BEHAVIOURAL, ENVIRONMENTAL, SOCIOECONOMIC AND DEMOGRAPHIC DETERMINANTS OF DIARRHOEA MORBIDITY AMONG CHILDREN UNDER 5 YEARS IN MIGORI COUNTY, KENYA.

BY

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OCTOBER 2017
DECLARATION

This thesis is my original work and has not been presented for a degree in any other University.

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DEDICATION

To my father Paul Oluoch Odero, mother Wilfrida Aoko Nyajowi, grandmother Birigita Oyier Kaunu, wife Emmah Nyaboke Machogu and our son Scharsftein Oluoch Odero.
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DEFINITION OF TERMS

Behavioural factors: Includes childcare practices such as hand washing, breastfeeding practices, weaning practices, vaccination and diarrhoea management.
Caregiver: This is a person who is responsible for taking care of a child; the person can be male or female relative of the child or non-relative

Diarrhoea: Diarrhoea is the passage of three or more loose or watery stools per day, or more frequently than is normal for the child. It is usually a symptom of gastrointestinal infection, which can be caused by a variety of bacterial, viral and parasitic organisms.

Environmental factor: Includes refuse disposal, water storage, water drawing methods, safe drinking water, latrine availability, water source and distance to water source.

Household member: A person constituting a household.

Household: A person or a group of persons who live together in the same dwelling unit(s) or in connected premises, who acknowledge one adult member as head of the household and who have common arrangements for cooking and eating their food.

Hygiene: The practice of keeping oneself and surrounding environment clean.

Improper disposal: Storage of refuse in a container without cover, disposal of refuse in open land or field.

Improved latrine: Ventilated Improved Pit (VIP) latrine, flush or pour flush latrine and pit latrine with a slab.

Improved water source: Protected well, piped water, protected spring, borehole and rainwater.

Overcrowding: Having more than 1.5 persons per room (excluding children under ten years).

Personal hygiene practices: Habits regarding washing hands before eating or preparing food and after going to the toilet.

Proper disposal: Burning refuse, burying refuse in the pits or storage of refuse in closed container awaiting disposal in the designated public dump site.

Refuse: All solid wastes from a household (e.g. garbage, cow dung, home-sweepings, human excreta)
Sanitation: Provision of facilities and services for the safe disposal of human urine and faeces at the household level.

Scooper: A cup or bowl used to draw water from a storage container.

Socioeconomic and demographic factor: includes age, gender, occupation, marital status, education level, household size, number of under fives in household, household residence, number of rooms and income level (wealth index).

Under fives: Children aged 0-59 months.

Unimproved latrine: Pit latrine without a slab and bucket latrine.

Unimproved water source: Unprotected well, unprotected spring and surface water, e.g. dam, lake, pond, river or stream.

ABBREVIATIONS AND ACRONYMS

AIDS    Acquired Immune Deficiency Syndrome
CLTS    Community Lead Total Sanitation
CRA     Commission on Revenue Allocation
EA      Enumeration Area
GoK     Government of Kenya
ABSTRACT

Globally, there are 2.5 billion cases of diarrhoea among under fives every year. In 2015, diarrhoea caused 9% of deaths among under fives worldwide. In Africa, there are 696 million cases of diarrhoea among under fives every year. About 46% deaths among under fives in Africa are attributed to diarrhoea. In Kenya, diarrhoea accounted for 20% of deaths among under fives in 2011 causing 38,802 deaths. In Migori County, diarrhoea is a major cause of morbidity and mortality, yet the interaction with predisposing factors is still high. This study focused on assessing the behavioural, environmental, socioeconomic and demographic determinants of diarrhoea morbidity among children under 5 years in Migori County, Kenya.
A cross-sectional study design was used. A total of 216 under fives were sampled using multistage sampling technique. A questionnaire was used as the research instrument for data collection. SPSS was used for data analysis. Descriptive statistics, Chi-square test of independence and Fisher’s exact tests were computed. According to study findings, 18% of under-fives in Migori County had diarrhoea two weeks before the study. Socioeconomic and demographic factors associated with diarrhoea among under fives was the number of rooms in a household \((p = 0.002)\). Behavioural factors included hand washing with soap \((p<0.001)\); food storage method \((p<0.001)\); and heating stored food before feeding \((p<0.001)\). Environmental factors included method of refuse disposal \((p<0.001)\); latrine availability \((p = 0.001)\); latrine type \((p = 0.037)\); latrine sharing \((p<0.001)\); source of drinking water \((p = 0.009)\); water storage \((p = 0.002)\); method of drawing water \((p = 0.005)\); scooper cleaning \((p<0.001)\); cleaning water container before refilling \((p = 0.034)\); and drinking water treatment \((p = 0.010)\). Conclusion of the study was that determinants of diarrhoea morbidity identified should be addressed to prevent occurrence of diarrhoea disease among under fives. The null hypothesis that diarrhoea among under fives has no association with behavioural, environmental, socioeconomic and demographic factors was rejected. Among the three categories of determinants, environmental factors had more significant associations. Recommendation is that the community in the study area could possibly benefit is concerted efforts are made to increase the number of latrines. Efforts should be made to protect water sources in the study community. In addition, the study emphasizes that hygiene practices should be encouraged, and intervention programmes should be implemented on refuse disposal to create awareness on proper refuse and wastewater disposal.
CHAPTER 1- INTRODUCTION

1.1 Background to the study

Globally, diarrhoeal disease is a major cause of morbidity among children under 5 years (under fives) (Islam et al., 2015). Every year, there are over 2.5 billion diarrhoea cases among under fives globally (UNICEF and WHO, 2014). In 2015, diarrhoea was responsible for about 9% of deaths among under fives worldwide, which suggests that about 1,400 under fives die every day or 526,000 under fives die every year from diarrhoea (UNICEF, 2015). However, the disease predominantly concentrates only in 15 countries, including Kenya (IVAC, 2013). Despite being home to about 50% of the under five populations globally, the 15 countries report three quarters of the global diarrhoea deaths (Niefert and Bunik, 2013).

In Africa, there are over 696 million cases of diarrhoea among under fives every year. Diarrhoea is a major cause of morbidity which accounts for over 70% of childhood diseases in Africa. Research notes that a child in Africa experiences at least five diarrhoeal episodes a year. Moreover, about 46% deaths among under fives in Africa are attributed to diarrhoea (Niefert and Bunik, 2013). Although diarrhoea is preventable and curable, the number of deaths among under fives due to diarrhoea only reduced by four percent in Africa between 2000 and 2015 which can be due to high poverty levels and inadequate interventions.

In Kenya, diarrhoea is a major public health problem and is listed amongst the leading causes of mortality and morbidity amongst under fives. Kenya Demographic and Health Survey (KDHS) of 2014 reported that diarrhoea was a major cause of

In Migori County, diarrhoea is a major public health problem and a leading cause of morbidity and mortality among under fives despite the fact that the causes of diarrhoea are well understood (GoK, 2013a). In 2013, about 15% of under fives in Migori County were reported to have diarrhoea (GoK, 2013a). Generally, factors predisposing children to diarrhoea include environmental factors, behavioural factors, socioeconomic and demographic factors.

Environmental factors such as refuse disposal and latrine availability can influence the diarrhoea occurrence (Shridevi et al., 2015). However, poor environmental factors in Migori County such as the practice of open defecation can increase the risk of the disease. For example, 26% of the population in Migori County has no sanitation facilities (GoK, 2013b).

Behavioural factors such as child feeding practices, personal hygiene practices, seeking appropriate treatment measures and measles vaccination can influence diarrhoea occurrence amongst under fives (Masiha et al, 2015). However, in Migori County, about 75% of under fives with diarrhoea do not receive recommended treatment and over 14% of under fives do not receive measles vaccination which an increase the risk of the disease (GoK, 2013a).
Socioeconomic and demographic factors such as age and occupation of mothers (or caregivers) influence diarrhoea occurrence among under fives by impacting family behaviour and the environment, thus altering the exposure of under fives to disease causing organisms and increasing their vulnerability to infection (Shridevi et al., 2015). The incidence of diarrhoea is high among poor households and rural areas where there is higher interaction with predisposing factors (Chilambwe et al., 2015). In Migori County, about 45.6% of the population live below the poverty line which deprives them of basic necessities like education, health and food which can influence their socioeconomic and demographic characteristics and thus lead to the risk of diarrhoea disease (GoK, 2013b).

Under fives are more susceptible to diarrhoea because they have an underdeveloped immune system. In addition, they are also more vulnerable to dehydration from diarrhoea because of a high metabolic rate, high body water content, along with a high body surface area to mass index which contribute to increased turnover of solute and fluids (Koyfman, 2015).

1.2 Problem statement

Diarrhoea is a major public health problem and a leading cause of morbidity among children under five years in Kenya. It accounts for about 20% deaths among under fives and about 4.7% of outpatient visits among under fives in Kenya. GoK (2013a) reported that about 15% of under fives have diarrhoea in Migori County every year. Diarrhoea cases, deaths & disease burden among under fives can be reduced; however, interaction with predisposing factors is still high in Migori County. For example, about 75% of under fives with diarrhoea do not receive recommended
treatment and 14% of under fives no measles vaccination (GoK, 2013b). A considerable size of the population in Migori County (26%) resorts to open defecation due to lack of sanitation facilities. The issue is that more cases of diarrhoea among under fives in Migori County will occur if the current status quo is maintained and consequently result in more under five deaths.

Studies on prevention efforts to curb diarrhoea diseases report different results. Cairncross (2010)’s study drew on three systemic reviews and found that hygiene and sanitation were the most appropriate prevention strategies, while Bhutan (2013)’s study of interventions to address diarrhoea in 75 countries mentioned breastfeeding. There is limited information on how diarrhoea among under fives in Migori County is influenced by behavioural, environmental, socioeconomic and demographic factors because there are few studies (GoK, 2013a). The study sought to identify the various behavioural, environmental, socioeconomic and demographic determinants of diarrhoea among under fives in Migori County, Kenya.

1.3 Research questions

1. What are the socioeconomic and demographic factors that predispose children under 5 years to diarrhoea in Migori County?

2. What are the behavioural factors that predispose children under 5 years to diarrhoea in Migori County?

3. What are the environmental factors that predispose children under 5 years to diarrhoea in Migori County?
1.4 Hypothesis

H₀: Diarrhoea among under fives has no association with behavioural, environmental, socioeconomic and demographic factors.

1.5 Objectives

1.5.1 Broad objective

To assess the behavioural, environmental, socioeconomic and demographic determinants of diarrhoea morbidity among children under 5 years in Migori County, Kenya.

1.5.2 Specific objectives

1. To determine the socioeconomic and demographic factors that are associated with diarrhoea among children under 5 years in Migori County.

2. To determine the behavioural factors that are associated with diarrhoea among children under 5 years in Migori County.

3. To determine the environmental factors that are associated with diarrhoea among children under 5 years in Migori County.

1.6 Significance of the study

Identifying the underlying factors associated with diarrhoea morbidity among under fives in the context of Migori County in this study may be beneficial in various ways for different stakeholders: (a) Study participants can benefit in terms of understanding the significant factors influencing childhood morbidity and identify the amenable factors that they can change to address the situation. (b) Programme development can
become more effective since the predisposing factors are identified and may be used to influence the development of appropriate intervention strategies that are specific to the study area and improve child survival. (c) Academia can benefit from having an additional literature since there is no specific report that has been published on Migori County on how diarrhoea among under fives is influenced by different factors. (d) Migori County government can benefit from the new knowledge generated and thus plan better interventions for prevention of diarrhoea morbidity and consequently mortality.

1.7  Delimitation and limitation

1.7.1  Delimitation

The study mainly focused on determining the environmental, behavioural, socioeconomic and demographic factors and how they are associated with diarrhoea morbidity among under fives in Migori County. Given the high diarrhoea morbidity in Migori County, the main thrust of the study was to improve prevention efforts by understanding the determinants of the disease (the morbidity is actually higher than the mortality).

1.7.2  Limitation

The limitation was that the mothers (or caregivers) of under fives were used to provide information sought, hence the quality of data collected was dependent on their honesty.
1.8 Conceptual Framework

The conceptual framework was developed based on the literature review of the causes of diarrhoea among under fives. Past studies consider that the causes of diarrhoea in children encompass behavioural factors (Imdad et al., 2011; Gurpreet et al., 2011), poor sanitation (Girma and Berhane, 2011) and socioeconomic factors (Gary et al., 2013). These are indirect causes of diarrhoea, which are grouped into underlying causes at the family or household level which operate through the basic causes at the societal level (e.g. economic structure and inadequate education).

In this study, the conceptual framework was applied to understand how the socioeconomic and demographic factors, behavioural factors and environmental factors predispose the under fives to diarrhoea. At the family or household level, the underlying causes were environmental factors and behavioural factors while at the societal level, the basic causes were the socioeconomic and demographic factors. These factors interact to influence diarrhoeal morbidity directly or indirectly. Hence, the study attempted to find the association between the factors and the diarrhoea morbidity among under fives in Migori County. The conceptual framework is depicted as shown in the Figure1.1.
**Figure 1.1: Conceptual framework**

Source: Developed based on literature review
CHAPTER 2- LITERATURE REVIEW

2.1 Introduction

The literature review enhances understanding of the causative agents of diarrhoea, types of diarrhoea and its transmission. It also explains how the diarrhoea morbidity can be influenced by socioeconomic factors, environmental factors and behavioural factors. Other sections include the prevention and treatment of diarrhoea and explanation of other facts that relate to diarrhoea.

2.2 Overview of epidemiology of diarrhoea

Liu et al. (2012) defines diarrhoea as the passage of three or more liquid or loose stools per day. It also involves having a more frequent passage of watery or loose stools than is normal for an individual (UNICEF, 2010). Broadly, diarrhoea can be grouped into infectious and noninfectious diarrhoea. Pathophysiology of infectious diarrhoea involves two mechanisms: organisms (like Shigella dysenteriae) damages and penetrates intestinal mucosa cells; or toxins secreted by organisms (like Vibrio cholera) stimulate secretion of chloride and reduce water and sodium absorption.

Annual mortality in under fives from diarrhoea in developing countries stand at 1.8 million deaths in 2015 which is a reduction from 4.5 million deaths in developing countries two decades ago (Gary et al., 2013). Annual diarrhoeal incidence in under fives in developing countries includes 3.2 episodes. Gender and diarrhoea incidence show about 1.2 male to female ratio. There are various enteropathogens identified, including virus, bacteria, and pathogens. In developing countries, seasonality
contributes to diarrhoea episodes since the viral diarrhoeas peak in cooler months while bacterial diarrhoeas peak in the hotter months (Gary et al., 2013).

Types of diarrhoea mainly vary in duration, cause and severity of the affected bowel area and the general health of an individual. A number of childhood diarrhoeal episodes are mild, however, acute cases may result in significant loss of fluids and hence dehydration or death (WHO, 2011). Diarrhoea also causes diminished cognitive development, poor physical growth and weight loss among under fives since it can reduce a child’s appetite which alters the feeding patterns.

Diarrhoea is one of the leading causes of under five deaths globally (Chisti et al., 2011). Despite the fact that there is an enormous literature on diarrhoeal morbidity among under fives, evidence of the reasons why diarrhoeal morbidity among under fives are still high in many countries in Sub-Saharan Africa in spite of interventions and action plans made is very less (UNICEF, 2013). The main reason, according to Park et al. (2010) is that the programmes tend to be disease oriented, which cannot be effective in reducing the diarrhoea occurrence alone without the consideration of socioeconomic, behavioural and environmental factors. In Kenya, the causes of under five deaths have been mainly preventable diseases such as diarrhoea (Liu et al., 2012).

2.3 Types of diarrhoea

Based on clinical syndromes of diarrhoea, there are four types, namely: acute watery diarrhoea, chronic diarrhoea, dysentery and prolonged or persistent diarrhoea. Acute watery diarrhoea involves rapid dehydration and significant loss of fluids. It lasts for hours or days and is mainly caused by rotavirus, Escherichia coli and Vibrio cholera
(Kariptas et al., 2011). Dysentery or bloody diarrhoea contains mucus and blood in the faeces which is mainly caused by *Shigella dysenteriae*. It is also associated with nutrient losses and intestinal damage. Prolonged or persistent diarrhoea refers to diarrhoea episodes without or with blood and having a longer duration of over 14 days (Gary et al., 2013).

Undernourished children as well as those with HIV and AIDS tend to develop persistent diarrhoea, which make their condition worse (Yilgwan and Okolo, 2012). Chronic diarrhoea refers to long lasting or recurrent diarrhoea resulting from non-infectious causes such as gastrointestinal disease, or systemic to secondary disease or psychological in nature. The study focused on acute watery diarrhoea, dysentery or bloody diarrhoea and prolonged or persistent diarrhoea which are caused by infectious agents.

2.4 **Diarrhoeal causative agents**

Diarrhoea results when there is an imbalance in the secretion and absorption properties of the intestinal tract. This can be due to various causes such as metabolism errors (Moyo et al., 2011), intestinal diseases (Ouyang et al., 2012) or intestinal tract infections (Nakawesi et al., 2010). According to Mamula et al. (2004), intestinal tract infection mainly arises from viral organisms (e.g. *Rotavirus* and *Enteric adenovirus*), parasitic organisms (e.g. *Cryptosporidium parvum*, *Giardia lamblia* and *Entamoeba histolytica*) and bacterial organisms (e.g. *Escherichia coli*, *Vibrio cholerae*, *Shigella dysenteriae* and *Salmonella enterica*).
2.5 Transmission of infectious agents of diarrhoea

All pathogens known to cause diarrhoea are transmitted mainly through the faecal-oral route either directly or indirectly (Jadhav, 2011). Direct transmission takes place through person-to-person contact or direct contact with the faecal matter (hand-to-mouth) (Mukherjee et al., 2010). Indirect transmission can be vector-borne (insects) or vehicle-borne (contaminated water, food and objects).

Vehicle-borne transmission occurs when an individual drinks water contaminated by faeces due to contamination of water sources or/and water storage facilities (Mukherjee et al., 2010). An individual may eat food contaminated by faeces due to poor hygiene or there can be contact with contaminated objects. Vector-borne transmission occurs when flies contaminate the utensils and food or land on under fives directly. Faecal-oral transmission is presented in Figure 2.1.

Figure 2.1: Cycle of faecal-oral transmission (F-diagram)

Source: Kumar and Vollmer (2012)
2.6 Environmental factors and diarrhoeal morbidity

Water is an important factor in the occurrence of diarrhoea among under fives, since infectious agents of diarrhoeal disease are acquired through contaminated water (Jill et al., 2010). Unsafe water from unprotected or polluted water sources is ranked the among the top diarrhoea mortality risk factors (Sheth, 2010). Improving water quality through treatment of drinking water can help to reduce the diarrhoeal occurrence in developing countries. Another study by O’Connor (2012) noted that when under fives drink untreated water from unprotected sources like wells, rivers and other surface water, they are at risk of contracting diarrhoea since these sources are largely polluted.

Increasing distance from water source has been mentioned by Munos et al. (2010) as a risk factor for diarrhoea among under fives since it affects the quantity of water available for hygiene practices such as regular hand washing. Storage of water in containers may determine contamination of water depending on the conditions of storage. According to Moyo et al. (2011), the water usage pattern in homes (e.g. obtaining water by dipping hands in a container rather than pouring) largely influences diarrhoea among under fives even if the water supply points are not polluted.

Under fives tend to be less likely to contact diarrhoea in households with latrines compared to those without while proper use of latrines can reduce diarrhoea risk (Marc, 2010). Girma and Berhane (2011) wrote that sharing latrines among many households could result in unhygienic latrines. The associated odour and fly problem may further deter others from using the latrines making open defecation more
preferable. Improper disposal of refuse increases the risk of diarrhoea among under fives since it attracts flies. Poor sanitation practices like an indiscriminate disposal of an under five’s stool or open defecation lead to increased transmission of infectious agents of diarrhoeal disease (Kumar and Vollmer, 2012).

The presence of animals or livestock in living rooms enhances exposure to infectious agents of diarrhoea. Climate changes may also result in diarrhoea, for instance, Laishram et al. (2012) observed that during rainy seasons, the diarrhoea morbidity is higher since water sources are polluted by runoff from open defecation in areas with low latrine coverage. However, it is vital to understand that the influence of environmental factors is complex and are conditioned by various behaviours, socioeconomic and demographic factors.

### 2.7 Behavioural factors and diarrhoeal morbidity

Behavioural factors influence the exposure to infectious agents of diarrhoeal disease (Ozdemir et al., 2010). Personal hygiene practices, for instance dirty utensils and dirty kitchens may attract flies in houses which can spread diarrhoeal infectious agents (Chisti et al., 2011). Not washing hands using soap after defecation, before meals and before preparation of weaning foods is directly associated with increased diarrhoea among under fives. Other risky behaviours for diarrhoea among under fives include eating habits like eating cold leftovers, eating raw foods and contaminated fruits. Effective diarrhoea management relies mainly on early detection and treatment.

Appropriate care plays a great role during diarrhoea episodes among under fives since it can prevent mortality from diarrhoea by up to 30 % (Liu et al., 2012). Mothers who
take their children for measles vaccination and rotavirus vaccination engage in important childcare practices since vaccination is vital for diarrhoea prevention. Immunization reduces diarrhoea by preventing infections causing diarrhoea (rotavirus) and infections (measles) that cause diarrhoea as a side effect (Karambu et al., 2013). Rotavirus causes 40% of diarrhoea hospital admissions among under fives globally. Rotavirus is responsible for 100 million acute diarrhoea episodes annually and causes 350,000-600,000 diarrhoeal deaths among children (Liu et al., 2012).

Undernourished children and those with suppressed immune system experience diarrhoea as a side effect of measles (Tu et al., 2011). Death due to measles in under five occurs due to diarrhoea. Under fives who are not vaccinated against measles and rotavirus suffer more diarrhoeal mortality. Vitamin A supplementation is important in the prevention of diarrhoea and reduces mortality by 19-54% of children (Liu et al., 2012). Zinc intake and vitamin A supplementation also reduces complications, duration and severity of diarrhoea. Hence mothers must ensure under fives receive vitamin A supplementation.

Breastfeeding has been reported by Jadhav (2011) to have a direct role in the prevention of diarrhoea through protection of children under six months by delaying the contact of a child with contaminated weaning foods. Moreover, exclusively breastfed infants tend to have lower diarrhoeal episodes compared to non-breastfed infants (Niefert and Bunik, 2013). Breastfeeding also indirectly prevents diarrhoea by contributing to good nutrition, which boosts immunity. This is because breast milk has a higher concentration of antibodies which reduces diarrhoea risk (Gurpreet et al., 2011).
Food preparation practices such as unsafe storage of weaning foods may affect diarrhoeal morbidity among under fives (Nakawesi et al., 2010). Infants who are fed with dirty bottles have been found to be at more risk of diarrhoea compared to breastfed infants. However, these behavioural factors may be influenced by environmental factors, social economic factors and cultural beliefs such as visiting traditional healers before getting appropriate medical intervention in health facilities (Yilgwan and Okolo, 2012). Health service utilization influences child care practices since the health facilities provide child care practices such as immunization (Yakoob et al., 2011). Health personnel also provide health education to mothers on exclusive breastfeeding, weaning practices and relevant knowledge on early treatment of diarrhoeal disease using modern methods like ORS. Moreover, ORS can be obtained from health facilities.

Mothers who utilize health services are also given the knowledge on how to treat water for drinking and may even receive commodities for such treatment from the health facilities. During severe diarrhoea conditions such as dehydration, there is a need for medical attention in health facilities. One major reason why mortality related to diarrhoeal disease is high is health service under-utilization. This implies that sick under fives are not attended to by qualified, healthcare personnel until it is late. There are a number of factors that are responsible for health service under-utilization, such as unavailability of health facilities and mother’s individual factors such as knowledge level on appropriate childcare practices.
2.8 Socioeconomic factors and diarrhoeal morbidity

Socioeconomic and demographic factors affect behavioural and environmental risk factors for diarrhoea. Place of residence, such as rural or urban has been found to determine water safety and water availability. The study by Jill et al. (2010) reported that under fives in urban areas with a safe water supply and proper sanitation or existence of sewage systems tend to have a lower prevalence of diarrhoea. The size of the family also increases risk of under fives to diarrhoea because, the bigger the size, the higher the likelihood of overcrowding if there are few numbers of rooms. Larger household size increases person-to-person contact which increases chances of contacting infectious agents of diarrhoea (Imdad et al., 2011).

Ganesh et al. (2011) noted that higher number of under fives in a family also relates to poor child spacing, which makes a mother to have low breast milk volume. The child’s age may predispose them to diarrhoea since their inborn immunity is weaker. The episodes of diarrhoea among under fives reduce as their age increases. For instance, diarrhoea incidences are highest mainly between the 6 to 23 months and then declines after 24 months of age and further decreases in the subsequent years of life (Girma and Berhane, 2011).

Some studies in Sub-Saharan Africa reported that there were higher rates of diarrhoea in families with lower education attainment (Yakoob et al., 2011). Education provides the needed knowledge of hygiene, weaning practices, feeding practices, interpretation of diarrhoea symptoms and promotes appropriate diarrhoea management. Low-income households are largely characterized by poor housing, poor sanitary facilities, overcrowding and poverty, which are confounding variables that promote
Transmission of agents of diarrhoeal disease (Cairncross, 2010). Parental occupation may dictate time available for the mother to breast feed under fives and also relates directly to income level. The mother’s age influence diarrhoea since the young mothers tends to have less experience on in the appropriate childcare practices as noted by Shamshulet al. (2012).

2.9 Other factors

Immunodeficiency is a risk factor for diarrhoea since the diarrhoea duration, mortality, severity and incidence are higher in under fives with HIV (Bhattacharya et al., 2011). Malnutrition also predisposes the under fives to diarrhoea since it weakens their immune systems and affects barrier protection by mucous membranes. Diarrhoea causes nutrient malabsorption; reduce dietary intake, increase catabolism as well as sequestration of the nutrients needed for growth leading to malnutrition (Brown, 2014). Malnutrition and diarrhoea relationship is shown in Figure 2.2.

**Figure 2.2:** Malnutrition and diarrhoea relationship

Source: Brown (2014)
2.10 Prevention and treatment of diarrhoea

Treatment measures include use of Oral Rehydration Salts (ORS), appropriate energy intake (food) and zinc supplementation which reduces the severity and duration of diarrhoea episodes (UNICEF, 2015). However, these are still not accessible to many under fives. Karambu et al. (2013) noted that antibiotics are used in case of dysentery, cholera or typhoid, and intravenous saline provided in severe cases. Prevention measures include educating mothers about sanitation, reduction of flies. Schilling (2010) wrote that rotavirus vaccination in high risk regions has also been introduced but are yet to be adopted in many developing countries.

Nonetheless, these measures alone have little impact on the diarrhoea occurrence without considering long term prevention of diarrhoea such healthy behaviours (e.g. hand washing with soap) and sanitation. Other ways that have been promoted for long term prevention of diarrhoea among under fives include water treatment methods and prevention of pollution of water sources. As shown, in the literature review, diarrhoea is a preventable disease but it still remains to be one of the leading causes of under five mortality in Kenya.

2.11 Summary and gaps in literature

In summary, the literature review showed that there are a number of behavioural, environmental, socioeconomic and demographic factors that influence the occurrence of diarrhoeal disease. However, there remains a gap in literature since no study has compared these factors. More research on the exposure of under fives to diarrhoea is required, particularly in Kenya since the disease remains a major cause of morbidity and mortality among under fives. Although diarrhoea is a topical issue in many
studies, our understanding of the main determinants responsible for diarrhoea morbidity among under fives and the scale of the problem in Migori County (Kenya) remains limited. Besides, there is no published report on Migori County about factors influencing diarrhoea occurrence among under fives. In this regards, the current study intends to fill in the gaps so far identified.
CHAPTER 3 – RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the methodology, including the study design, sampling techniques, study area, target population, data collection methods and analysis.

3.2 Study design

The study design was a cross-sectional descriptive study. The cross-sectional study was conducted to describe the prevailing situation in a target population as it occurs naturally (Bonita et al., 2006). The cross-sectional study design was deemed the most appropriate for the study because it is non-experimental, descriptive research and allows for associations among variables to be tested given that all data for each sample is collected at one point in time.

3.3 Variables

3.3.1 Dependent variable

The dependent variable was the occurrence of diarrhoea among under fives in the past two weeks preceding the study. This was defined as the passage of three or more loose or liquid stools per day (or more frequent passage than is normal for the individual) (Liu et al., 2012).

3.3.2 Independent variables

Socioeconomic and demographic factors included age, gender, occupation, marital status, education level, household size, number of under fives in household1,
household residence, number of rooms and income level (wealth index). Environmental factors included refuse disposal, water storage and drawing methods, safe drinking water, latrine availability, water source and distance to water source. Behavioural factors are the childcare practices, which included hand washing, breastfeeding practices, weaning practices, vaccination and diarrhoea management.

3.4 Location of the Study

The study area was Migori County in Kenya, which has an area of 2,597 km² (GoK, 2014). Population of Migori County is 1,038,712 people (MoH, 2013a). About 15% of under fives have diarrhoea in Migori County. Under five mortality rate in Migori County is 123/1000 live births. The rationale for selection of Migori County as the study location was that diarrhoea is a major cause of under five morbidity in Migori County (GoK, 2013b). Compared to other countries in Kenya, it is the leading in terms of diarrhoea occurrence among under fives (GoK, 2015). The study location map is shown in Figure A1 in Appendix VIII.

3.5 Target population

All children under five years living in Migori County. The total population of under fives in Migori County was 209,351 under fives.

3.6 Study population

Children under five years living in sampled Enumeration Areas (EAs) in Migori County (Kenya) was the unit of analysis, but their mothers (or caregivers) were interviewed on their behalf since they are minors who cannot answer for themselves.
3.6.1 Inclusion criteria

Children under five years in selected households, whose mother (or caregiver) gave consent and voluntarily accepted to participate in the study.

3.6.2 Exclusion criteria

i. Children above five years living in Migori County

ii. Under five meets the inclusion criteria but due to other compelling factors such as the mother (or caregiver) has serious communication problems or is unavailable or do not give consent, they were excluded

3.6.3 Sample size calculation

Fisher (1998)’s formula was used to determine the sample size. This formula was deemed the most appropriate for this study because it provides a representative sample when the target population is greater than 10,000.

\[ n = \frac{Z^2pq}{d^2} \]

Where;

\( n \) was the desired sample size,

\( Z \) was standard normal deviate (1.96) which corresponds to 95% confidence level,

\( p \) was the proportion in a target population estimated to have a particular characteristic (e.g. 15% of under fives have diarrhoea in Migori County),

\( q \) was 1 – \( p \)

\( d \) was degree of accuracy desired (i.e. 0.05).
The calculation was computed as follows:

\[
\frac{1.96^2 \times 0.15 \times 0.85}{0.05^2} = 195.92
\]

= 196 under fives
= 216 (after 10% adjustment)

Total sample size after 10% adjustment was 216 under fives. The adjustment was based on recommendations from Israel (2013) that a 10% adjustment should be added to cater for survey non-response and item non-response.

### 3.6.4 Sampling technique

The study used multistage sampling consisting of three stages (Figure 3.1). In stage one, 30 Enumeration Areas (EAs) were selected using simple random sampling from a list of 80 EAs created by the Kenya National Bureau of Statistics (KNBS) in National Sample Survey and Evaluation Programme (NASSEP) V out of the 518 EAs in Migori County (GoK, 2013b). The 30 EAs were selected because they are more than 10% of the EAs used in NASSEP V and not all EAs could be sampled due to logistical challenges, time constraints and lack of adequate resources. The reason why simple random sampling was used as opposed to other sampling technique was because it is free of bias and the sample has an equal chance of being selected. Simple random sampling was done by first listing the population, then assigning number to units and finally selecting the sample.

In stage two, seven households were selected using simple random sampling from a list of households with under fives in each EA leading to a total number of 216 households in the sampled EAs. The seven households in each EA were sampled
because it is the average found after dividing the total sample size and total EAs. As noted, 216 households were included in the study. In stage three, one under five was selected within each household. When there was more than one under five, one was selected using simple random sampling. Justification for simple random sampling was that selection is free from bias and ensures that each child has an equal chance of being selected (Saunders et al., 2012).

Figure 3.1: Multistage sampling
Source: KNBS (2015)
3.7 Research instrument

Research instrument was a structured questionnaire with closed ended questions. Justification of using questionnaire as the study instrument as opposed to other tools was because it enables quantitative data to be gathered in the study. Moreover, the study was objective, involved a quantitative approach to address the research questions, and tests the hypothesis. The questionnaire also offers advantages during data collection, such as quick data collection and quick coding.

The questionnaires were researcher administered to enhance reliability of data. Kiswahili language was used since there are various ethnic communities in Migori County who understand Kiswahili. English questionnaire was translated into Kiswahili then back translated into English to ensure the translation does not lead to distortion of the questions (Appendix I and Appendix II).

3.8 Pre-test

The questionnaire was pre-tested in Homa-Bay. Justification for undertaking the pre-test in Homa-Bay was that it is a neighbouring county with similar characteristics as Migori County with regard to the study variables. In addition, Homa-Bay County is second in terms of diarrhoea prevalence in Kenya. The reason for pre-testing was to identify any defects in the questionnaire such as ambiguity and question difficulty which were corrected (Saunders et al., 2012). Pre-testing was done by administering the questionnaire to 10 mothers (or caregivers) of under fives.
3.9 Validity

Construct validity concerns ability of investigators to establish correct measures for concepts studied. This was achieved by using past surveys like 2008/09 KDHS to develop the study questionnaire (GoK, 2010). In addition, the incomplete and inconsistently filled questionnaires were not included in the analysis in this study to enhance validity. External validity concerns being able to generalize the result to the entire population. This was ensured in this study through random selection to achieve a representative sample. The study findings were also compared to the results of past studies.

3.10 Reliability

Reliability refers to the extent to which a research instrument produces consistent and stable results. Reliability was ensured to minimize biases and errors in the study. Reliability of the instrument was accomplished by personally collecting the data using the same questionnaire for all samples to enable consistency of gathering information (Matthews and Ross, 2010).

3.11 Data collection techniques

Questionnaires were administered in Kiswahili to mothers (or caregivers) of the under fives in the households after obtaining informed consent. Those who consented were asked to sign the consent form before participating. However, those who consented, but could not write were asked to affix their left thumbprint on the consent form before participating. The actual interview was conducted in the home of mothers (or caregivers) of under fives running from 24 July 2015 to 28 August. The village elders
were used where necessary as the study guides to help in locating the EAs and to introduce the interviewer to the participants.

Involving village elders as study guides increased the trust of participants in the investigator. To minimize the rate of non-response or non-availability of the participants, the day and time the data was gathered was vital hence households of mothers (or caregivers) of under fives were visited in the morning to access the respondents when they are available. In case of non-availability, then a return visit to the selected households was done.

3.12 Data analysis

Data analysis was conducted after the questionnaires were checked for consistency and completeness (Bryman and Bell, 2011). After data cleaning and coding, the data was entered into a computer and quantitative analysis performed using SPSS version 20.0. The data were analysed using various methods, especially the descriptive. In essence, descriptive statistics that were performed included mean, standard deviation, and frequency distribution in percentages.

Overcrowding was measured by persons-per-room (PPR). Calculated by household size (excluding children under ten years) divided by number of rooms. If the calculated figures were greater than 1.50 then overcrowding occurs in the household (USDHUD, 2007).

Wealth index was developed to estimate the economic status of households. In wealth index development, Quintiles (wealth levels) was constructed where a weight (factor
score) for each variable was generated using Principle Component Analysis (PCA) and each household was given a score for each variable and these were summed. The ranking was then done based on the total score and then grouped into lower, second, middle, fourth and highest (Vyas and Kumanarayake, 2006). A list of all the variables used in the PCA is shown in Table 3.1.

**Table 3.1: Wealth index variables**

<table>
<thead>
<tr>
<th>Variable name</th>
<th>1 = Wood or concrete</th>
<th>0 = Earth or dung or mud</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floor material</td>
<td>1 = Wood or concrete</td>
<td>0 = Earth or dung or mud</td>
</tr>
<tr>
<td>Wall material</td>
<td>1 = Wood or brick or mud</td>
<td>0 = Cane or no wall</td>
</tr>
<tr>
<td>Roof material</td>
<td>1 = Galvanized iron or tiles or concrete</td>
<td>0 = Thatch or mud or makuti</td>
</tr>
<tr>
<td>Lighting used</td>
<td>1 = Gas or electricity or generator or solar panel</td>
<td>0 = Wood or candle or kerosene</td>
</tr>
<tr>
<td>Has radio</td>
<td>1 = Yes</td>
<td>0 = No</td>
</tr>
<tr>
<td>Has TV</td>
<td>1 = Yes</td>
<td>0 = No</td>
</tr>
<tr>
<td>Owns a refrigerator</td>
<td>1 = Yes</td>
<td>0 = No</td>
</tr>
<tr>
<td>Owns a car</td>
<td>1 = Yes</td>
<td>0 = No</td>
</tr>
<tr>
<td>Owns a mobile phone</td>
<td>1 = Yes</td>
<td>0 = No</td>
</tr>
<tr>
<td>Owns a motorbike</td>
<td>1 = Yes</td>
<td>0 = No</td>
</tr>
<tr>
<td>Owns a sewing machine</td>
<td>1 = Yes</td>
<td>0 = No</td>
</tr>
<tr>
<td>Owns a bicycle</td>
<td>1 = Yes</td>
<td>0 = No</td>
</tr>
<tr>
<td>Owns livestock</td>
<td>1 = Yes</td>
<td>0 = No</td>
</tr>
</tbody>
</table>

Source: WFP (2014) and KDHS of 2008/09 (GoK, 2010).

Chi-square test of independence was used to test for the association between diarrhoea occurrence and the environmental, behavioural, socioeconomic and demographic factors. Justification for the Chi-square test was that it is the test of choice for analysing categorical variables. Presentation of these results also involved pie charts, frequency tables and cross-tabulation to enhance illustration of the results.
3.13 Ethical and logistical considerations

Ethical and logistical challenges that can be encountered during a research include issues of confidentiality, privacy, voluntariness and working with various institutional review boards (Saunders et al., 2012). Strategies were developed in this study to address these challenges. To ensure confidentiality, the respondents in this study were treated with secrecy and privacy to protect them from victimization (Matthews and Ross, 2010). To ensure anonymity, the participants’ names were not included in the report. Informed consent involves obtaining permission from a subject after giving an explanation that addresses a subject’s concern. Informed consent was obtained from participants by explaining the risks and what to expect when involved before signing the consent form (Appendix III and Appendix IV).

In addition, ethical clearance was obtained from Kenyatta University Ethics Review Committee (Appendix V). Administrative approval involves getting official permission to conduct a research in an area. To attain administrative approval, research authorization (Appendix VI) and research clearance permit (Appendix VII) was sought from National Commission for Science, Technology and Innovation (NACOSTI).
CHAPTER 4 – RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the results of the study and the discussion. Major sections include socioeconomic and demographic characteristics, diarrhoea occurrence, risk factors associated with diarrhoea among under fives, and discussion of findings.

4.2 Socioeconomic and demographic characteristics

A total of 216 under fives were sampled from 30 Enumeration Areas (EAs) in Migori County, however, only 210 questionnaires were included in the analysis because six questionnaires were not consistently answered or incomplete. According to the results, Nyatike Sub-County accounted for the largest share with six EAs (Figure 4.1)

Table 4.1 presents the socioeconomic and demographic characteristics of the study population. According to the results, 70% were from rural areas while 30% were from urban areas. Slightly over a half (51.9%) lived in households with five members or less and 60% of the households had more than two under fives. It was also found that

Figure 4.1: Distribution of sampled EAs by Sub-County, Migori County

Table 4.1 presents the socioeconomic and demographic characteristics of the study population. According to the results, 70% were from rural areas while 30% were from urban areas. Slightly over a half (51.9%) lived in households with five members or less and 60% of the households had more than two under fives. It was also found that
77.1% lived in households with two rooms or less for sleeping (excluding kitchen and bathroom). Results revealed that slightly over half of the study population lived in overcrowded households (56.7%) in Migori County.

Wealth Quintiles was developed using PCA as described in section 3.12 on data analysis in the previous chapter. About a quarter of households fell in the fourth wealth quintile (25.7%) while the middle wealth quintile had the least number of households (13.8%). Almost half of the mothers (or caregivers) of under fives (47.6%) were farmers or fishermen and about three quarters (71%) were married (living with a spouse). According to the results, 64.3% of the mothers (or caregivers) of under fives were aged between 20─40 years, almost all (94.8%) were females and almost a half (46.7%) had attained primary education. Slightly above half (51%) of the under fives were females and almost half (49%) were aged between 6─24 months age group.
### Table 4.1: Socioeconomic and demographic characteristics of the participants, Migori County (N=210)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household residence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural area</td>
<td>147</td>
<td>70.0</td>
</tr>
<tr>
<td>Urban area</td>
<td>63</td>
<td>30.0</td>
</tr>
<tr>
<td>Household size (Mean =5.6; SD = 1.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 5 members</td>
<td>109</td>
<td>51.9</td>
</tr>
<tr>
<td>&gt; 5 members</td>
<td>101</td>
<td>48.1</td>
</tr>
<tr>
<td>Number of rooms (Mean= 1.8; SD = 1.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 2</td>
<td>162</td>
<td>77.1</td>
</tr>
<tr>
<td>&gt; 2</td>
<td>48</td>
<td>22.9</td>
</tr>
<tr>
<td>Overcrowding classification¹</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not overcrowded</td>
<td>91</td>
<td>43.3</td>
</tr>
<tr>
<td>Overcrowded</td>
<td>119</td>
<td>56.7</td>
</tr>
<tr>
<td>Number of under fives in household (M= 2.5; SD = .7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 2</td>
<td>84</td>
<td>40.0</td>
</tr>
<tr>
<td>&gt; 2</td>
<td>126</td>
<td>60.0</td>
</tr>
<tr>
<td>Household wealth status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lowest</td>
<td>43</td>
<td>20.5</td>
</tr>
<tr>
<td>Second</td>
<td>42</td>
<td>20.0</td>
</tr>
<tr>
<td>Middle</td>
<td>29</td>
<td>13.8</td>
</tr>
<tr>
<td>Fourth</td>
<td>54</td>
<td>25.7</td>
</tr>
<tr>
<td>Highest</td>
<td>42</td>
<td>20.0</td>
</tr>
<tr>
<td>Employment status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salaried employment or business</td>
<td>53</td>
<td>25.5</td>
</tr>
<tr>
<td>Farming or fishing</td>
<td>99</td>
<td>47.6</td>
</tr>
<tr>
<td>Others¹</td>
<td>56</td>
<td>26.9</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never married¹</td>
<td>29</td>
<td>13.8</td>
</tr>
<tr>
<td>Married²</td>
<td>149</td>
<td>71.0</td>
</tr>
<tr>
<td>Ever married³</td>
<td>32</td>
<td>15.2</td>
</tr>
<tr>
<td>Age of mother or caregiver in years (M= 34.4; SD = 11.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below 20</td>
<td>14</td>
<td>6.7</td>
</tr>
<tr>
<td>20–40</td>
<td>135</td>
<td>64.3</td>
</tr>
<tr>
<td>Above 40</td>
<td>61</td>
<td>29.0</td>
</tr>
<tr>
<td>Gender of mother or caregiver</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>11</td>
<td>5.2</td>
</tr>
<tr>
<td>Female</td>
<td>199</td>
<td>94.8</td>
</tr>
<tr>
<td>Education level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No education</td>
<td>41</td>
<td>19.5</td>
</tr>
<tr>
<td>Primary</td>
<td>98</td>
<td>46.7</td>
</tr>
<tr>
<td>Post-Primary or Vocational</td>
<td>41</td>
<td>19.5</td>
</tr>
<tr>
<td>Secondary or A level</td>
<td>24</td>
<td>11.4</td>
</tr>
<tr>
<td>College or University</td>
<td>6</td>
<td>2.9</td>
</tr>
<tr>
<td>Gender of under five</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>107</td>
<td>51.0</td>
</tr>
<tr>
<td>Female</td>
<td>103</td>
<td>49.0</td>
</tr>
<tr>
<td>Age of under five in months (M = 21.3; SD = 15.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below 6</td>
<td>32</td>
<td>15.2</td>
</tr>
<tr>
<td>6–24</td>
<td>103</td>
<td>49.0</td>
</tr>
<tr>
<td>Above 24</td>
<td>75</td>
<td>35.7</td>
</tr>
</tbody>
</table>

1 Overcrowding classification measured by persons-per-room. Calculated by household size (excluding children under ten years) divided by number of the room, i.e. if greater than 1.50 then overcrowding occurs
2 Retired, volunteer, no work, incapacitated or housewife
3 Single
4 Living together with spouse
5 Not living together, e.g. separated, divorced or widowed
4.3 Diarrhoea occurrence

Overall, 18.1% of under fives had diarrhoea two weeks before the study (Figure 4.2). Among under-fives with diarrhoea, a considerable number (63.6%) had diarrhoea lasting more than 7 days. Among under-fives with diarrhoea, the majority reported that it was watery (78.8%).

![Diarrhoea classification](image.png)

**Figure 4.2:** Diarrhoea occurrence among under fives (0 to 59 months) in Migori County, August 2015.

4.4 Risk factors associated with diarrhoea among under fives

4.4.1 Socioeconomic and demographic factors

Table 4.2 illustrates the distribution of socioeconomic and demographic characteristics by diarrhoea occurrence among under fives. A higher proportion of under fives with diarrhoea were from urban areas (20.6%) compared to those from rural areas (17%). Results show that 20.8% of under fives in households with more than five members had diarrhoea compared to 15.6% in households with less than five members ($p = 0.328$). In addition, 33.3% of under fives in households with more than 2 rooms for sleeping had diarrhoea compared to 13.6% of under fives had diarrhoea in
households with 2 rooms or less ($p = 0.124$). It was also found that over a quarter of households in the middle wealth quintile (31%) reported that they had an under five with diarrhoea.

Over a quarter (31%) of children with diarrhoea were from households with middle wealth status. According to the results, 23% each of the mothers (or caregivers) of under fives who were aged above 40 years and who had attained primary education reported to have an under five with diarrhoea. Almost a quarter of the under five males and a quarter of the children aged under 6 months were reported to have diarrhoea. Chi-square test showed that the number of rooms was significantly associated with diarrhoea ($p = 0.002$). The rest of the socioeconomic and demographic characteristics did not show a significant association with diarrhoea among under fives.
Table 4.2: Distribution of socioeconomic and demographic characteristics by diarrhoea occurrence among under fives, Migori County (N=210)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Diarrhoea occurrence</th>
<th>Chi-square or Fischer’s exact test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Diarrhoea</td>
<td>No diarrhoea</td>
</tr>
<tr>
<td></td>
<td>x² = 0.392</td>
<td>df = 1</td>
</tr>
<tr>
<td><strong>Household residence</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>25(17.0%)</td>
<td>122(83.0%)</td>
</tr>
<tr>
<td>Urban</td>
<td>13(20.6%)</td>
<td>50(79.4%)</td>
</tr>
<tr>
<td><strong>Household size</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤5 members</td>
<td>17(15.6%)</td>
<td>92(84.4%)</td>
</tr>
<tr>
<td>&gt;5 members</td>
<td>21(20.8%)</td>
<td>80(79.2%)</td>
</tr>
<tr>
<td><strong>Number of rooms</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 2</td>
<td>22(13.6%)</td>
<td>140(86.4%)</td>
</tr>
<tr>
<td>&gt; 2</td>
<td>16(33.3%)</td>
<td>32(66.7%)</td>
</tr>
<tr>
<td><strong>Overcrowding classification</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not overcrowded</td>
<td>19(20.9%)</td>
<td>72(79.1%)</td>
</tr>
<tr>
<td>Overcrowded</td>
<td>19(16.0%)</td>
<td>100(84.0%)</td>
</tr>
<tr>
<td><strong>Number of under fives in household</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤2</td>
<td>11(13.1%)</td>
<td>73(86.9%)</td>
</tr>
<tr>
<td>&gt;2</td>
<td>27(21.4%)</td>
<td>99(78.6%)</td>
</tr>
<tr>
<td><strong>Household wealth status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lowest</td>
<td>8(18.6%)</td>
<td>35(81.4%)</td>
</tr>
<tr>
<td>Second</td>
<td>6(14.3%)</td>
<td>36(85.7%)</td>
</tr>
<tr>
<td>Middle</td>
<td>9(31.0%)</td>
<td>20(69.0%)</td>
</tr>
<tr>
<td>Fourth</td>
<td>9(16.7%)</td>
<td>45(83.3%)</td>
</tr>
<tr>
<td>Highest</td>
<td>6(14.3%)</td>
<td>36(85.7%)</td>
</tr>
<tr>
<td><strong>Employment status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salaried employ or business</td>
<td>9(17.0%)</td>
<td>44(83.0%)</td>
</tr>
<tr>
<td>Farming or fishing</td>
<td>17(17.2%)</td>
<td>82(82.8%)</td>
</tr>
<tr>
<td>Others</td>
<td>11(19.6%)</td>
<td>45(80.4%)</td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never married</td>
<td>2(6.9%)</td>
<td>27(93.1%)</td>
</tr>
<tr>
<td>Married</td>
<td>28(18.8%)</td>
<td>121(81.2%)</td>
</tr>
<tr>
<td>Ever married</td>
<td>8(25.0%)</td>
<td>24(75.0%)</td>
</tr>
<tr>
<td><strong>Age of mother or caregiver (in years)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below 20</td>
<td>3(18.8%)</td>
<td>13(81.3%)</td>
</tr>
<tr>
<td>20-29</td>
<td>10(13.5%)</td>
<td>64(86.5%)</td>
</tr>
<tr>
<td>30-39</td>
<td>10(17.5%)</td>
<td>47(82.5%)</td>
</tr>
<tr>
<td>Above 40</td>
<td>15(23.8%)</td>
<td>48(76.2%)</td>
</tr>
<tr>
<td><strong>Gender of mother or caregiver</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>2(18.2%)</td>
<td>9(81.8%)</td>
</tr>
<tr>
<td>Female</td>
<td>36(18.2%)</td>
<td>163(81.9%)</td>
</tr>
<tr>
<td><strong>Education level</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No education</td>
<td>8(19.5%)</td>
<td>33(80.5%)</td>
</tr>
<tr>
<td>Primary</td>
<td>23(23.5%)</td>
<td>75(76.5%)</td>
</tr>
<tr>
<td>Post-Primary or Vocational</td>
<td>5(12.2%)</td>
<td>36(87.8%)</td>
</tr>
<tr>
<td>Secondary or A level</td>
<td>1(4.2%)</td>
<td>23(95.8%)</td>
</tr>
<tr>
<td>College or University</td>
<td>1(16.7%)</td>
<td>5(83.3%)</td>
</tr>
<tr>
<td><strong>Gender of under five</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>22(20.6%)</td>
<td>85(79.4%)</td>
</tr>
<tr>
<td>Female</td>
<td>16(15.5%)</td>
<td>87(84.5%)</td>
</tr>
<tr>
<td><strong>Age of under five (in months)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below 6</td>
<td>8(25.0%)</td>
<td>24(75.0%)</td>
</tr>
<tr>
<td>6-24</td>
<td>21(20.4%)</td>
<td>82(79.6%)</td>
</tr>
<tr>
<td>Above 24</td>
<td>9(12.0%)</td>
<td>66(88.0%)</td>
</tr>
</tbody>
</table>
4.4.2 Behavioural factors

According to the results, 58.1% of mothers (or caregivers) of under fives reported that they washed their hands, both before preparing food, and after visiting the toilet or wiping their children after toilet. In addition, 62.7% of under fives aged between 6—59 months had received Vitamin A supplementation within the last 6 months before the survey and almost all (94.8%) of the eligible under fives (aged between 9 to 59 months) had been vaccinated against measles by the time the study was being conducted.

It was found that 20.8% of under-fives were reportedly given food that had been stored in a tray or container without cover. Also, 17.2% of the mothers (or caregivers) of under fives reported not heating stored food before feeding the children. Not all children in the study were on breast milk at the time of data collection, according to results, only 42.4% (89) of under fives studied were on breast milk. In addition, only 5.28% (11) of under fives were exclusively breastfed which translates into 28.9% (11) of under fives aged 6 months and below (n = 38). According to the results, 42.1% (16) of under fives aged 6 months and below (n = 38) fed or were fed using fingers while 26.3% (10) were bottle-fed.

Table 4.3 presents the behavioural characteristics by diarrhoea occurrence among under fives. Fischer exact tests showed that hand washing with soap was significantly associated with diarrhoea ($p<0.001$). In addition, Chi-square tests showed that the food storage method ($p<0.001$) and heating stored food ($p<0.001$) were significantly associated with diarrhoea. The rest of the behavioural characteristics did not show a significant association with diarrhoea among under fives.
<table>
<thead>
<tr>
<th></th>
<th>Diarrhoea occurrence</th>
<th>Chi-square or Fischer’s’ exact test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Diarrhoea</td>
<td>No diarrhoea</td>
</tr>
<tr>
<td>Hand washing with soap</td>
<td></td>
<td></td>
</tr>
<tr>
<td>After visiting the toilet or wiping</td>
<td>2(66.7%)</td>
<td>1(33.3%)</td>
</tr>
<tr>
<td>Before preparing food</td>
<td>8(66.7%)</td>
<td>4(33.3%)</td>
</tr>
<tr>
<td>Both</td>
<td>14(11.5%)</td>
<td>108(88.5%)</td>
</tr>
<tr>
<td>Breastfeeding practice&lt;sup&gt;1&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exclusive</td>
<td>1(9.1%)</td>
<td>10(90.9%)</td>
</tr>
<tr>
<td>Non-exclusive</td>
<td>6(24.0%)</td>
<td>19(76.0%)</td>
</tr>
<tr>
<td>Supplementation and vaccination</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vitamin A supplementation only</td>
<td>1(25.0%)</td>
<td>3(75.0%)</td>
</tr>
<tr>
<td>Measles vaccination only</td>
<td>7(15.6%)</td>
<td>38(84.4%)</td>
</tr>
<tr>
<td>Both</td>
<td>18(17.8%)</td>
<td>83(82.2%)</td>
</tr>
<tr>
<td>Food preparation practices&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food storage method</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refrigerator</td>
<td>1(6.3%)</td>
<td>15(93.8%)</td>
</tr>
<tr>
<td>Covered container</td>
<td>17(12.5%)</td>
<td>119(87.5%)</td>
</tr>
<tr>
<td>Uncovered container</td>
<td>18(45.0%)</td>
<td>22(55.0%)</td>
</tr>
<tr>
<td>Heating stored food&lt;sup&gt;3&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heating</td>
<td>11(6.9%)</td>
<td>148(93.1%)</td>
</tr>
<tr>
<td>No heating</td>
<td>25(75.8%)</td>
<td>8(24.2%)</td>
</tr>
<tr>
<td>Feeding method&lt;sup&gt;4&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beverages</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bottle feeding</td>
<td>4(28.6%)</td>
<td>10(71.4%)</td>
</tr>
<tr>
<td>Cup feeding</td>
<td>2(33.3%)</td>
<td>4(66.7%)</td>
</tr>
<tr>
<td>Both</td>
<td>2(33.3%)</td>
<td>4(66.7%)</td>
</tr>
<tr>
<td>Solid food</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Finger feeding</td>
<td>9(19.6%)</td>
<td>37(80.4%)</td>
</tr>
<tr>
<td>Spoon feeding</td>
<td>1(14.3%)</td>
<td>6(85.7%)</td>
</tr>
<tr>
<td>Both</td>
<td>7(17.5%)</td>
<td>33(82.5%)</td>
</tr>
</tbody>
</table>

<sup>1</sup> Under fives (≤ 6 months)

<sup>2&4</sup> Food preparation practices and feeding method were used as proxies for weaning practice because the study was interested in knowing contamination of food

<sup>3</sup> Before feeding under five
4.4.3 Environmental factors

Over half of mothers (or caregivers) of under fives (55%) disposed their refuse in open land, field or farm. According to the results, latrine coverage was 67.6%, while the remaining 32.4% of the households had no latrines. Out of those owning a latrine, 59.1% had unimproved latrine, 29.9% were sharing a latrine facility, 25.6% of the latrines were reported to have flies and over half (56.1%) cleaned the latrines over 3 times per week while 43.9% cleaned the latrines 3 times per week or less, or when dirty. According to the results, 69% of the mothers (or caregivers) of under fives used water from unimproved sources for drinking and half of them (50%) covered over 1 Kilometre to obtain the water. The majority (82.9%) stored drinking water in a covered container, 73.8% of them drew water from the storage container by dipping a scooper and 87.1% did not empty or clean the water container before adding fresh water. According to the results, 44.5% cleaned the scooper 1-3 times per week or when dirty. Over half of the mothers (or caregivers) of under fives (55.7%) reported to treat drinking water. The majority (82.8%) boiled or added chlorine or water guard or PUR (P&G Purifier of Water) as the treatment method.

Chi-square tests showed that refuse disposal ($p<0.001$), latrine availability ($p = 0.001$), latrine type ($p = 0.037$), latrine sharing ($p<0.001$), source of drinking water ($p = 0.009$), drinking water treatment ($p = 0.010$), water storage ($p = 0.002$), method of drawing water ($p = 0.005$), scooper cleaning ($p<0.001$) and cleaning container before refilling ($p = 0.034$) were significantly associated with diarrhoea (Table 4.4). The rest of the environmental characteristics did not show a significant association with diarrhoea among under fives.
Table 4.4: Distribution of environmental characteristics by diarrhoea occurrence among under fives, Migori County (N = 210)

<table>
<thead>
<tr>
<th>Diarrhoea occurrence</th>
<th>Diarrhoea</th>
<th>No diarrhoea</th>
<th>Chi-square or Fischer’s’ exact test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refuse disposal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refuse pit</td>
<td>6(11.1%)</td>
<td>48(88.9%)</td>
<td>$x^2 = 28.584$</td>
</tr>
<tr>
<td>Open land, field or farm</td>
<td>13(11.3%)</td>
<td>102(88.7%)</td>
<td>df = 2 $p &lt; .001$</td>
</tr>
<tr>
<td>Garbage can</td>
<td>19(47.5%)</td>
<td>21(52.5%)</td>
<td></td>
</tr>
<tr>
<td>Waste water disposal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open land or garden</td>
<td>33(18.8%)</td>
<td>143(81.3%)</td>
<td>$x^2 = 0.242$ df = 1 $p = .623$</td>
</tr>
<tr>
<td>Along road or paths</td>
<td>5(15.2%)</td>
<td>28(84.8%)</td>
<td></td>
</tr>
<tr>
<td>Latrine availability</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>17(12.0%)</td>
<td>125(88.0%)</td>
<td>df = 1 $p = .001$</td>
</tr>
<tr>
<td>No</td>
<td>21(30.9%)</td>
<td>47(69.1%)</td>
<td></td>
</tr>
<tr>
<td>Latrine type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improved¹</td>
<td>3(5.4%)</td>
<td>53(94.6%)</td>
<td>$x^2 = 4.333$ df = 1 $p = .037$</td>
</tr>
<tr>
<td>Unimproved²</td>
<td>14(17.3%)</td>
<td>67(82.7%)</td>
<td></td>
</tr>
<tr>
<td>Latrine sharing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sharing</td>
<td>14(34.1%)</td>
<td>27(65.9%)</td>
<td>df = 1 $p &lt; .001$</td>
</tr>
<tr>
<td>No sharing</td>
<td>3(3.1%)</td>
<td>93(96.9%)</td>
<td></td>
</tr>
<tr>
<td>Flies around or inside latrine</td>
<td></td>
<td></td>
<td>$p = .553$</td>
</tr>
<tr>
<td>Yes</td>
<td>5(15.2%)</td>
<td>28(84.8%)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>11(11.5%)</td>
<td>85(88.5%)</td>
<td></td>
</tr>
<tr>
<td>Latrine cleaning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 3 times per week or when dirty</td>
<td>10(17.2%)</td>
<td>48(82.8%)</td>
<td>df = 1 $p = .185$</td>
</tr>
<tr>
<td>&gt; 3 times per week</td>
<td>7(9.5%)</td>
<td>67(90.5%)</td>
<td></td>
</tr>
<tr>
<td>Source of drinking water</td>
<td></td>
<td></td>
<td>$x^2 = 6.874$</td>
</tr>
<tr>
<td>Improved³</td>
<td>5(7.7%)</td>
<td>60(92.3%)</td>
<td>df = 1 $p = .009$</td>
</tr>
<tr>
<td>Unimproved⁴</td>
<td>33(22.8%)</td>
<td>112(77.2%)</td>
<td></td>
</tr>
<tr>
<td>Distance to water source</td>
<td></td>
<td></td>
<td>$x^2 = 0.00$</td>
</tr>
<tr>
<td>Below 1Km</td>
<td>19(18.1%)</td>
<td>86(81.9%)</td>
<td>df = 1 $p = 1.000$</td>
</tr>
<tr>
<td>Above 1Km</td>
<td>19(18.1%)</td>
<td>86(81.9%)</td>
<td></td>
</tr>
<tr>
<td>Drinking water treatment</td>
<td></td>
<td></td>
<td>$x^2 = 6.697$</td>
</tr>
<tr>
<td>Yes</td>
<td>14(12.0%)</td>
<td>103(88.0%)</td>
<td>df = 1 $p = .010$</td>
</tr>
<tr>
<td>No</td>
<td>24(25.8%)</td>
<td>69(74.2%)</td>
<td></td>
</tr>
<tr>
<td>Method of treating water</td>
<td></td>
<td></td>
<td>$p = 1.000$</td>
</tr>
<tr>
<td>Boil or chemical treatment</td>
<td>12(12.5%)</td>
<td>84(87.5%)</td>
<td></td>
</tr>
<tr>
<td>Allow to settle or filter</td>
<td>2(10.0%)</td>
<td>18(90.0%)</td>
<td></td>
</tr>
<tr>
<td>Water storage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open container</td>
<td>25(14.4%)</td>
<td>149(85.6%)</td>
<td>df = 1 $p = .002$</td>
</tr>
<tr>
<td>Closed container</td>
<td>13(36.1%)</td>
<td>23(63.9%)</td>
<td></td>
</tr>
<tr>
<td>Method of drawing water</td>
<td></td>
<td></td>
<td>$x^2 = 8.034$</td>
</tr>
<tr>
<td>Dipping scooper</td>
<td>35(22.6%)</td>
<td>120(77.4%)</td>
<td>df = 1 $p = .005$</td>
</tr>
<tr>
<td>Pouring</td>
<td>3(5.5%)</td>
<td>52(94.5%)</td>
<td></td>
</tr>
<tr>
<td>Scooper cleaning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 3 times per week or when dirty</td>
<td>27(39.1%)</td>
<td>42(60.9%)</td>
<td>df = 1 $p &lt; .001$</td>
</tr>
<tr>
<td>&gt; 3 times per week</td>
<td>8(9.3%)</td>
<td>78(90.7%)</td>
<td></td>
</tr>
<tr>
<td>Water container cleaning before refilling</td>
<td></td>
<td></td>
<td>$p = .343$</td>
</tr>
<tr>
<td>Yes</td>
<td>1(3.7%)</td>
<td>26(96.3%)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>37(20.2%)</td>
<td>146(79.8%)</td>
<td></td>
</tr>
</tbody>
</table>

¹ Ventilated improved pit (VIP) latrine, flush or pour flush latrine and pit latrine with a slab
² Pit latrine without a slab and bucket latrine
³ Protected well, piped water, protected spring, borehole and rain water
⁴ Unprotected well, unprotected spring and surface water, e.g. dam, lake, pond, river or stream
4.5 **Discussion**

The study results showed that 18% of under fives in the sampled EAs in Migori County had diarrhoea two weeks before the study. This was slightly higher than the 15% reported by the 2011 Multiple Indicator Cluster Survey (MICS) but lower than the 27.9% reported by KDHS in 2014, which was released in December 2015 after data collection in this study (GoK, 2013b; GoK, 2015). The difference could be caused by the difference in the time of study, the difference in EAs sampled, increase in population of under fives and/or increase in diarrhoea morbidity in Migori County.

4.5.1 **Socioeconomic and demographic factors that predispose under fives to diarrhoea in Migori County**

The results showed that all the socioeconomic and demographic characteristics except number of rooms in the household were significantly associated with diarrhoea. In this study, overcrowding was not found to be significantly associated with diarrhoea among under fives. This was contrary to what was found in the study by Chisti et al. (2011) in Bangladesh, Gurpreet et al. (2011) in Malaysia and Karambu et al. (2013) in Igembe District Hospital (Kenya). Nonetheless, it is important to educate the people on the association between overcrowding and diarrhoea among under fives since overcrowding promotes transmission of agents of diarrhoeal disease as noted by Imdad et al. (2011)’s systemic review of WHO regional databases and Cairncross (2010)’s systemic reviews of various studies.
4.5.2 Behavioural factors that predispose under fives to diarrhoea in Migori County

Behavioural characteristics of mothers (or caregivers) of under fives associated with diarrhoea among under fives were also examined in this study. According to the results, lack of hand washing with soap was associated with the occurrence of diarrhoea among under fives. This finding conforms to that of Munos et al. (2010)’s systemic review who reported that not washing hands is a risk factor for diarrhoea. Hand washing is important because it prevents transmission of infectious agents of diarrhoea after being in contact with excreta such as after changing babies’ nappies as noted by Bhattacharya et al. (2011)’s study in a rural community of Madhya Pradesh. Some mothers (or caregivers) did not wash their hands with soap before preparing food, and after visiting the toilet or wiping the baby. In the study community, there is a need for this preventive behaviour to be encouraged by providing health education to help people understand the link between hand washing and diarrhoea prevention and thus contribute towards reducing occurrence of diarrhoeal illness in Migori County.

The results showed that children who were fed on unheated leftovers were more likely to experience diarrhoea compared to those who were fed on heated leftovers. This finding concurs with that of Chisti et al. (2011)’s study in Bangladesh which reported that feeding under fives on cold leftovers was a risk for contacting diarrhoeal diseases. Leftover food can act as a breeding ground for bacteria, since the food has been in contact with saliva and skin as noted by Kariptas et al. (2011)’s study in Turkey. If left uncovered, or if inadequately covered, the food can also be contaminated. When food is heated, the germs are killed, preventing diarrhoea disease, hence there is need
for mothers (or caregivers) of under fives to practice heating stored food before feeding under fives, especially when food is improperly stored to reduce the risk of diarrhoea among under fives as noted by Shamshul, et al. (2012)’s study in Kathmandu, Nepal. In this regard, it is important that mothers (or caregivers) be educated on the importance of properly heating leftover foods before feeding their children.

Mothers (or caregivers) who used appropriate storage methods for leftover food were less likely to report diarrhoea among their children. These results are in conformity with those of Yilgwan and Okolo (2012)’s study in Nigeria, which reported that exposure to causative agents of diarrhoea is frequently related to unhygienic practice of not covering stored food. Nakawesi et al. (2010)’s study in Uganda also reported that poor storage of food leads to contamination of food by flies. The implication of this is that there is a need for interventions by Migori County that promote appropriate practices in food storage method such as creation of awareness on importance of storage of food trays or containers with covers to prevent contamination of food by flies and support reduction in diarrhoea diseases.

Breastfeeding practice, measles vaccination and vitamin A supplementation, and feeding method were not associated with the occurrence of diarrhoea among under fives. The findings are in contrast to those of Laishram et al. (2012)’s study in India, which reported that breastfeeding, Vitamin A supplementation and measles vaccination are associated with diarrhoea among under fives in developing countries. This could have been because most of the children in this study were vaccinated and a considerable number were exclusively breastfed.
According to Karambu et al. (2013)’s study in Igembe District (Kenya), measles vaccination and vitamin A supplementation has been documented to reduce cases of diarrhoea since vaccination reduces diarrhoea by preventing infections (measles) that cause diarrhoea as a side effect and boosts immunity of under fives. Moreover, exclusively breastfed infants tend to have lower diarrhoeal episodes compared to non-breastfed infants as noted by Niefert and Bunik (2013)’s study in the US. It is important that children under six months should be exclusively breastfed since this delays the contact of a child with contaminated weaning foods. Indeed, Jadhav (2011)’s study in Bangalore, noted that breastfeeding has a direct role in the prevention of diarrhoea. In addition, efforts to sustain the high vaccination coverage achieved in Migori County should be instituted. Food contamination can also occur through feeding method if there is use of dirty utensils and unwashed fingers, which can lead to diarrhoea morbidity as noted by Gary et al. (2013)’s article on acute diarrhoea in children.

4.5.3 Environmental factors that predispose under fives to diarrhoea in Migori County

A number of other environmental characteristics of mothers (or caregivers) of under fives were found to be associated with diarrhoea in this study. For example, diarrhoea was high among under fives living in households with improper refuse disposal than those in households disposing wastes properly. This concurs with the report by Mukherjee et al. (2010)’s study in Kolkata. Improper refuse disposal such as in open fields attracts flies, which increase the exposure of food to flies as noted by Ganesh and Kar (2011)’s study in India. Hence, there is a need for developing solid waste
management systems and to improve refuse disposal in households and reduce the risk of contracting diarrhoea.

Households without latrines are more likely to report the diarrhoea occurrence among under fives compared to those that have latrines. A similar finding was reported by Nakawesi et al. (2010)’s study in Uganda on acute diarrhoea among children. Lack of latrines in 32.4% of the households increases dangers posed by open defecation and latrine sharing. This is a public health concern since disease causing agents found in excreta are exposed to flies and rain water and create risks of diarrhoeal infection from contaminated community grounds. In this study, latrine availability was found to be significantly associated with diarrhoea among under fives. Latrine availability within the compounds increases the possibility of latrine utilization and facilitates safe human excreta disposal. Consequently, this is one approach that can be used in Migori County to decrease the contact between hosts and diarrhoeal causative organisms.

Diarrhoea occurrence is also more likely in households with unimproved latrines compared with households with improved latrines. This finding was expected given that unimproved latrines tend to have poor hygiene, operational deficiencies and repugnant smells, which attract flies, as noted by Cairncross (2010)’s systemic reviews of various studies. Unimproved latrines and their association with diarrhoea were documented by Schilling (2010) in rural western Kenya. Consequently, it is important for households in Migori County to be encouraged and enabled to upgrade their latrines to improved types if substantial changes in the reduction of diarrhoeal disease are expected. Such intervention can be similar to the community lead total sanitation (CLTS) approach by Plan International in Mathare 10, Nairobi where the
intervention included creating awareness on sanitation practices and galvanizing the citizens to drive the steps themselves towards ending open defecation, constructing latrines, demanding sanitation facilities in residential areas from landlords and identifying subsequent health impact as noted by Quayle (2012)’s study in Mathare, Kenya.

Similar to the results reported by Yilgwan and Okolo (2012)’s study in Nigeria, this study found that households with shared latrines had a higher occurrence of diarrhoea among under fives compared to those that had did not share their latrine. This is not surprising because shared latrines are more likely to be in unkempt and unsanitary conditions. Such unsanitary conditions in latrines are favourable environment for vectors (flies and cockroaches) that transmit pathogens (protozoa, bacteria and viruses) of diarrhoea and other diseases. Moreover, there is a possibility that such pathogens may be transmitted from an infected person to healthy others (Jadhav, 2011). The study community could possibly benefit if concerted efforts are made to increase the number of latrines as noted by WSP (2004)’s report on Kenya.

The study also established that diarrhoea occurrence was more common among under fives of mothers (or caregivers) who used unimproved source of drinking water than those who relied on an improved source of drinking water. This significant association between water source for drinking and occurrence of diarrhoea among under fives was also mentioned in Simiyu (2010)’s study in Mandera District, Kenya. This could be attributed to the fact that improved water sources (such as piped water) are likely to be less contaminated compared to unimproved water sources (such as rivers). Besides, Simiyu (2010)’s study in Mandera District, Kenya, reported that the
probability of a water source being contaminated depends on the protection of the source. These results emphasize on the importance of protecting water sources in the study community. Water storage was found to be a risk factor of diarrhoea among under fives. These results are consistent with a report by UNICEF (2014), which mentioned that poor water storage was a key determinant of diarrhoea among under fives due to the higher likelihood of contamination from dust, flies and other contaminants in water stored in open or uncovered containers.

Diarrhoea among under-fives is more likely to be reported from households that do not treat their drinking water compared to those that treat their drinking water. This finding is in line with that of Walker and Black (2010)’s systemic review of various studies which pointed out that water treatment and diarrhoea are related. Indeed, treatment of drinking water, such as boiling or addition of chlorine or water guard or PUR kills germs that cause diarrhoea. Treatment of drinking water should be promoted through health education and awareness. In addition, improved access to water treatment chemicals like PUR and chlorine contribute to the prevention of diarrhoea morbidity among under fives in the county.

It was also found in this study that the method of drawing water was significantly associated with diarrhoea, implying that diarrhoea occurrence is less likely among under fives of households that draw water by pouring than dipping with a scooper. The finding is in conformity to that of O’Connor (2012)’s study in rural western Kenya, which found that poor handling and drawing of water were risk factors for diarrhoea in households. Dipping a scooper to draw drinking water increases the danger of contamination of the water by microbes, when the water gets into contact
with contaminated hands. Besides, not cleaning the scooper can also create contamination of water by dirty scoopers thus cause diarrhoea and this is why scooper cleaning was significantly associated with diarrhoea. In this regard, it is important for good water handling methods to be practiced. This can be promoted through community sensitization and health campaigns to avoid water contamination and transmission of diarrhoeal agents.

Improper waste water disposal, flies around or inside latrine, latrine cleaning, method of treating water, and distance to water source have been revealed by past studies to be related to diarrhoea morbidity among under fives in past reports by MoH (2013b) in Migori County and past studies by Imdad et al. (2011)’s systemic review of WHO regional databases, Jill et al. (2010)’s study in low and middle income countries. However, such associations were not found in this study. Although in this study, these factors were not significantly associated with diarrhoea among under fives, they can play a vital role in transmission of infectious agents of diarrhoea given that diarrhoea determinants are interdependent and interrelated as noted by Bhattacharya et al. (2011)’s study in rural community of Madhya Pradesh. Hence, prevention measures aimed at addressing these determinants are also right and cost-effective ways of significantly reducing diarrhoea among under fives.

Programmes for safe water provision are also necessary to increase access to adequate and improved water sources. Moreover, improving access to water can enable the households to practice hand washing, clean latrines regularly, wash fruits or food thoroughly, wash utensils and other food preparation materials or surfaces which block contamination paths directly and indirectly such as flies and fingers.
CHAPTER 5 – CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

Conclusion and recommendations are presented in this chapter. The conclusion was drawn from the findings and it states whether the study achieved the specific objectives. Recommendations are based on study findings and conclusions. The last section concerns further researches where the need for further research was detailed.

5.2 Summary of findings

The study results showed that 18% of under fives had diarrhoea two weeks before the study in Migori County. Among the three categories of determinants of diarrhoea among under fives in Migori County, environmental factors had more significant associations. In this regards, the null hypothesis that diarrhoea among under fives has no association with behavioural, environmental, socioeconomic and demographic factors was rejected. Among socioeconomic and demographic factors, only the number of rooms in the household was significantly associated with diarrhoea among under fives. Hand washing with soap was associated with the occurrence of diarrhoea among under fives. The results showed that children who were fed on unheated leftovers were more likely to experience diarrhoea compared to those who were fed on heated leftovers. Mothers (or caregivers) who used appropriate storage methods for leftover food were less likely to report diarrhoea among their children.

Diarrhoea was high among under fives living in households with improper refuse disposal than those in households disposing wastes properly. Households without latrines are more likely to report diarrhoea occurrence compared to those that have
latrines. Latrine availability within the compounds increases the possibility of latrine utilization and facilitates safe human excreta disposal. Diarrhoea occurrence is more likely in households with unimproved latrines compared with households with improved latrines. This study found that households with shared latrines had a higher occurrence of diarrhoea compared to those that had did not share their latrine.

The study also found that diarrhoea occurrence was more common among under fives of mothers (or caregivers) of under fives who used unimproved source of drinking water than an improved source of drinking water. This study showed a higher occurrence of diarrhoea among households that stored drinking water in closed containers compared to those that stored their drinking water in open or uncovered containers. Diarrhoea among under-fives is more likely to be reported from households that do not treat their drinking water compared to those that treat their drinking water. The method of drawing water was significantly associated with diarrhoea, implying that diarrhoea occurrence is less likely among under fives of households that draw water by pouring than dipping with a scooper.

5.3 Conclusion

As long as the determinants of diarrhoea among under fives identified in this study are not successfully addressed, then the under fives are continually at risk of exposure to infectious agents of diarrhoea, and they can contract the disease – and many are at risk of dying unnecessarily. Based on the findings and discussion, the study concludes the following:
The occurrence of diarrhoea among under fives in Migori County in 2015 was higher than the figures reported in 2009 by MICS of 2011 (GoK, 2013b). In addition, the study was able to achieve its broad objective of identifying the behavioural, environmental, socioeconomic and demographic determinants of diarrhoeal morbidity among under fives in Migori County, Kenya.

The null hypothesis that diarrhoea among under fives has no association with behavioural, environmental, socioeconomic and demographic factors was rejected. In terms of socioeconomic and demographic factors that are predisposing children under 5 years to diarrhoea in Migori County, it was evident in the findings that the number of rooms in a household determines whether a child is likely or not to experience diarrhoea.

With regards to the behavioural factors that are predisposing children under 5 years to diarrhoea in Migori County, it was established in this study that hand washing with soap, food storage method, and heating stored food before feeding under fives were the determinants of diarrhoea occurrence.

Concerning the environmental factors that are predisposing children under 5 years to diarrhoea in Migori County, the results showed that the method of refuse disposal, latrine availability, latrine type, latrine sharing, source of drinking water, water storage, method of drawing water, scooper cleaning and drinking water treatment where the environmental factors that determine diarrhoea occurrence. Among the three categories of determinants of diarrhoea among under fives in Migori County, environmental factors had more significant associations.
5.4 Recommendations

Overall, the study results have vital practical and policy recommendations for combating diarrhoea among under fives in Migori County. Hygiene and diarrhoea preventive practices, such as hand washing with soap and treating water for drinking should be encouraged among all household members. Education. Public Health officers through community sensitization, health campaigns, community mobilization and health education can implement this. Such interventions are important towards increasing their knowledge on the need for hand washing with soap; proper food preparation practices; how to store drinking water safely; and handle water safely, including proper method of drawing water, and cleaning scooper and water container regularly. This is because merely having an adequate water supply is not the solution to diarrhoea among under fives.

Latrine ownership should be encouraged in every homestead in the study area. This can be implemented by the household members to increase latrine availability and reduce latrine sharing practices. Concerned health authorities can also develop intervention programmes that encourage latrine construction in homesteads that have no latrines. Such intervention can be similar to the community lead total sanitation (CLTS) approach by Plan International in Mathare 10, Nairobi (Quayle, 2012) and the Total Sanitation Campaign on latrine coverage and use by the Government of India (Barnard et al., 2014) which have been found to be successful. Furthermore, intervention programmes on refuse disposal should also be implemented to create awareness and encourage proper refuse and waste water disposal.
Provision of safe and reliable water is key to actualizing the recommended hygiene practices and the prevention of diarrhoea. Migori County government can implement this by scaling up the provision of adequate safe water, such as constructing protected wells, improvement of water points, and protection of water sources like springs from pollution. Other prevention measures that also need to be maintained or introduced in Migori County based on recommendations of past studies (Yakoob et al., 2011) in other areas or countries include measles vaccination, rotavirus vaccination (WHO, 2011), exclusive breastfeeding, nutrition, micronutrient supplementation and creation of employment to reduce poverty. Although these factors were not significantly associated with diarrhoea, they can play a vital role given that diarrhoea determinants are interdependent and interrelated as noted by Bhattacharya (2011).

To policy makers, there is a need to give high priority to the determinants found in this empirical study to be associated with diarrhoea among under fives when developing the health interventions to reduce debilitating health of under fives. In particular, the focus should be on environmental factors since it had more significant associations with diarrhoea among under fives in Migori County compared to the other two categories of determinants.

### 5.5 Future Research

Future studies need to: (a) conduct investigations on barriers to diarrhoea management; (b) increase the number of items used to estimate the income status of households, which was a limitation in this study; and (c) develop ways of verifying the self-reported information such as interviewing different family members simultaneously and compare their responses.
REFERENCES


APPENDICES

Appendix I: Questionnaire (English version)

Questionnaire

Kenyatta University

School of public health

Department of Community Health

Questionnaire for Assessment of behavioural, environmental, socioeconomic and demographic determinants of diarrhoea morbidity amongst children under 5 years in Migori County, Kenya.

<table>
<thead>
<tr>
<th>SECTION 1: HOUSEHOLD IDENTIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO.</td>
</tr>
<tr>
<td>01</td>
</tr>
<tr>
<td>02</td>
</tr>
<tr>
<td>03</td>
</tr>
<tr>
<td>04</td>
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<td>05</td>
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<tr>
<td>06</td>
</tr>
<tr>
<td>07</td>
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<tr>
<td>08</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>SECTION 2: HOUSEHOLD CHARACTERISTICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q01 HOUSEHOLD RESIDENCE</td>
</tr>
<tr>
<td>1 Rural</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Q05 DOES HOUSEHOLD OWN:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Yes</td>
</tr>
<tr>
<td>0. No</td>
</tr>
<tr>
<td>1. Radio</td>
</tr>
<tr>
<td>2. TV</td>
</tr>
<tr>
<td>3. Refrigerator</td>
</tr>
<tr>
<td>4. Car</td>
</tr>
<tr>
<td>5. Mobile Phone</td>
</tr>
<tr>
<td>6. Motorbike</td>
</tr>
<tr>
<td>7. Livestock</td>
</tr>
<tr>
<td>8. Bicycle</td>
</tr>
<tr>
<td>9. Sewing machine</td>
</tr>
<tr>
<td>1. Wood or concrete or cement or tiles</td>
</tr>
<tr>
<td>0. Earth, dung or mud</td>
</tr>
<tr>
<td>RECORD OBSERVATION</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Q06 FLOOR MATERIAL OF DWELLING STRUCTURE</th>
<th>Q07 WALL MATERIAL OF DWELLING STRUCTURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Wood or concrete or cement or tiles</td>
<td></td>
</tr>
<tr>
<td>0. Earth, dung or mud</td>
<td></td>
</tr>
<tr>
<td>RECORD OBSERVATION</td>
<td></td>
</tr>
<tr>
<td>1. Brick/Block, or mud, stone, mud/cement, mud/wood, galvanized iron sheets</td>
<td></td>
</tr>
<tr>
<td>0. Wood only, reed/grass, or no wall</td>
<td></td>
</tr>
<tr>
<td>RECORD OBSERVATION</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Q08 ROOF MATERIAL OF DWELLING STRUCTURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Galvanized iron sheet, tiles or concrete or asbestos sheets</td>
</tr>
<tr>
<td>0. Thatch, mud/dung, or makuti</td>
</tr>
<tr>
<td>RECORD OBSERVATION</td>
</tr>
</tbody>
</table>
**Q09**
LIGHTING THAT IS MOST USED IN HOUSEHOLD

1. Gas, electricity, generator or solar panel
0. Wood, candle or kerosene

---

**SECTION 3: MOTHER OR CAREGIVER CHARACTERISTICS**

<table>
<thead>
<tr>
<th>Q10 GENDER OF MOTHER OR CAREGIVER</th>
<th>Q11 AGE OF MOTHER OR CAREGIVER In years</th>
<th>Q12 OCCUPATION OF MOTHER OR CAREGIVER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Male</td>
<td></td>
<td>1. Salaried employment</td>
</tr>
<tr>
<td>2. Female</td>
<td></td>
<td>2. Business</td>
</tr>
</tbody>
</table>
<pre><code>                                                             | 3. Farming/Fishing                    |
                                                             | 4. Housewife                          |
                                                             | 5. Others (please specify)            |
</code></pre>

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Q13 MARITAL STATUS OF MOTHER OR CAREGIVER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Never married (single)</td>
</tr>
<tr>
<td>2. Married/living together</td>
</tr>
<tr>
<td>3. Ever married/not living together with</td>
</tr>
<tr>
<td>spouse e.g. separated/divorced/widowed</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>1</th>
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</thead>
</table>

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**Q14 HIGHEST SCHOOL MOTHER OR CAREGIVER COMPLETED**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
</table>

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**SECTION 4: UNDER FIVE CHARACTERISTICS**

<table>
<thead>
<tr>
<th>NO.</th>
<th>NAMES OF ALL UNDER FIVES IN THE HOUSEHOLD</th>
</tr>
</thead>
<tbody>
<tr>
<td>01.</td>
<td></td>
</tr>
<tr>
<td>02.</td>
<td></td>
</tr>
<tr>
<td>03.</td>
<td></td>
</tr>
<tr>
<td>04.</td>
<td></td>
</tr>
<tr>
<td>05.</td>
<td></td>
</tr>
</tbody>
</table>

***If there are two or more under fives, chose one of the under fives using simple random sampling***

***Proceed to ask questions about the (name)***
**SECTION 5: DIARRHOEA MORBIDITY AMONG UNDER FIVE**

<table>
<thead>
<tr>
<th>Q17</th>
<th>Q18</th>
<th>Q19</th>
<th>Q20</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAS (NAME) HAD DIARRHOEA IN PAST 14 DAYS?</td>
<td>FOR HOW LONG HAS (NAME) BEEN HAVING THE DIARRHOEA</td>
<td>THE DIARRHOEA WAS GENERALLY</td>
<td>DURING THE DIARRHOEA EPISODE, WAS TREATMENT SOUGHT?</td>
</tr>
<tr>
<td>Diarrhoea is bloody stool, or more than three watery or loose stool per day</td>
<td>In days</td>
<td>1. Watery 2. Mucus and blood</td>
<td>1. Yes 2. No → Q23</td>
</tr>
<tr>
<td>1. Yes 2. No → Q23</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Q21</th>
<th>Q22</th>
</tr>
</thead>
<tbody>
<tr>
<td>WHERE WAS TREATMENT SOUGHT?</td>
<td>WHAT TREATMENT DID (NAME) RECEIVE?</td>
</tr>
<tr>
<td>1. Health facility facility/clinic/pharmacy 2. Pharmacy 3. Clinic 4. At home 5. Others (specify)</td>
<td>1. Oral rehydration therapy (ORT) e.g. ORS, Increased fluids 2. Other treatment e.g. Zinc supplements, antibiotic drugs, anti-motility drugs, intravenous solution 3. Home remedy/Others (specify)</td>
</tr>
<tr>
<td></td>
<td>1 2 3 4 5</td>
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<table>
<thead>
<tr>
<th>Q23</th>
<th>Q24</th>
<th>Q25</th>
<th>Q26a</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAS (NAME) EVER BREAST FED?</td>
<td>WAS (NAME) BREASTFED LAST NIGHT AND YESTERDAY?</td>
<td>WAS (NAME) GIVEN ANY SOLID/LIQUID FOOD YESTERDAY OTHER THAN BREAST MILK?</td>
<td>HOW DID/WAS (NAME) FED?</td>
</tr>
<tr>
<td>1 2 3</td>
<td>1 2 3</td>
<td>1 2 3</td>
<td>1 2 3 4</td>
</tr>
<tr>
<td>Q26b</td>
<td>Q27</td>
<td>Q28</td>
<td>Q29</td>
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<td>-----</td>
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</tr>
<tr>
<td>IS (NAME) BEING EXCLUSIVELY BREASTFED?</td>
<td>WAS (NAME) GIVE VITAMIN A CAPSULE WITHIN THE LAST 6 MONTHS?</td>
<td>FROM WHERE WAS IT LAST OBTAINED?</td>
<td>HAS (NAME) RECEIVED MEASLES VACCINE?</td>
</tr>
<tr>
<td>Exclusive breast feeding under fives (≤6months)</td>
<td>1. Yes 2. No 3. DK</td>
<td>1. Immunization campaign day 2. Health facility 3. Other (specify)</td>
<td>1. Yes 2. No 3. DK</td>
</tr>
<tr>
<td>1. No 2. Yes</td>
<td>Show picture of capsule/syrup/ampules</td>
<td></td>
<td>Short in right upper arm at 9 months or older</td>
</tr>
<tr>
<td></td>
<td>1 2 3</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Q30</th>
<th>Q31</th>
<th>Q32</th>
</tr>
</thead>
<tbody>
<tr>
<td>YOU REGULARLY WASH HANDS WITH SOAP:</td>
<td>HOW DO YOU STORE FOOD FOR (NAME)?</td>
<td>DO YOU OFTEN HEAT STORED FOOD BEFORE GIVING THE (NAME)?</td>
</tr>
<tr>
<td>1 2 3 4</td>
<td>1 2 3</td>
<td>1 2</td>
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<table>
<thead>
<tr>
<th>Q33</th>
<th>Q34</th>
<th>Q35</th>
<th>Q36</th>
</tr>
</thead>
<tbody>
<tr>
<td>WHERE IS REFUSE DISPOSED?</td>
<td>WHERE IS WASTE WATER DISPOSED?</td>
<td>IS THERE FUNCTIONAL LATRINE WITHIN COMPUND?</td>
<td>WHAT KIND OF FACILITY?</td>
</tr>
<tr>
<td>1 2 3 4</td>
<td>1 2 3 4</td>
<td>1 2</td>
<td>1 2 3 4 5 6</td>
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<table>
<thead>
<tr>
<th>SECTION 7: ENVIRONMENTAL FACTORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q37</td>
</tr>
<tr>
<td>WHERE IS REFUSE DISPOSED?</td>
</tr>
<tr>
<td>1 2 3 4 5 6</td>
</tr>
<tr>
<td>Q37</td>
</tr>
<tr>
<td>-----</td>
</tr>
<tr>
<td>IS IT USUALLY SHARED WITH GENERAL PUBLIC OR OTHER HOUSEHOLDS?</td>
</tr>
<tr>
<td>2. No</td>
</tr>
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<table>
<thead>
<tr>
<th>Q41</th>
<th>Q42</th>
<th>Q43</th>
<th>Q44</th>
</tr>
</thead>
<tbody>
<tr>
<td>WHAT IS THE DISTANCE TO WATER SOURCE?</td>
<td>IS WATER STORED IN COVERED CONTAINER?</td>
<td>HOW IS WATER DRAWN FROM STORAGE CONTAINER?</td>
<td>HOW OFTEN IS THE SCOOPER CLEANED IN A WEEK?</td>
</tr>
<tr>
<td>In meters</td>
<td>1. Yes</td>
<td>1. Dipping scooper</td>
<td>1. Daily</td>
</tr>
<tr>
<td></td>
<td>2. No</td>
<td>2. Pouring out</td>
<td>2. 4 to 6 times</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3. 1 to 3 times</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4. Not cleaned until when dirty</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Q45</th>
<th>Q46</th>
<th>Q47</th>
</tr>
</thead>
<tbody>
<tr>
<td>IS WATER TREATED FOR DRINKING?</td>
<td>HOW IS WATER TREATED?</td>
<td>DO YOU NORMALLY EMPTY/CLEAN WATER CONTAINER BEFORE ADDING FRESH WATER?</td>
</tr>
<tr>
<td>1. Yes</td>
<td>1. Boiling</td>
<td>1. Yes</td>
</tr>
<tr>
<td>2. No</td>
<td>2. Add chlorine /water guard /PUR</td>
<td>2. No</td>
</tr>
<tr>
<td></td>
<td>3. Allow to settle/decantation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Others (specify)</td>
<td></td>
</tr>
</tbody>
</table>

Source: Adapted and modified from MICS of 2011, KDHS of 2014 and literature review
Appendix II: Questionnaire (Kiswahili version)

Dodoso
Chuo Kikuu cha Kenyatta

Shule afya ya umma

Idara ya afya ya jamii

Dodoso kwa ajili ya tathmini ya mambo ya kitabia, kimazingira na kiuchumijamii inayohusishwa na mchipuko wa maradhi ya kuhara miongoni mwa watoto chini ya miaka mitano katika kaunti ya Migori

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</thead>
<tbody>
<tr>
<td>01</td>
<td>Wilaya</td>
</tr>
<tr>
<td>02</td>
<td>Kata/Mji</td>
</tr>
<tr>
<td>03</td>
<td>Kata ndogo/wodi</td>
</tr>
<tr>
<td>04</td>
<td>Nambari ya klasta ya NASSSEP V</td>
</tr>
<tr>
<td>05</td>
<td>Kijiji</td>
</tr>
<tr>
<td>06</td>
<td>Nambari ya kaya</td>
</tr>
<tr>
<td>07</td>
<td>Nambari ya sampuli</td>
</tr>
<tr>
<td>08</td>
<td>Tarehe ya utafiti</td>
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<tr>
<th>SEHEMU YA 2: TAARIFA ZA KAYA</th>
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<tbody>
<tr>
<td>Mahali Kaya Ina Poishi</td>
</tr>
<tr>
<td>1 Mashinani</td>
</tr>
<tr>
<td>2 Mjini</td>
</tr>
</tbody>
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<th>Swali la 03</th>
<th>Swali la 04</th>
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<tr>
<td>MAHALI KAYA</td>
<td>IDADI YA VJIUMBA KATIKA KAYA (UKIWACHA BAFU NA JIKONI)</td>
<td>IDADI YA WANAKAYA</td>
<td>IDADI YA WATOTO CHINI YA MIAKA MITANO WALIOHAI KATIKA KAYA</td>
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<tr>
<td>INAPoisHi</td>
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<tr>
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<td>2 Mjini</td>
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<th>Swali la 07</th>
<th>Swali la 08</th>
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<tbody>
<tr>
<td>JE KAYA INA:</td>
<td>SAKAFU YA NYUMBA IMETENGEZWA NA</td>
<td>UKUTA YA NYUMBA IMETENGEZWA NA</td>
<td>PAA YA NYUMBA IMETENGEZWA NA</td>
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<tr>
<td>1. Ndio</td>
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</tr>
<tr>
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<td>1</td>
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<td>2. Televishe</td>
<td>0. Udongo, samadi au matope</td>
<td>0. Vjiti au hakuna ukuta</td>
<td>0. Nyasi, matope au makuti</td>
</tr>
<tr>
<td>3. Jokofu</td>
<td>ANGALIA NA UANDIKE</td>
<td>ANGALIA NA UANDIKE</td>
<td>ANGALIA NA UANDIKE</td>
</tr>
<tr>
<td>4. Gari</td>
<td></td>
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</tr>
<tr>
<td>5. Simu ya runumu</td>
<td></td>
<td></td>
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<tr>
<td>6. Pikiuki</td>
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<td>7. Mifuugo</td>
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<td>8. Baiskeli</td>
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<tr>
<td>9. Cherehani</td>
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Swali la 09
TAA AMBAYO
HUTUMIWA ZAIDI
KATIKA KAYA

1. Gesi, umeme, jenereta
   au nishati ya juu
0. Kuni, mshumaa au
   mafuta ya taq

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**SEHEMU YA 3: TAARIFA ZA MAMA (AU MLEZI)**

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<th>Swali la 13</th>
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<tbody>
<tr>
<td>JINSIA YA (MLEZI)</td>
<td>UMRI WA (MAMA AU MLEZI)</td>
<td>KAZI (MAMA AU MLEZI) HUFANYA</td>
<td>HALI YA NDOA YA (MAMA AU MLEZI)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Ukulima/uvuvi</td>
<td>3. Wametengana</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Mama wa nyumbani</td>
<td>4. Wameachana</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Nyingine (tafadhalaini)</td>
<td>5. Mjane/mgane</td>
</tr>
<tr>
<td></td>
<td></td>
<td>bainisha</td>
<td>Kimada</td>
</tr>
</tbody>
</table>

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</tbody>
</table>

**Swali la 14**

KIWANGO KIPI CHA JUU CHA SHULE (MAMA AU MLEZI) ALIFIKA

1. Elimu isiyo rasmi
2. Shule ya msingi
3. Chuo cha ufundi
4. Shule ya upili au
   kidato cha 13 ama 14
5. Chuo cha kadiri au
   chuo kikuu

<table>
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**SEHEMU YA 4: SIFA ZA WATOTO CHINI YA MIAKA MITANO**

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<tr>
<th>NO.</th>
<th>MAJINA YA WATOTO CHINI YA MIAKA MITANO KATIKA KAYA</th>
</tr>
</thead>
<tbody>
<tr>
<td>01.</td>
<td></td>
</tr>
<tr>
<td>02.</td>
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<tr>
<td>03.</td>
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</tr>
<tr>
<td>04.</td>
<td></td>
</tr>
<tr>
<td>05.</td>
<td></td>
</tr>
</tbody>
</table>

***Kama idadi ya watoto chini ya miaka mitano ni wawili au zaidi, chagua mmoja wao kwa kutumia simple random sampling
***Endelea kuuliza maswali kuhusu (jina)
**Swali la 15**
**JINSIA YA (JINA)**
1. Kiume
2. Kike

<table>
<thead>
<tr>
<th>JINA</th>
<th>1</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Kiume</td>
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</tr>
<tr>
<td>Kike</td>
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</tbody>
</table>

**Swali la 16**
**UMRI WA (JINA)**
Katika miezi

<table>
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</tbody>
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**SEHEMU YA 5: MARADHI YA KUHARA MIONGONI MWATAWOTO CHINI YA MIAKA MITANO**

<table>
<thead>
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<th>Swali la 18</th>
<th>Swali la 19</th>
<th>Swali la 20</th>
</tr>
</thead>
<tbody>
<tr>
<td>JE, (JINA) ALIHARA KATIKA SIKU KUMA NNE ZILIZOPITA?</td>
<td>KWA MUDA GANI SASA (JINA) AMEKUWA AKIHARISHA</td>
<td>KIJUMLA, KUHARA KUMEKUWA KWA KINYESI CHA AINA GANI?</td>
<td>WAKATI ALIPOKUWA AKIHARA, JE MATIBABU YALITAFUTWA?</td>
</tr>
<tr>
<td>Kuhara ni kinyesi chenye damu, au kinyesi majimaji nacho hutolewa mara tatu na zaidi kwa siku moja</td>
<td>Katika siku</td>
<td>1. Yowevu 2. Kijilamasi na damu ndani</td>
<td>1. Ndio 2. La <strong>SWALI LA 23</strong></td>
</tr>
<tr>
<td>1. Ndio</td>
<td>2. La <strong>SWALI LA 23</strong></td>
<td>1</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Swali la 21</th>
<th>Swali la 22</th>
</tr>
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<tbody>
<tr>
<td>MATIBABU YALIPATIKANA WAPI?</td>
<td>NI MATIBABU GANI (JINA) ALIPEWA</td>
</tr>
<tr>
<td>1. Kituo cha afya</td>
<td>1. ORS</td>
</tr>
<tr>
<td>2. Duka la dawa</td>
<td>2. Zinki</td>
</tr>
<tr>
<td>4. Nyumbani</td>
<td>4. Dawa ya maji au antibiotiki</td>
</tr>
<tr>
<td>5. Kwingleko (tafadhali bainisha)</td>
<td>5. Zinginezo (tafadhali bainisha)</td>
</tr>
<tr>
<td>6. Hajui</td>
<td>6</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Swali la 23</th>
<th>Swali la 24</th>
</tr>
</thead>
<tbody>
<tr>
<td>JE, (JINA) AMEWAHI KUNYONYA?</td>
<td>JE, (JINA) BADO YUANYONYESHWA HADI SASA?</td>
</tr>
<tr>
<td>1. Ndio</td>
<td>1. Ndio</td>
</tr>
<tr>
<td>2. La <strong>SWALI LA 25</strong></td>
<td>2. La</td>
</tr>
<tr>
<td>3. Hajui</td>
<td>3. Hajui</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Swali la 25</th>
<th>Swali la 26</th>
</tr>
</thead>
<tbody>
<tr>
<td>JE, (JINA) ALIPEWA CHAKULA CHOCHOTE KIGUMU AU KIOWEVU JANA?</td>
<td>JE, (JINA) HULISHWA KUTUMIA NINI?</td>
</tr>
<tr>
<td>Kwa mfano, maji, chakula kigumu, maziwa, supu, uji, fomyula ya watoto wachanga, juisi au yogati</td>
<td>1. Chupa</td>
</tr>
<tr>
<td>1. Ndio</td>
<td>2. Vidole</td>
</tr>
<tr>
<td>2. La <strong>SWALI LA 27</strong></td>
<td>3. Kijiko na kikombe</td>
</tr>
<tr>
<td>3. Hajui</td>
<td>4. Kikombe</td>
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<table>
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**SEHEMU YA 6: DESTURI ZA KUHUDUMIA WATOTO**

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</thead>
<tbody>
<tr>
<td>JE, (JINA) AMEWAHI KUNYONYA?</td>
<td>JE, (JINA) BADO YUANYONYESHWA HADI SASA?</td>
</tr>
<tr>
<td>1. Ndio</td>
<td>1. Ndio</td>
</tr>
<tr>
<td>2. La <strong>SWALI LA 25</strong></td>
<td>2. La</td>
</tr>
<tr>
<td>3. Hajui</td>
<td>3. Hajui</td>
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<table>
<thead>
<tr>
<th>Swali la 25</th>
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</tr>
</thead>
<tbody>
<tr>
<td>JE, (JINA) ALIPEWA CHAKULA CHOCHOTE KIGUMU AU KIOWEVU JANA?</td>
<td>JE, (JINA) HULISHWA KUTUMIA NINI?</td>
</tr>
<tr>
<td>Kwa mfano, maji, chakula kigumu, maziwa, supu, uji, fomyula ya watoto wachanga, juisi au yogati</td>
<td>1. Chupa</td>
</tr>
<tr>
<td>1. Ndio</td>
<td>2. Vidole</td>
</tr>
<tr>
<td>2. La <strong>SWALI LA 27</strong></td>
<td>3. Kijiko na kikombe</td>
</tr>
<tr>
<td>3. Hajui</td>
<td>4. Kikombe</td>
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<table>
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</table>
### Swali la 27
JE, (JINA) AMEWAHI KUPEWA VATIMINI A?
1. Ndio
2. La ➔ Swali la 29
3. Hajui ➔ Swali la 29
Onyesha picha ya vitamini A

### Swali la 28
ALIPEWA MWISHO KUTOKA WAPI?
1. Siku za kampeni za chanjo
2. Kituo cha afya
3. Kwingineko (tafadhali bainisha)
4. Hajui

### Swali la 29
JE, (JINA) AMEPOKEA CHANJO DHIDI YA SURUA?
1. Ndio
2. La
3. Hajui
Hudungwa katika mkono wa kulia upande wa juu
akiwa umri wa miezi tisa ama zaidi
Tazama kadi ya hospitali iwapo itapatikana

### Swali la 30
JE, UWA UNAOSHA MKONO MARA KWA MARA KWA SABUNI:
1. Baada ya kutoka msalani
2. Baada ya kumbadilisha mtoto nepi au kumsaidia mtoto kwenda haja kubwa
3. Kabla ya kuandaa chakula cha mtoto
4. Kabla ya maankuli au kumlisha mtoto

### Swali la 31
CHAKULA CHA (JINA) HUHIFADHIWA WAPI?
1. Ndani ya jokofu
2. Katika sinia au mkebe bila kifuniko
3. Katika sinia au mkebe uliofunikwa

### Swali la 32
JE, UWA UNACHEMSHA VYAKULA VILIVYO HIFADHIWA KILA MARA KABLA YA KULISHA (JINA)?
1. Ndio
2. La

### Swali la 33
JE, TAKA HUTUPWA WAPI?
1. Shimo la takataka
2. Choma motoni
3. Chooni
4. Shamba wazi
5. Jaa la takataka
6. Kwingineko (tafadhali bainisha)

### Swali la 34
MAJI MACHAFU YALIYOTUMIWA HUMWAGWA WAPI?
1. Shambani
2. Kando ya barabarani/njia
3. Kidimbwini
4. Kwingineko (bainisha)

### Swali la 35
JE, KUNA CHOOCO NDANI YA BOMA KINACHOTUMIWA NA WANAKAYA?
1. Ndio
2. La ➔ Swali la 40

### Swali la 36
NI CHOOCO CHA AINA GANI?
1. Shimo Vilivyooboresha Mfumo wa Hewa
2. Choo cha kuflush kwa maji na tanki yake/choo cha kuflushi kwa kumwaga maji
3. Choo cha shimo
4. Nyinginezo (tafadhali bainisha)

### SEHEMU YA 7: MAMBO YA KIMAZINGIRA

<table>
<thead>
<tr>
<th>Swali la 33</th>
<th>Swali la 34</th>
<th>Swali la 35</th>
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<tr>
<td>JE, TAKA HUTUPWA WAPI?</td>
<td>MAJI MACHAFU YALIYOTUMIWA HUMWAGWA WAPI?</td>
<td>JE, KUNA CHOOCO NDANI YA BOMA KINACHOTUMIWA NA WANAKAYA?</td>
<td>NI CHOOCO CHA AINA GANI?</td>
</tr>
<tr>
<td>2. Choma motoni</td>
<td>2. Kando ya barabarani/njia</td>
<td>2. La ➔ Swali la 40</td>
<td>2. Choo cha kuflush kwa maji na tanki yake/choo cha kuflushi kwa kumwaga maji</td>
</tr>
</tbody>
</table>
### Swali la 37
JE, CHOO HICHO
HUTUMIWA NA WATU WA NJE AU WANAKAYA WENGEINE?
1. Ndio
2. La

---

### Swali la 38
JE, KUNA NZI KARIBU AU NDANI YA CHOOLI?
1. Ndio
2. La

### Swali la 39
KATIKA JUMA MOJA, CHOO HIKI HUSAFISHWA MARA NGAPI?
1. Kila siku
2. Mara me-sita
3. Mara moja-tatu
4. Husafishwa tu wakati kimechafuka

### Swali la 40
MAJI (YA KUPIKIA AU KUNYWA) HUTEKWA WAPI?
1. Maji ya mfereji
2. Kisima kilicholindwa
3. Kisima kisicholindwa
4. Chemichemi kilicholindwa
5. Chemichemi kisicholindwa
6. Kisima kilicho na pampu
7. Maji ya mvua
8. Boma la kuzuia maji, ziwa, kidimbwi au mto
9. Kwingeuko (tafadhali bainisha)

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### Swali la 41
KUTOKA NYUMBANI HADI PAHALI PA KUTEKA MAJI NI UMBALI WA?

Katika mita

1. Ndio
2. La

---

### Swali la 42
MAJI YA KUNYWA YANATIWA KATIKA CHOMBO ILIYOFUNIKWA?

1. Kutumbukiza kifaa cha kuchotea
2. Kumwgaga Swali la 45

### Swali la 43
JE, MAJI HUTEKWA VIPI KUTOKA CHOMBO CHA KUHIFADHIWA?

1. Kila siku
2. Mara me-sita
3. Mara moja-tatu
4. Husafishwa tu wakati kimechafuka

### Swali la 44
JE, KIFAA CHA KUTEKA MAJI KUHIFADHIWA MARA NGAPI WAI KWA WIKI?

1. Kila siku
2. Mara me-sita
3. Mara moja-tatu
4. Hakisafishwi hadi kichafuka

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### Swali la 45
JE, MAJI YA KUNYWA HUTIBIWA?

1. Ndio
2. La

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### Swali la 46
MAJI HAYO HUTIBIWA VIPI?

1. Kuchemshwa
2. Kuongeza klorinini/waterguard/pur
3. Kuyaaacha yatulie
4. Nyinginezo (tafadhal shainisha)

### Swali la 47
JE, HUWA UNATOA MAJI YOTE NA KUSAFISHA CHOMBO CHA KUHIFADHIA MAJI KABLA YA KUTILIA MAJI MENGINE?

1. Ndio
2. La

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Source: Adapted and modified from MICS(2011), KDHSof 2014 and literature review
Appendix III: Study consent form (English version)

MOTHER (OR CAREGIVER) OF UNDER FIVE CONSENT FORM: Diarrhoea among under fives

**Study purpose**
Hello! My name is ODERO COLLINCE OMONDI. I am student at Kenyatta University. I am carrying out a research on the “Assessment of behavioural, environmental, socioeconomic and demographic determinants of diarrhoea morbidity amongst children Under 5 years in Migori County, Kenya”. I will be asking questions to the mother or caregiver of under fives. Your involvement in this study will help improve the understanding on the factors associated with diarrhoea in Migori County.

**Explanation of procedures**
The research will be done in your home and may last for about 20 minutes. The questions will concern the household characteristics, mother or caregiver characteristics, under five characteristics, diarrhoea morbidity, child care practices and environmental factors. You may refuse to answer a question or take part in the study for any reason. You may stop taking part at any time by just informing me that you wish to stop. If you are not considering to be a participant, you will not be victimized or get any harm.

**Discomfort and Risks**
There may be cases where you will feel uncomfortable about the questions asked. In such cases, you may not need to provide an answer. I will skip such questions and proceed to the next section. You can decide to stop taking part anytime. Also, when someone is approaching us during the study process, we will stop the study for some time until when there is privacy. Some of the questions may not concern you, but I will ask everyone the same questions.

**Benefits**
This study will be of help to the society by generating new knowledge. Although you may not directly benefit from taking part, the answers that you will provide will be of great importance in planning better intervention programs to ensure morbidity and mortality among under fives is reduced.

**Confidentiality**
The answers that you provide will not be shared with others. Your name will also not be appearing in the report. The community members will also not know the answers you provided or anyone else. After completing this study, all the data gathered will be analyzed and used to develop a report. Once this study is finished, the list of under fives in this household will be destroyed.

**Number of study samples**
If you agree to be a study participant, you will be one of the 185 mothers (or caretakers) from Migori County who will have taken part.
Payment and costs for taking part
There will be no payments or costs for being a study participant.

Your rights as a participant
You have the right to be answered or ask a question that you may be concerned about in relation to the study. If you have concerns or questions, please contact the people listed below, or asks me after or before the study. For now, do you have a question?

Contact Information
If at any time later, after taking part, you have any questions about this study or the findings, you can contact:

1. Mr. Odero Collince Omondi: mobile +254715474840 email: collince.odero@ku.ac.ke
2. Dr. Eunice Chomi: mobile +254713917511 email e_chomi@yahoo.com
3. Dr. Peter Odada Sumba: mobile +254720766550 email: odadakasumba@yahoo.com
4. Kenyatta University Ethical Review Committee Secretariat on kuerc@ku.ac.ke

Consent
Now, tell me whether you have accepted to take part in the study?
Yes ☐  No ☐

If you agree, it means that the above information regarding your participation in the study is clear to you. And that you have been given a chance to ask questions and your questions have been answered to your satisfaction. Your participation in this study is entirely voluntary. By signing this consent form, you understand that you can leave the study at any time. A copy of this consent form will be given to you.

Name of participant..............................................................................................................................

________________________________________  ____________________________________________
Signature or thumbprint                      Date

Investigator’s statement
I, the undersigned, have explained to the participant in a language the participant understands the procedures to be followed in the study and the risks and benefits involved.

Name of researcher.............ODERO COLLINCE OMONDI.................................

________________________________________  ____________________________________________
Signature or thumbprint                      Date
Appendix IV: Study consent form (Kiswahili version)

Nakala ya ridhaa ya utafiti

NAKALA YA RIDHAA YA MAMA (AU MLEZI) WA MTOTO ALIYE CHINI YA MIAKA MITANO: Kuhara kwa mtoto aliye chini ya miaka mitano

Sababu ya kufanya utafiti


Maelezo ya utaratibu


Uusumbufu na hali ya hatari

Kuna uwezekano kuwa utathisikia kutopendewa na maswali fulani nitakayo uliza. Ukihisi kutopendeza kuhusu kuharapisha kutoka kwa kwanza. Ninaweza yamfanya sio mazingira kwa watoto walio chini ya miaka mitano.

Faida

Utafiti husaidia jamii kwa kutoa ufahamu mpya. Huenda usifaidike kibinafsi kutokana na utafiti huu. Hata hivyo majibu yako yatakua mwa mazingira na mazoea, bora zaizidi ili kuwaharapisha kuhara kwa viwo vinavyokanana na kuhara kwa watoto walio chini ya miaka mitano.

Usiri

Idadi ya sampuli ya utafiti
Ukiamua kuendelea na majadiliano, utakua mmoja kati ya wamama (au walezi) 185 kutoka katika kaunti ya Migori ambao watajadiliana namimi

Malipo na gharama kwa ajili ya kushiriki
Haikugharimu chochote kushiriki katika utafiti huu. Hutapokea pesa zozote kwa kushiriki katika utafiti huu.

Haki zako kama mshiriki
Una haki ya kuuliza maswali yoyote na kupata majibu yake kuhusiana na utafiti huu. Ikiwa una maswali ama shauku zozote, wasiliana na wale walio orodheshwa hapa chini, ama uniulize mimi maswali kabla au baada ya majadiliano. Je, una maswali sasa?

Vile unaweza kuwasiliana
Ikiwa sa zozo te baadaye, ama baada ya kushiriki katika huu mahojiano utakuwa na maswahili kuwasili utafiti huu ama matokeo yake, unaweza kuwasiliana na:

1. Bw. Odero Collince Omondi: kwa nambari +254715474840 barua pepe: collince.odero@ku.ac.ke
2. Dk. Eunice Chomi: kwa nambari +254713917511 barua pepe e_chomi@yahoo.com
3. Dk. Peter Odada Sumba: kwa nambari +254720766550 barua pepe: odadakasumba@yahoo.com
4. Sekretarieti ya kamati ya mapitio ya kimaadili ya Chuo kikuu cha Kenyatta kwa kuerc@ku.ac.ke

Ridhaa
Sasa waweza kuniambia kama unakubali kushiriki katika utafiti huu?

Ndio □
La ○


Jina la mshiriki .........................................................................................................................

___________________________                _____________________________
Saini au kidole cha gumba                                      Tarehe

Kauli ya mpelelezi
Mimi, aliyetia sahihi, nime mweleza mshiriki kwa kutumua kugha anaelewa kuwasili utaratibu itakayofuatwa katika utafiti huu na faida na hatari zilizoko

___________________________                _____________________________
Saini au kidole cha gumba                                      Tarehe
Appendix V: Ethical clearance from Kenyatta University Ethical Review Committee

Dear Mr. Odero,

APPLICATION NUMBER PKU/323/1298 – “BEHAVIOURAL, ENVIRONMENTAL AND SOCIOECONOMIC DETERMINANTS ASSOCIATED WITH DIARRHOEA MORBIDITY AMONG CHILDREN UNDER 5 YEARS IN MIGORI COUNTY, KENYA”.

IDENTIFICATION OF PROTOCOL

The application before the committee is with a research topic, “Behavioural, environmental and socioeconomic determinants associated with diarrhea morbidity among children under 5 years in Migori County, Kenya” received on 3rd March, 2015 and discussed on 14th April, 2015.

2. **APPLICANT**
   Odero Collince Omondi

3. **SITE**
   Migori County, Kenya

4. **DECISION**
   The committee has considered the research protocol in accordance with the Kenyatta University Research Policy (section 7.2.1.3) and the Kenyatta University Ethics Review Committee Guidelines AND APPROVED that the research may proceed for a period of ONE year from 27th April 2015.

5. **ADVICE/CONDITIONS**
   i. Progress reports are submitted to the KU-ERC every six months and a full report is submitted at the end of the study.
   ii. Serious and unexpected adverse events related to the conduct of the study are reported to this board immediately they occur.
   iii. Notify the Kenyatta University Ethics Committee of any amendments to the protocol.
   iv. Submit an electronic copy of the protocol to KUERC.

If you accept the decision reached and advice and conditions given please sign in the space provided below and return to KU-ERC a copy of the letter.

**PROF. NICHOLAS K. GIKONYO**
CHAIRMAN; KENYATTA UNIVERSITY ETHICS REVIEW COMMITTEE

I __ODERO COLLINCE OMONDI__ accept the advice given and will fulfill the conditions therein.

Signature: ________________________________ Dated this day ______________ of ______________ 2015.

cc: Vice-Chancellor
Appendix VI: Research authorization from NACOSTI

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone: +254-20-2213471,
2241349, 310571, 2219420
Fax: +254-20-318245, 318249
Email: secretary@nacosti.go.ke
Website: www.nacosti.go.ke
When replying please quote

Ref: No.

Date: 10th July, 2015

NACOSTI/P/15/8835/6232

Odero Collince Omondi
Kenyatta University
P.O. Box 43844-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on “Behavioural, environmental and socioeconomic determinants associated with diarrhoea morbidity among children under 5 years in Migori County, Kenya,” I am pleased to inform you that you have been authorized to undertake research in Migori County for a period ending 27th April, 2016.

You are advised to report to the County Commissioner, the County Director of Education and the County Coordinator of Health, Migori County before embarking on the research project.

On completion of the research, you are expected to submit two hard copies and one soft copy in pdf of the research report/thesis to our office.

DR. S. K. LANGAT, OGW
FOR: DIRECTOR-GENERAL/CEO

Copy to:
The County Commissioner
Migori County.

The County Director of Education
Migori County.
Appendix VII: Research clearance permit from NACOSTI

THIS IS TO CERTIFY THAT:
MR. ODERO COLLINCE OMONDI
of KENYATTA UNIVERSITY, 0-400
NAIROBI (TOM MBOYA STREET), has
been permitted to conduct research in
MIGORI COUNTY

on the topic: BEHAVIOURAL, ENVIRONMENTAL AND SOCIOECONOMIC DETERMINANTS ASSOCIATED WITH DIARRHOEA MORBIDITY AMONG CHILDREN UNDER 5 YEARS IN MIGORI COUNTY, KENYA.

for the period ending:
27th April, 2016

Applicant's Signature

Director General
National Commission for Science, Technology & Innovation

CONDITIONS

1. You must report to the County Commissioner and the County Education Officer of the area before embarking on your research. Failure to do that may lead to the cancellation of your permit.
2. Government Officers will not be interviewed without prior appointment.
3. No questionnaire will be used unless it has been approved.
4. Excavation, filming and collection of biological specimens are subject to further permission from the relevant Government Ministries.
5. You are required to submit at least two (2) hard copies and one (1) soft copy of your final report.
6. The Government of Kenya reserves the right to modify the conditions of this permit including its cancellation without notice.

Republic of Kenya
National Commission for Science, Technology & Innovation

Research Clearance Permit

Serial No. A 5761

Conditions: see back page
Appendix VIII: Study location map

Figure A1: Map of Migori County indicating the location of the sampled Enumeration Areas (EA) by Sub-location by Sub-Counties

Source: KNBS (2015)