of Health through the Environmental health division and partnering NGOs should promote hand-washing to increase hand washing facility coverage and sustainability for the prevention of diarrhoea among children under-five in Bwaise households.

The Ministry of Health as well as the Ministry of Water and Environment should provide Information, Education and Communication (IEC) materials on water quality interventions at household level to promote boiling of water, treatment with chlorine tablets as well as proper storage of water.

The Ministry of Health together with Uganda Red Cross (URC) should provide hygiene promotion campaigns focusing on safe disposal of children’s faeces (such as in the toilet/latrine) to reduce the risk of exposure to diarrhoea among children under five years of age in the household.

Local government (Kampala Capital City Authority - KCCA) together with Non-Governmental Organizations (NGOs) should provide interventions to support mothers and caretakers of children in provision of low cost/sustainable health education packages through community involvement (community motivation steps) to prevent diarrhoea through hand washing with or without soap especially after defecating and handling child’s stools in Bwaise.

The Ministry of Health, Ministry of Finance and Planning (FP) as well as the NGOs working in Bwaise should promote and provide family planning services in Bwaise so as to reduce the number of children under-five years of age at the household level.

Local Government (KCCA in this case), NGOs, and other stakeholders in Kawempe Division should sensitize households about the importance of maintaining hygiene (such as washing hands) during food preparation and storage as a contributing factor towards protecting children under five from the risk of diarrheal diseases in flood prone communities.
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APPENDIX I: Copy of the Client Consent Form

Makerere University, College of Health Sciences, School of Public Health

| Study Title: Factors associated with Diarrhoea in Children Under-five and household Adaptation Strategies in flash flood prone area of Bwaise II and II parishes, Kampala |

I am ___________________________ from Makerere University School of Public Health (MakSPH). We are carrying out a study to determine the prevalence and factors associated with diarrhoea among children under-five and household adaptation strategies in Bwaise II and III parishes prone to flash floods in Kawempe division, Kampala.

As a mother or caretaker of a child under five, you have been purposefully selected as one of the respondents in this study.

**Risks of study participations:** We do not anticipate any risks to you participating in this study other than those encountered in day-to-day life.

**Benefits of study participations:** There may be no direct benefit to the respondents, however results generated will provide background information for policy development towards protecting children under-five years living in low lying areas against the effects of flash-floods especially diarrhea.

**Study costs/compensation:** There is no cost to you for participating in this study.

**Confidentiality:** All results and records of this study will be kept confidential. Information may be used in scientific presentations and or publication, however, no personal or identifying information about you will be released.

**Voluntary Participation:**
Participation in this work/exercise is voluntary. Your decision whether or not to participate in this study will not affect your current or future relations with Makerere University or the community. If you decide to participate, you are free to withdraw at any time without any consequence whatsoever and without affecting those relationships.

Please do not hesitate to contact us if you have any questions or concerns about this study.

**Principal Investigator:**
David Kaptengan,
0759025422 / 0775025422,
dkaptenan@gmail.com

If you have accepted to participate in this study, I kindly request you to sign here bellow

Respondent Signature: ___________________________

Research Assistant Signature: ___________________________ Date: _______ 2016
APPENDIX I: Copy of the mother/caretaker questionnaire guide

Section A: General Information

Interviewer Initials: ____________________ Date of Interview: ____________________
Village: ____________________ Parish: ____________________ Unique Identifier: ____________________
Questionnaire checked  1. Yes  2. No

Section B: individual characteristics

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>Maybe</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Respondent?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. How old are you (In complete years – “00” if unknown)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Marital status</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>4. Is your family occupying here as a landlord or tenant?</td>
<td></td>
<td></td>
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<tr>
<td>5. How long has your family lived here?</td>
<td></td>
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</tr>
<tr>
<td>6. What is your highest level of Education reached?</td>
<td></td>
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</tr>
<tr>
<td>7. What is your religion?</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>8. How many children under-five years are in your household</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. What is your household’s main source of income?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Section C: Prevalence of diarrhoea among U5 in flood prone Bwaise II and III parishes

These will help the researchers to understand the prevalence of diarrhoea among children under five in households in flash flood prone area of Bwaise II and II parishes

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>Maybe</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Does this area flood during rainy seasons?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. How frequent is flooding in this area? (Tick only one)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Which months do you experience flash floods in this area? (Check all that apply)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. When was the last flooding here? (Tick only one)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5. a). Are there any health facilities in your area? | Yes ☐ | No ☐ | If No, go to 7  
   b). During periods of floods, is service provision at the health facility affected by floods? | Yes ☐ | No ☐ | If Yes, go to 7  

6. If no, which of the following is responsible for change in service delivery? *(Tick which ever applies)*  
   a) The facility remains closed. ☐  
   b) Some health workers do not come. ☐  
   c) Some services are not offered. ☐  
   d) Destruction of infrastructure. ☐  
   e) Difficulty accessing health facility ☐  

7. During your stay here, has your family ever lost any of the household properties or assets like beds, TV, etc. due to flooding?  
   1. Yes ☐  
   2. No ☐  
   99. I don’t know ☐  

8. During flooding, have you noticed exposure of faecal matter in this area? | Yes ☐ | No ☐ | If No, go to 10  

9. If yes, what is the source of the exposure? *(Tick which ever applies)*  
   a) Overflow from toilets/latrines around ☐  
   b) Overflow from nearby sewage channel ☐  
   c) Wash up from children’s faeces in compound ☐  

10. Has any of your children below 5 years had diarrheal in the last six months? | Yes ☐ | No ☐  

---

**Section D: Factors associated with diarrhoea in children under-five in periods of floods**  
These will help the researcher to better understand the factors that are associated with diarrhoea among children under five years in periods of flash floods in Bwaise.  

1. Was your house legally approved for construction? | 1. Yes ☐  
   2. No ☐  
   99. Don’t know ☐  

2. Do you have any toilet facility? | Yes ☐ | No ☐ | If No, go to 3  
   a). IF YES, what type is it? | 1. Pour flush ☐  
   2. Pit latrine ☐  

   b). Where is this toilet facility located? | 1. Inside or attached to dwelling ☐  
   2. Outside premises ☐  

   c). How many households share this toilet facility? *(Ask Regardless of Location)* | 1. Not shared ☐  
   2. More than one ☐  
   99. I Don’t know ☐  

   d). Has your toilet facility been affected by floods? | Yes ☐ | No ☐  

3. What is the main source of water used by this household for hand washing? *(Check one)* | 1. Protected dug well ☐  
   2. Unprotected dug well ☐  
   3. Tap ☐  
   4. Rain water collection ☐  
   5. Bottled water ☐  
   6. Surface water (river/stream/pond) ☐  
   7. Others (specify) ☐  

---
<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. a) Do you store water?</td>
<td>Yes</td>
</tr>
<tr>
<td>6. a) Are the containers covered?</td>
<td>Yes</td>
</tr>
<tr>
<td>7. Do you treat your water in any way to make it safer to drink?</td>
<td>Yes</td>
</tr>
<tr>
<td>8. IF YES, what do you usually do to the water to make it safer to drink? (Only check more than one response, if several methods are usually used together, for example, Cloth filtration and chlorine) Check which ever applies</td>
<td>1. Boil</td>
</tr>
<tr>
<td>9. Do you have soap (solid/liquid) in your household? (Only ask for the availability of soap, not of other cleaning agents like detergents, ash, sand)</td>
<td>1. Yes</td>
</tr>
<tr>
<td>10. Have you used soap in the last 2 days?</td>
<td>Yes</td>
</tr>
<tr>
<td>11. What did you use it for? (Probe what was the occasion, but do not read the answers. Encourage “what else” until nothing further is mentioned &amp; check all that apply)</td>
<td>Washing my children</td>
</tr>
<tr>
<td>12. Has your household experienced any overflow from pit latrine/septic tank during periods of floods?</td>
<td>Yes</td>
</tr>
</tbody>
</table>
13. Where do the children (under five) in the household normally defecate? It is …

<table>
<thead>
<tr>
<th></th>
<th>1. Within the house (floor)</th>
<th>2. In the potty</th>
<th>3. In a polythene</th>
<th>4. In the toilet/latrine</th>
<th>5. In the backyard</th>
<th>6. Other</th>
</tr>
</thead>
</table>

14. Would it be different during periods of floods? Yes ☐ No ☐

15. If yes, where do they defecate during periods of floods? *(Check which ever applies)*

<table>
<thead>
<tr>
<th></th>
<th>1. In the house</th>
<th>2. In the potty</th>
<th>3. In a polythene</th>
<th>4. In the toilet/latrine</th>
<th>5. In the backyard</th>
<th>6. Other</th>
</tr>
</thead>
</table>

16. How do you handle children’s & babies faeces during periods of floods?

<table>
<thead>
<tr>
<th></th>
<th>1. Tie in a polythene &amp; add to refuse</th>
<th>2. Drop in the toilet/latrine</th>
<th>3. Don’t do anything</th>
<th>4. Other (specify)</th>
</tr>
</thead>
</table>

17. What is the main type of anal cleansing do you use for your children and babies

|---|-----------------|--------------|---------|-------|-------------------|

18. Where do you dispose-off the anal cleansing materials?

<table>
<thead>
<tr>
<th></th>
<th>1. On a trench</th>
<th>2. In a toilet/pit latrine</th>
<th>3. On a refuse dump</th>
<th>4. Other (specify)</th>
</tr>
</thead>
</table>

**SECTION E: Adaptation strategies to protect children U5 from Diarrheal diseases**

These will help researcher to better understand the adaptation strategies developed by households in Bwaise to protect children from diarrheal diseases during periods of flash floods

1. **What main plan do you have for protecting your family during seasons of floods** *(Check only one)*

   a). I am planning to quit this place
   b). Bailing water out of the house
   c). Constant clearance of the drainage channel
   d). Using sandbags to raise the area higher
   e). Digging trenches to divert water away
   f). Temporarily moving away from the area
   g). Raising the bed using stones or bricks

2. **Do you know of any method for preventing diarrheal diseases among children and babies during periods of floods?**

   Yes ☐ No ☐

3. **Do you ever empty your latrine to avoid feces that would contaminate water entering into your houses whenever there are floods?**

   Yes ☐ No ☐

4. **During periods of floods, how do you mainly ensure that water for drinking is safe?**

   1. Boiling
   2. Using water guard
   3. I Don’t do anything
   4. Others (Specify)
5. Do you have any hand washing facility? | Yes ☐ | No ☐  
---
6. Is any soap or detergent usually present for hand washing during periods of floods? | Yes ☐ | No ☐  
---
7. Usually during periods of floods, when would you wash your hands…? *(Tick which ever applies)*  
   a) Before feeding your child? ☐  
   b) Before preparing food ☐  
   c) After cleaning a child's anus ☐  
   d) After disposal of child faeces ☐  
   e) After using toilet ☐  
---
8. Considering your current household conditions and your adaptation strategies, do you feel your children are safe from diarrhoea during floods?  
   1. Very safe ☐  
   2. Safe ☐  
   3. Unsafe ☐  
---
9. Which precautions do you observe in your entire food preparation and storage?  
   1. Maintaining hygiene ☐  
   2. Don’t do anything ☐  
   3. Others specify: __________________  
---
10. Are you planning to move to a no flooding area? | Yes ☐ | No ☐  
   If No, END  
---
11. If YES, when can that be? *(Tick only one that applies)*  
   1. Immediately ☐  
   2. In less than a year ☐  
   3. In two or more years’ time ☐  
   99. I don’t know ☐  
---

*Thank you for your response*
APPENDIX III: Copy of the Approval Letter from Higher Degrees, REC

MAKERERE UNIVERSITY
P.O. Box 7072 Kampala Uganda
Website: www.musph.ac.ug

COLLEGE OF HEALTH SCIENCES
SCHOOL OF PUBLIC HEALTH
HIGHER DEGREES, RESEARCH AND ETHICS COMMITTEE

29th March, 2016

Mr. David Kaptengan
Master of Disaster Management
School of Public Health

Re: “Factors associated with Diarrhea in children under five during flash floods and Adaptation strategies by households in Bwaise, Kampala”

This is to inform you that the Higher Degrees, Research and Ethics Committee (HDREC) has approved your study documents for the above referenced research study:

<table>
<thead>
<tr>
<th>Document Name</th>
<th>Approval Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Research Protocol</td>
<td>29th March 2016</td>
</tr>
<tr>
<td>2 Consent Forms</td>
<td>29th March 2016</td>
</tr>
<tr>
<td>3 Questionnaires</td>
<td>29th March 2016</td>
</tr>
</tbody>
</table>

Also note that your study was first approved by HDREC 29th March 2016 therefore approval expires at every annual anniversary of this approval date. The current approval is therefore valid until: 29th March 2017.

Continued approval is conditional upon your compliance with the following requirements:

1) No other consent form(s), questionnaire and/or advertisement documents should be used. The consent form(s) must be signed by each subject prior to initiation of any protocol procedures. In addition, each subject must be given a copy of the signed consent form.

2) All protocol amendments and changes to other approved documents must be submitted to HDREC and be implemented until approved by HDREC except where necessary to eliminate apparent immediate hazards to the study subjects.
3) Significant changes to the study site and significant deviations from the research protocol and all unanticipated problems that may involve risks or affect the safety or welfare of subjects or others, or that may affect the integrity of the research must be promptly reported to HDREC.

4) For Masters Students in the School of Public Health, you are required to submit 2 copies of your proposal plus a letter of intention to submit a dissertation giving a period of 3 months to the Dean school of Public Health before you commence data collection.

- Please complete and submit reports to HDREC as follows:
  a) Renewal of the study approval – complete and return the continuing Review Report – Renewal Request (Form 404A) at least 60 days prior to the expiration of the approval period. The study cannot continue until re-approved by HDREC.

  b) Completion, termination, or if not renewing the project – send a final report within 90 days upon completion of the study.

Yours sincerely

[Signature]

Dr. Suzanne Kiwanuka

Chairperson, Higher Degrees, Research and Ethics Committee
APPENDIX IV: Copy of the Permission Letter from Higher Degrees, REC

MAKERERE UNIVERSITY
P.O. Box 7072 Kampala Uganda
Website: www.musph.ac.ug

COLLEGE OF HEALTH SCIENCES
SCHOOL OF PUBLIC HEALTH
HIGHER DEGREES, RESEARCH AND ETHICS COMMITTEE

29th March 2016

To whom it may concern

Dear Sir/Madam,

RE: PERMISSION TO CONDUCT RESEARCH

I hereby introduce to you Mr. Kaptengan David Masters of Disaster Management student at Makerere University School of Public Health.

He is required to conduct a research study as a requirement for the award of the Masters in Disaster Management. The title of his study is "Factors associated with Diarrhea in children under five during flash floods and adaptation strategies by households in Bwaise, Kampala"

He already presented the proposal to the Makerere University School of Public Health, Higher Degrees, Research and Ethics Committee and he has been granted approval to go ahead with data collection.

Your support in this regard will be highly appreciated.

Thank you.

Dr. Suzanne Kiwanuka
Chairperson, Higher Degrees, Research and Ethics Committee

HIGHER DEGREES, RESEARCH AND ETHICS COMMITTEE
APPROVED ON
29 MAR 2016
APPENDIX V: Copy of the Approval Letter from NCST

Uganda National Council for Science and Technology
(Established by Act of Parliament of the Republic of Uganda)

Our Ref: HS 3003
30th August 2016

Kaptengan David
Principal Investigator
Makerere University
Kampala

Re: Research Approval: Factors Associated with Diarrhea in Children Under-Five after the Occurrence of Flash-Floods and Adaptation Strategies Developed by Households in Bwaise, Kampala

I am pleased to inform you that on 25/07/2016, the Uganda National Council for Science and Technology (UNCST) approved the above referenced research project. The Approval of the research project is for the period 25/07/2016, to 25/07/2017.

Your research registration number with the UN CST is HS 3003. Please, cite this number in all your future correspondences with UN CST in respect of the above research project.

As Principal Investigator of the research project, you are responsible for fulfilling the following requirements of approval:

1. All co-investigators must be kept informed of the status of the research.
2. Changes, amendments, and addenda to the research protocol or the consent form (where applicable) must be submitted to the designated Research Ethics Committee (REC) or Lead Agency for re-review and approval prior to the activation of the changes. UN CST must be notified of the approved changes within five working days.
3. For clinical trials, all serious adverse events must be reported promptly to the designated local REC for review with copies to the National Drug Authority.
4. Unexpected events involving risks to research subjects/participants must be reported promptly to the UN CST. New information that becomes available which alters the risk/benefit ratio must be submitted promptly for UN CST review.
5. Only approved study procedures are to be implemented. The UN CST may conduct impromptu audits of all study records.
6. A progress report must be submitted electronically to UN CST within four weeks after every 12 months. Failure to do so may result in termination of the research project.

Below is a list of documents approved with this application:

<table>
<thead>
<tr>
<th>Document Title</th>
<th>Language</th>
<th>Version</th>
<th>Version Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Research proposal</td>
<td>English</td>
<td>N/A</td>
<td>March 2016</td>
</tr>
<tr>
<td>2. Focus Group Discussion Guide</td>
<td>English</td>
<td>N/A</td>
<td>March 2016</td>
</tr>
<tr>
<td>3. Hospital Data Guide</td>
<td>English</td>
<td>N/A</td>
<td>March 2016</td>
</tr>
<tr>
<td>4. Mother / Caretaker Questionnaire</td>
<td>English</td>
<td>N/A</td>
<td>March 2016</td>
</tr>
<tr>
<td>5. Adaptation Strategies to Protect Children from Diarrheal Diseases</td>
<td>English</td>
<td>N/A</td>
<td>March 2016</td>
</tr>
<tr>
<td>6. Informed Consent Form</td>
<td>English</td>
<td>N/A</td>
<td>March 2016</td>
</tr>
</tbody>
</table>

Yours sincerely,

Hellen N. Opolot
for: Executive Secretary

UGANDA NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

Copied to: Chair, Makerere University School of Public Health Higher Degrees, Research Ethics Committee
OFFICE OF THE TOWN CLERK

KALEMPE DIVISION URBAN COUNCIL

Our ref: KDUC/KCCA/201/17
6th October, 2016

TO WHOM IT MAY CONCERN

Re: PERMISSION TO CONDUCT ACADEMIC RESEARCH

This is to introduce MR. KAPTENGAN DAVID, a master’s student of Makerere University, college of health sciences, school of public health. As a requirement for the award of a master’s degree, he is carrying out a research entitled “factors associated with diarrhea in children under five during flash floods and adaptation strategies by households in Kawempe Division”.

This is therefore to you requests you to offer him the necessary assistance.

Rwakabale Geoffrey
TOWN CLERK