NUTRITIONAL MANAGEMENT OF CHILDHOOD DIARRHOEA IN KOROGOCHO INFORMAL SETTLEMENT NAIROBI CITY COUNTY, KENYA

MATTHEW MWANIKI MAINA (BSC. F N & D)
P57/CTY/PT/23707/2011

A THESIS SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF PUBLIC HEALTH (EPIDEMIOLOGY AND DISEASE CONTROL) IN THE SCHOOL OF PUBLIC HEALTH OF KENYATTA UNIVERSITY

MAY, 2018

DECLARATION

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

Signature …… Date……..……

Matthew Mwaniki Maina
Department of Foods, Nutrition and Dietetics

SUPERVISORS

We confirm that the work reported in this thesis was carried out by the candidate under our supervision as the University supervisors.

Signature …… Date……..……

Prof. Judith Kimiywe,
Department of Foods, Nutrition and Dietetics
Kenyatta University

Signature …… Date……..……

Dr. Priscilla Kabue,
Department of Community Health Nursing
Kenyatta University

DEDICATION

This work is dedicated to my entire family and friends for their encouragement and support towards my education.

ACKNOWLEDGEMENT

I give all the glory to the Almighty God for the successful completion of this study. I wish to express my sincere gratitude to all those who contributed towards the completion of this work. I offer deep gratitude to my supervisors, Prof. Judith Kimiywe and Dr. Priscilla Kabue for their guidance, support and overall supervision of this thesis. I am grateful to the dean and the staff in the school of public health for their support towards this work. I acknowledge the National Council for Science, Technology and Innovation for granting permission to undertake the study. Thanks to the Sub-County Medical Officer of Health Ruaraka Sub-County for allowing me to conduct the research in Korogocho informal settlement. Special thanks go to my employer Children of God Relief Institute, for allowing me pursue the course. I wish to thank my family and friends whose encouragement and support has brought me this far. Finally, I thank all the caregivers, children, research assistants, community health volunteers who offered assistance towards completion of this study.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS AND ACRONYMS

AIDS:	Acquired Immune Deficiency Syndrome
CHV:	Community Health Volunteer
ENA:	Emergency Nutrition Assessment
FGD:	Focus Group Discussion
HAZ:	Height for Age Z-score
KDHS:	Kenya Demographic and Health Survey
KNBS:	Kenya National Bureau of Statistics
MAM:	Moderate Acute Malnutrition
MUAC:	Mid Upper Arm Circumference
ORS:	Oral Rehydration Solution
SAM:	Severe Acute Malnutrition
SPSS:	Statistical Package for Social Sciences
UNICEF:	United Nations Children Fund
WAZ:	Weight for Age Z-score
WHZ:	Weight for Height Z-score

OPERATIONAL DEFINITION OF TERMS

Caregiver:	Primary person who was involved with provision of the child's care
Child:	Any person aged 6- 59 months
Diarrhea:	Increased frequency or decreased consistency of bowel movements
Household:	A number of people, who eat from the same pot, live and enjoy the same facility together
Informal settlement:	Groups of unplanned housing units constructed on land that occupants have no legal claim
Malnutrition:	Children with stunting (height-for-age Z score [HAZ] < −2.00 SD), or wasting (weight-for-height Z score [WHZ] < −2.00 SD), or underweight (weight-for-age Z score [WAZ] < −2.00 SD) as per World Health Organization (WHO) guidelines
Morbidity:	Number of children who had diarrhea
Nutritional management:	Feeding and zinc supplementation during and after diarrhea episode
Z – Score:	The number of standard deviations (SD) below or above the reference median value

ABSTRACT

Diarrhea is the second leading cause of death in children under five years old worldwide. Nearly one in five children deaths – about 1.5 million each year is due to diarrhea. Diarrhea is the third most common cause of mortality and morbidity in Kenya, with a case fatality of up to 21 percent causing approximately 9 percent of deaths in children less than five years of age. The primary focus of diarrheal disease control programs has been on improved case management through the promotion of oral rehydration therapy, while nutritional management has been relatively neglected. The purpose of this study was to determine the nutritional management of childhood diarrhea in Korogocho informal settlement. This was a descriptive cross sectional survey that was carried out in Korogocho informal settlement, Nairobi City County. Semi structured interviewer administered questionnaires and focus group discussions were used to collect data. Cluster sampling was used where several steps were taken in selecting the sample. Simple random sampling was used in selecting five out of eight villages and then systematic random sampling was used in respondents' selection in the selected villages. Participants of focus group discussion were selected through purposive sampling. A sample size of 354 caregivers was selected. Quantitative data was analyzed using the SPSS software version 20 and ENA for Smart software and was presented in graphs and tables. The qualitative data collected from the focus-group discussions was categorized and analyzed using thematic content analyses. Chi square was used to test for statistical significance. Participation in the study was voluntary and written informed consent was obtained from the participants before conducting the interviews. Referrals were made through community health volunteers in case the participants fell ill or a child was diagnosed with danger signs of diarrhea or malnutrition during the study. The prevalence of diarrhea was 17.8%. Majority of the caregivers (89.3%) were mothers and there were more male children (51.1%) than females. Only 5.1% of caregivers had excellent knowledge on nutritional management of childhood diarrhea. Most of the caregivers (58.5%) gave less amount of food to their children when they had diarrhea. Correct use of oral rehydration solution and zinc supplementation was at 65.1% and 7.9% respectively. Prevalence of underweight, stunting and wasting levels among study children were 16.7%, 29.1% and 6.8% respectively. Male children were more stunted and wasted than female children. Children who had diarrhea were 2.3 times as likely to be malnourished as compared to those who did not have diarrhea. There was no significant difference in the nutritional management of childhood diarrhea according to caregiver's number of children ($p=0.815$), and age ($p=0.491$) but there was significant difference according to level of education ($p=0.003$). The study demonstrated that caregivers' were not aligned with optimal feeding, zinc supplementation, and fluid intake including oral rehydration solution during childhood diarrhea. Further studies on dietary patterns should be carried out to come up with guidelines for counseling the caregivers on nutritional management of diarrhea.

CHAPTER ONE: INTRODUCTION

1.1 Background to the study

Diarrhea disease is the passage of three or more loose or liquid stools per day (UNICEF/WHO, 2009). Diarrheal disease cause about one fifth of all children deaths every year, with 760,000 children being below five years. Worldwide, about 1.7 billion cases of diarrhea are reported every year with five million cases occurring among children below five years (Aluisio *et al*., 2015). Globally, diarrhea and pneumonia are responsible for about 40 percent of all child deaths among children annually (UNICEF/WHO, 2009). Diarrhea kills more children than measles, malaria and AIDS combined. Nearly 80% of all child deaths due to diarrhea occur in South Asia and Africa (Pahwa, Kumar, & Toteja, 2010). More than 75% of these deaths occur in fifteen countries and Kenya is ranked number ten (Nguyen, 2015).

Only 39% of children suffering from diarrhea in developing countries receive the correct treatment from their caregivers (Chiabi *et al*., 2010). WHO recommends continued feeding as a first line management of diarrhea although a lot of caregivers restrict some foods or change feeding patterns when their child have diarrhea (Carter, Bryce, Perin, & Newby, 2015). This can make a child become malnourished. Feeding during convalescence should be increased in terms of frequency, quality and quantity to replace the nutrients lost during diarrhea (Bado, Susuman, & Nebie, 2016).

In Kenya, caregivers perceive food restriction as a way of managing diarrhea among the children (Olson *et al*., 2011). Most of the caregivers in the informal settlements, where diarrheal disease is high usually discontinue normal feeding because they associate the

severity and duration of the diarrhea to the type and amount of foods a child takes (Mberu, Elung'ata, & Muindi, 2014).

The prevalence of diarrhea in Korogocho informal settlement was found to be 36% (Ikua, 2009). More than 20% of children suffering from diarrhea in Nairobi informal settlements do not receive any kind of treatment (Mberu *et al*., 2014).

Most cases of childhood diarrhea can be managed at home by continued feeding during diarrhea episodes and after. Children should take more food because of the increased nutrient requirement as a result of infection and reduced nutrient absorption in the intestine (Njeru, Kariri, Murigi, Waweru, & Muriithi, 2017). However, nutrition interventions have not been considered as an important component in the treatment and management of diarrhea by many caregivers hence the purpose of this study to fill this gap.

1.2 Problem statement

Belief that feeding during children during diarrhea is harmful and that food should be restricted is common among caregivers across countries. Children below five years are the most affected by diarrhea (Njeru *et al*., 2017). Continued feeding is not taken as a form of first line treatment during childhood diarrhea by caregivers because they perceive food to be harmful. Food restriction during diarrhea is perceived as a way of management of diarrhea among their children (Bado *et al*., 2016). This is an indicator of lack of information among caregivers on the correct ways of managing diarrhea among their children (Lata, 2016).

Feeding during and after episode of diarrhea has largely been neglected and continued feeding among children by their caregivers is decreasing leading to nutritional deficits (Njeru *et al*., 2017). Poor child feeding practices in particular during diarrhea, are important determinants of growth faltering and malnutrition (Mberu *et al*., 2014). This study will therefore address the gap which is the lack of integrating nutrition management to prevent diarrhea.

1.3 Justification

More than 60% of urban residents live in informal settlements with poor access to basic and social amenities. Mortality rates among children are higher in informal settlements than the rest of the country. Informal settlements usually suffer from poor hygiene and sanitation because of inadequate water supply, open disposal of fecal waste because most of the residents pay to use a toilet or a latrine and a lot of uncollected garbage. Korogocho informal settlement borders Nairobi County biggest dumpsite, the Dandora dumpsite where most of the residents earn a living from. All these environmental risks make the children susceptible to diarrheal infections when children come into contact with the contaminated food or water.

1.4 Purpose of the study

The purpose of this study was to determine the nutritional management of childhood diarrhea in Korogocho informal settlement.

1.5 Research questions

1. What are the feeding practices during diarrhea among children 6-59 months old in Korogocho informal settlement?
2. What is the utilization of zinc during diarrhoea among children 6-59 months old in Korogocho informal settlement?
3. What is the association between nutritional status of children 6-59 months old and diarrheal occurrence in Korogocho informal settlement?
4. What is the association between caregiver factors and diarrheal management among children 6-59 months old in Korogocho informal settlement?

1.6 Hypotheses

HO: Diarrheal occurrence among children 6-59 months old does not significantly contribute to malnutrition.

1.7 Objectives

1.7.1 General objective

To determine the nutritional management of childhood diarrhea in Korogocho informal settlement Nairobi County.

1.7.2 Specific objectives

1. To determine the feeding practices during diarrhea among children 6-59 months old in Korogocho informal settlement.

2. To determine the utilization of zinc during diarrhoea among children 6-59 months old in Korogocho informal settlement.
3. To determine the association between nutritional status of children 6-59 months old and diarrheal occurrence in Korogocho informal settlement.
4. To determine the association between caregiver factors and diarrheal management among children 6-59 months old in Korogocho informal settlement.

1.8 Significance and anticipated output

Caregivers benefited from information on nutritional management of childhood diarrhea. Referrals were made to local health facilities through community health volunteers in case the participants fell ill or a child was diagnosed with danger signs of diarrhea or malnutrition at the time of the study. Policy makers, donors, nongovernmental organizations, researchers and other stakeholders will utilize results of this study to inform policy guidelines and programming on diarrhea management in the informal settlements.

1.9 Limitation of the study

The limitation of this study was caregivers' self reporting, this may have affected the accuracy of recall. To minimize this compromise the questionnaire was pretested to enhance validity and reliability.

1.10 Delimitation of the study

Age of the caregiver, number of children under a caregiver and level education of a caregiver were made variables of interest in the study. The researcher wanted to establish if there was a significant relationship between the variables and diarrheal management practices by the caregivers.

1.11 Conceptual framework

Feeding practices when children suffer from diarrhea are influenced by several factors such as caregiver's level of education, age, sex, the number of children under a caregiver, type of caregiver, and income for the household. Many caregivers withhold food during childhood diarrhoea because they believe that, that will decrease the frequency of watery and loose stools.

Insufficient awareness and knowledge by caregivers on the importance of continued feeding and zinc supplementation nutritionally adequate diets during childhood diarrhea, can lead to malnutrition in the children. Figure 1.1 serves as a reference point in understanding the links between caregiver factors, continued feeding and zinc supplementation in children with diarrhea. Studies have shown that diarrhea can lead to malnutrition in children through dehydration and poor food intake. Malnutrition weakens the immune system thus prediposing a child to diarrhea. Optimal nutrition during and after diarrhea episodes ensures that the vicious cycle of malnutrition and diarrhea is broken.

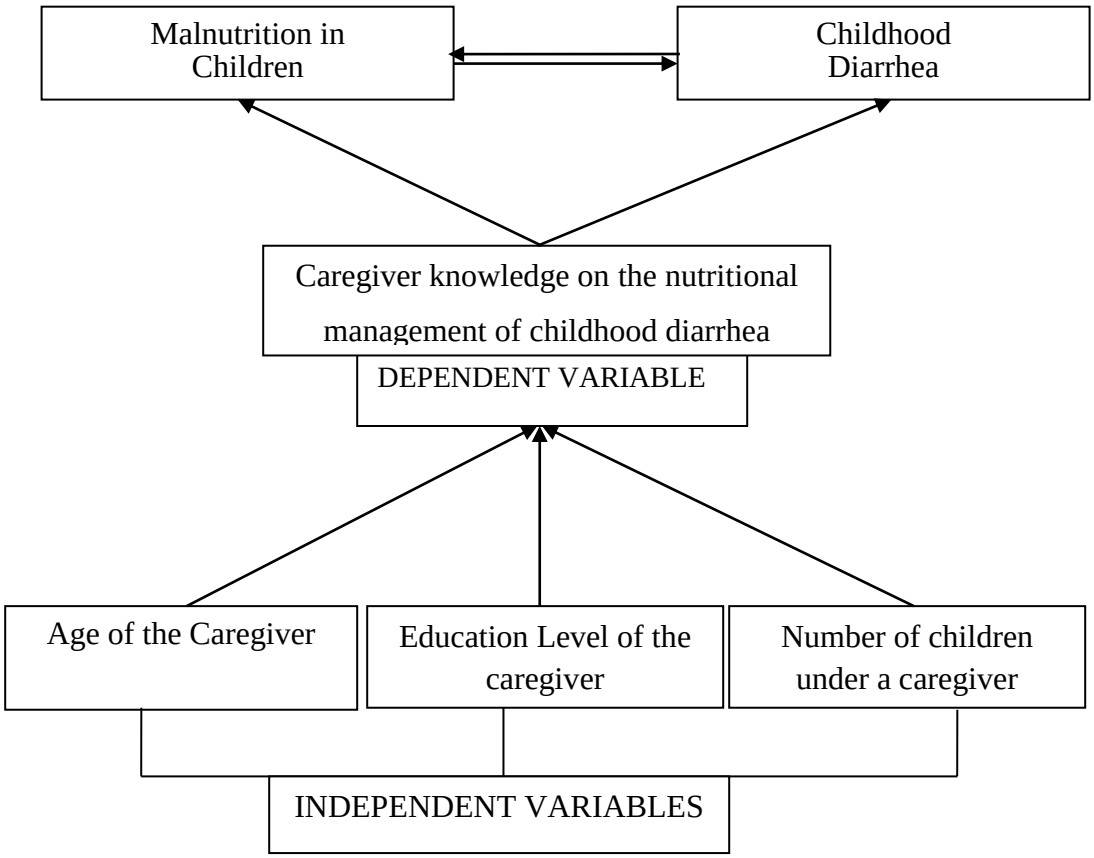


Figure 1.1 Conceptual framework showing the proposed causal pathway and relationship among study variables. Adapted and modified from Cairncross *et al*. (2010)

CHAPTER TWO: LITERATURE REVIEW

2.1 Diarrhoea and malnutrition

The goal of reducing under five mortality (1990) by two thirds by 2015 was not achieved despite the focus on child health (Nguyen, 2015). Diarrhea is the second leading cause of death in children under five years old (WHO, 2014). Globally, diarrhea is responsible for about 11% of all child deaths annually. Most of these deaths (almost 90%) occur in South Asia and Sub Saharan Africa (Ghimire, Sirkharam, & Baral, 2015). In Kenya, diarrhea kills about 86 children every day which is approximately 9% of all children deaths every year and it is the third leading cause of death among under-fives in the country (PATH, 2014). According to KDHS 2014, 15% of children below five years experience diarrhea with 2 percent suffering from dysentery. Children 6-11 months and 12-23 months experience diarrhea more than other age groups with diarrheal prevalence of 27% and 24% respectively (KNBS, 2015).

Diarrhea is classified into three categories; acute watery diarrhea which lasts several hours or days for example cholera, dysentery (acute bloody diarrhea) and, persistent diarrhea that lasts 2 weeks or longer (WHO, 2014). Acute watery diarrhea episodes lessen within 3 days after it starts. Viruses, bacteria and parasites are the common causes of acute watery diarrhea (Farthing *et al*., 2012). According to Boru *et al*. (2013) more than 10% of all diarrheal cases among children under five years of age progress to become acute bloody diarrhea. In developing countries such as Kenya, there is a likelihood of 10% of all diarrheal cases becoming persistent. The two main causative agents of diarrhea in developing countries are rotavirus and *Escherichia coli* (Saeed, Abd, & Sandstrom, 2015).

Malnutrition is a pathological state resulting from a relative or absolute deficiency or excess of one or more essential nutrients. A state of nutrition where the weight for age, height for age and weight for height indices are below -2 Z-score of the WHO Standards (WHO, 2006). Globally, malnutrition alone kills about 300,000 children annually. It is also indirectly responsible for more than 50% of all deaths among children (Fenn, 2009). Malnutrition weakens the immune system thus causing diarrhea or making it worse. When there is a diarrheal episode, the malnutrition may become worse (Moore *et al*., 2010). The higher the cumulative burden of childhood diarrhea the more the risk of nutritional stunting among the children (Checkley *et al*., 2008).

2.2 Risk factors, transmission, and prevention of diarrhoea

Age group 6-11 months has the highest prevalence of diarrhea followed by age group 12-23 months (Wamalwa, 2010). Exclusively breastfed children have lower morbidity rate of diarrhea (Ogbo *et al.,* 2017). A child with diarrhea can become malnourished due to dehydration or poor food intake while malnutrition predisposes a child to diarrhea because of weakened immune system (Rodriguez, Cervantes, & Ortiz, 2011). About 88% of diarrhea-associated deaths are attributable to insufficient hygiene (Tessema, 2017). The hot weather records high bacterial infections, while the cold season records more viral infections (Wu, Lu, Zhou, Chen, & Xu, 2016). Unhygienic food handling may increase the risk of diarrhea (Mukiira, & Ibisomi,2015).

Diarrhea transmission occurs from human to human, animal to human or via the environment when water or food is contaminated by faecal matter (Schriewer *et al*., 2015). Key measures to prevent diarrhea include vaccinations against measles and

rotavirus, improved nutrition including breastfeeding, vitamin A and zinc supplementation, hand washing with soap, safe drinking water, clean environment (sanitation), health education about disease transmission and personal and food hygiene (WHO, 2014).

Most of the clinic visits and hospitalizations of children under five years with severe diarrhea is as a result of rotavirus infection. Worldwide, rotavirus causes about 450,000 deaths of children under five years (Tate *et al*., 2012). In Kenya rotavirus causes about 27% of hospitalizations of all children under five years. Among children under five years with diarrhea, rotavirus kills nearly 8,000 Kenyan children every year (PATH, 2014). The ministry of health introduced rotavirus vaccine in the national infant routine immunization schedule as from 1st July 2014. Rotavirus vaccine is offered to all children 6 weeks old in two oral doses with the first dose given at 6 weeks and the second dose given at 10 weeks. The second dose should be at least 4 weeks after the first dose (Wandera *et al*., 2017).

2.3 Treatment of diarrhoea

2.3.1 Rehydration with oral rehydration salts (ORS) solution

Reducing deaths from diarrhea depends largely on delivering life-saving treatment of new low osmolarity ORS solution which is more effective at replacing fluids than the old standard ORS formulation. Stool volume output and vomiting is reduced by 25% and 30% respectively when new low osmolarity ORS is used compared to the old standard ORS (Chiabi *et al*., 2010).

In case of shock or severe dehydration, rehydration is done by use of intravenous fluid. The use of low osmolarity ORS has been to prevent severe dehydration and reduce diarrheal duration by 33% (Fayyaz, Liaquat, & Humayun, 2016).

2.3.2 Zinc supplementation

Zinc supplementation among the children prevents a new diarrheal episode in the next three months, quickens recovery and there is about 30% reduction in stool volume. Diarrheal severity and duration is reduced by 25% (WHO, 2014). In a study of children under five years of age by Chiabi *et al*. (2010) the reduction in acute and persistent diarrhea as a result of zinc supplementation was 15% and 24% respectively. It is recommended that children be provided with 10 mg per day for infants under six months old and 20mg if older of zinc supplementation for 10–14 days (WHO, 2014).

2.3.3 Feeding during and after diarrhoea

Children with severe acute malnutrition complicated by diarrhea have a higher risk of death than those who do not have diarrhea (Talbert *et al*., 2012). Children should take small amounts of foods they like most, a variety of nutrient rich foods, breastfeeding and take antibiotics only when there is blood in the stool (Seyal, & Hanif, 2009). There should be appropriate use of antibiotics for severe bacterial diarrhea to all children in need (WHO/UNICEF, 2009). Infants and young children should be fed according to the national operational guidelines (Table 2.1).

Table 2.1 Feeding during childhood diarrhea

Age	National operational guidelines for infant and young child during diarrhea
<6 Months	Breastfeeding more frequently, emptying one breast at a time, emptying one breast at a time, take zinc tablets, vitamin A supplement (50000 IU) and ORS solution as instructed by the health care worker.
>6-8 Months	Extra foods, breastfeeding, fluids, soups, fermented milk, fruit juices and/or safe water. Child should be fed 2 times a day
9-11 Months	2 - 3 meals, plus 1 – 2 snacks preferably fruit or milk
12-59 Months	3-4 Meals and 2 snacks preferably fruit and milk.

Ministry of Health and United States Agency for International Development, 2013

Caregivers believe that the type or amount of food a child takes during diarrhea affects the severity and duration. They prefer some foods which are believed to cure the illness and restrict some foods which are believed to cause diarrhea or increase the frequency of the watery stools (Carter *et al*., 2015). Refusal to eat during diarrhea is considered normal by caregivers and they usually do not encourage their children to feed. Food is restricted until the child fully recovers from the diarrhea (Njeru *et al*., 2017). Caregivers believe that withholding food during childhood diarrhea 'rests the bowel' and thus healing takes places (Njuguna, & Muruka, 2011).

Caregivers prefer some foods and restrict other foods when their children suffer from diarrhea and therefore, they prepare special diets. Normal feeding is resumed when the child fully recovers (Paintal, & Aguayo, 2016). Non solid foods are perceived to be harmful during diarrhea because caregivers believe that foods are not absorbed during diarrhea. Those misconceptions can make many children who suffer from diarrhea to have dehydration which may eventually lead to death (Olson *et al*., 2011).

Greasy foods, sugary foods, and most of the protein rich foods such as eggs, meat and milk are avoided during childhood diarrhea by many caregivers (Wamalwa, 2010). The

restriction of the foods is usually based on information received from elderly people in the families such as mothers and grandmothers, traditions and opinion leaders in the communities. They usually influence caregivers feeding practices and change of diet when their children have diarrhea. They recommend that the caregiver takes more time caring for the ill child and ensuring that the child takes medicines well including ORS (Bado *et al*., 2016). Continued feeding is not taken as a form of treatment for diarrhea. It is also believed that feeding during diarrhea may induce vomiting and loss of appetite (Mberu *et al*., 2014). Poor management of childhood diarrhea usually leads to dehydration and malnutrition among children and thus putting the children at higher risk of death. Diarrhea in children causes dehydration and thus contributes to malnutrition. During a diarrheal episode, water and electrolytes are lost in liquid stool. Dehydration occurs when these losses are not replaced adequately and a deficit of water and electrolytes develops (Olson *et al*., 2011).

Studies have shown a positive association between maternal education and the occurrence and management of diarrhea among children (Wamalwa, 2010). There is need to determine the role of other caregivers in the family when a child suffers from diarrhea.

2.4 Summary of literature review

Childhood diarrhea is one of the causes of malnutrition among children under five years of age. Diarrhea prevention and control among children under five years of age cannot be successful without the involvement of caregivers. They make decisions on feeding during childhood diarrhea. When caregivers reduce the amount of food given to the

child per meal during diarrhea or restrict some foods, the diarrhea becomes worse. Some caregivers perceive feeding during diarrhea to be harmful. Most caregivers discontinue normal feeding or give less food. Misperceptions regarding continued feeding during diarrheal illness among the communities pose significant health risk for children. Optimal nutrition during and after diarrheal episodes ensures that the vicious cycle of malnutrition and diarrhea is broken.

The inadequate information among caregivers on continued feeding as a first line treatment in diarrheal management usually lead to food restrictions, modified foods and special diets. This may prolong duration and increase severity of childhood diarrhea. To address this gap in knowledge, the researcher designed a study on nutritional management of childhood diarrhea in Korogocho informal settlement, Nairobi City County.

CHAPTER THREE: MATERIALS AND METHODS

3.1: Research design

The study adopted a descriptive cross sectional design to determine the knowledge regarding nutritional management of childhood diarrhea at home among caregivers of children 6-59 months. This design enabled the researcher to gather information about the caregivers, by interviewing a representative sample thus deriving extensive data within a short time (Mugenda, & Mugenda, 1999).

3.2 Variables

3.2.1 Dependent variable

The dependent variable was nutritional management of childhood diarrhoea. A correct response in the questionnaire (Appendix 6.2) was given a score of one, and incorrect one, a score of zero. Percentages using an index of Lata (2016) criteria were used for describing level of knowledge. By this criterion, below 36 per cent score of the respondents was considered poor knowledge, 37 – 68 per cent was considered good knowledge while above 69 per cent was considered excellent knowledge.

3.2.2 Independent variables

Child malnutrition was indicated by three anthropometric indices; weight-for-age (WAZ) indicated the level of underweight, height-for-age (HAZ), indicated the level of stunting, and weight-for-height (WHZ) indicated the level of wasting among the children. Socio economic variables included; marital status, caregiver's education level and occupation of the caregiver. Demographic variables included caregiver's age, child

sex, child age, child birth order, number of children a caregiver had, and diarrheal occurrence.

3.3 Study area

Korogocho informal settlement is the fourth largest in Nairobi City County with a size of about 0.97km^2. It is located in Kasarani Division, in eastern Nairobi, approximately 11 kilometers from the central business district. There are over 250 dwelling units per hectare and the average household size is three members per family. Some of the villages were estimated to have more than 3,481 households (Beguy *et al*., 2015).

3.4 Study population

The target population of this study was caregivers who had children 6-59 months old in Korogocho informal settlement, Nairobi City County.

3.5 Inclusion criteria

The inclusion criteria for the study participants was caregivers who had at least one child who was 6-59 months old, had lived in Korogocho slum for the last six months and was willing to participate in the study.

3.6 Exclusion criteria

Caregivers with children who were suffering from other illnesses were excluded, because this could have affected food intake and hence the nutritional status of the child.

3.7 Sampling technique

Cluster Sampling was used. Cluster sampling refers to a technique in which instead of selecting all the subjects from the entire population right off, the researcher takes several steps in gathering his/her sample. The entire population of Korogocho slum was divided into eight villages namely: Ngomongo, Ngunyumu, Highrigde, Grogan, Gitathuru, Kisumu Ndogo, Nyayo and Korogocho. Firstly, five villages were selected by simple random sampling. In this technique, every caregiver with a child under five years had equal chance of being selected as a participant. Simple random sampling ensured that each village was selected independently. Lottery method of simple random sampling was used. Each village was assigned a unique number, put in bowl and mixed thoroughly. A blind folded research assistant then picked five numbers. All the villages bearing the numbers picked by research assistant became participants of the study. The villages selected were Ngomongo, Gitathuru, Korogocho, Kisumu Ndogo and Grogan. From each village, participants, were selected by systematic random sampling. The researcher first randomly selected the first participant from the population. Then, the researcher visited every 9^{th} participant. The estimated number of households per village according to (Beguy *et al*., 2015) which was 3481 was divided by the desired sample size that is 354, to yield a sampling interval of 9. Every ninth household was visited, starting with a randomly selected number between 1 and 9 using simple random sampling. Number 3 was selected as the start and each ninth household in that village was chosen as a study unit. Purposive sampling method was used to select the participants for focus group discussions.

3.8 Sample size determination

The formula $n = \frac{(Z^2pq)}{d^2}$ (Fisher *et al*., 1998) was used to select the sample size;

Where: n is the desired sample size, given the total population size is greater or equal to 10,000.

Z is the standard normal deviate, usually set at 1.96 which corresponds to the 95% confidence level, p is the proportion in the target population estimated to have a particular characteristic. It was estimated that 30% of caregivers in Korogocho informal settlement would have good knowledge on nutritional management of childhood diarrhea. A study by Njuguna (2014) reported that only 35% of the caregivers were able to manage diarrhea at home.

q = 1-p,

d is the degree of accuracy desired, usually set at the 0.05 level.

$$n = \frac{1.96^2 \times 0.3 \times (1 - 0.3)}{0.05^2} = 322$$

A 10% was added to cater for incomplete or damaged questionnaires

$$= 322 + \left(\frac{10}{100} \times 322\right) = 354$$

Therefore, 354 caregivers with children 6-59 months were sampled for the study.

3.9 Research instruments

3.9.1 Questionnaire

Pre-tested and pre-coded semi-structured questionnaire were used to collect quantitative data from caregivers in the sampled households. The questionnaire was written in

English but questions were translated in a language the caregivers understood, Swahili. The responses were translated and written in English by research assistants during the interviews. The questionnaire included both open-ended and close-ended questions and had two sections. The Socio-demographic characteristics information included caregivers' age, educational level, employment status, marital status, household's income level per month, number of children a caregiver had, age and sex of child. The knowledge information included questions regarding caregiver knowledge on nutrition management of childhood diarrhea (Appendix 6.2).

3.9.2 Focus group discussion guide

Three Focus Group Discussions (FGDs) were held to collect qualitative data on feeding practices during and after diarrhea, oral rehydration therapy and zinc supplementation. Pretested focus group discussion guide were used (Appendix 6.3). Three FGDs were conducted and participants were drawn from the five villages where the questionnaires were administered. The participants for the FGDs included caregivers whose children were 6-59 months of age. Each FGD had 8 – 12 members, participants were recruited through purposive sampling with help of the CHVs following informed consent.

3.9.3 Anthropometry

Anthropometric measurements were performed by standard methods according to WHO Child Growth Standards for growth monitoring (WHO, 2006). The weight of the children was taken in light clothing using a digital scale to the nearest 0.1 kg. The length of children 6–23 months of age and the height for children 24-59 months of age

were measured to the nearest 0.1 cm using a board with a fixed head and sliding foot piece. The length for children 24-59 months of age was taken if they were unable to stand alone. Mid-upper-arm circumference (MUAC) was measured on a straight left arm (in right handed children) or straight right arm (in left handed children) midway between the tip of the elbow and the tip of the shoulder to the nearest 0.1 cm.

3.10 Pretest

Pretesting of the questionnaires was conducted in Ngomongo, Gitathuru and Kisumu Ndogo villages in Korogocho informal settlement; it was done two weeks before the study on 10% of the study sample, that is, 35 caregivers who were randomly selected. The researcher and the research assistants reviewed the assessment tools and this helped identify questions that needed to be removed, added or rephrased in the questionnaire and the time taken to finish one questionnaire.

Focus Group Discussion guide was also pretested in Ngomongo, Gitathuru and Kisumu Ndogo villages and the participants were purposively selected.

3.11 Validity

Validity was achieved by ensuring that the respondents were very clear on the nature of the research, creating a trust relationship with the participants, comparing the results obtained with other evidence and having experts check or provide guidance on the data collection tools.

3.12 Reliability

Reliability was achieved through pretesting the instrument to check if the questions were prompting the responses expected, recording on the spot and reviewing the written record with the respondent for completeness and comprehensiveness.

3.13 Data collection techniques

Face to face interviews were conducted using semi structured questionnaires by oral questioning of respondents that took approximately 25 minutes. The research assistants guided the caregiver while taking weight, height and MUAC of the children. The filing of the questionnaires was done at the households. Focus Group Discussions were held at selected halls in the informal settlement and each took approximately one and half hours. All participants consented to the study.

3.14 Data analysis

Coding, entry and analysis was done using SPSS software version 20. Chi square was used to test the associations among the variables: amount of food given and food restriction; nutrition status and diarrhoea occurrence; number of children under a caregiver and management of diarrhoea; age of the caregiver and management of diarrhoea; and level of education of a caregiver and diarrhoea management. The confidence level was set at 0.05 (95%) as recommended for most descriptive researches (Dahiru, 2008). Descriptive statistics such as percentages and frequencies were used to describe the data while tables and charts were used to represent the results. The qualitative data, collected from the focus-group discussions, was categorized and

analysed using thematic content analyses. The nutritional status data collected was compared with Child Growth Standards and presented as Z scores with cut-off point of -2 SD (WHO, 2006). Child anthropometry was analysed using ENA for Smart software. Z-scores were calculated for weight for height, weight for age, and height for age using computer-based software ENA for Smart in order to get those children who were wasted, underweight or stunted respectively. Mid-upper arm circumference (MUAC) <11.5cm indicated severe acute malnutrition (SAM), 11.5 – 12.4cm moderate acute malnutrition (MAM), 12.5 – 13.5cm mild malnutrition and >13.5cm normal nutrition status. Children with Z-Score below <-2SD and/or MUAC below 12.4 cm were taken to be malnourished.

3.15 Logistical and ethical considerations

The researcher explained the purpose of the study and benefits of the study to the participants and asked them for their permission to interview them. Participation in the study was totally voluntary and free of any coercion. Even those who initially accepted to participate were free to withdraw in the course of the study if they did not wish to continue. Informed consent was obtained from the clients after explanation of the study protocol (Appendix 6.1). The researcher guaranteed the anonymity of the participants and the confidentiality of the information they provided. Information was kept in safe custody where only the researchers could access. The study did not pose any health risk to the participants. Referrals were made to local health facilities through community health volunteers in case the participants got ill or a child was diagnosed with danger signs of diarrhea or malnutrition during the study. Approval to conduct the study was

sought from Kenyatta University Graduate School and ethical clearance sought from Kenyatta University Ethical Review Committee. A research permit was obtained from the Ministry of Education and the National Commission for Science, Technology and Innovation (NACOSTI) to carry out study in Korogocho informal settlement. Permission was also obtained from the Nairobi City County government and local authorities including the area chief before conducting the study.

CHAPTER FOUR: RESULTS

4.1 Socio-demographic characteristics of the study population

A total of 354 caregivers aged 17-55 years with a mean age of 28.4 years participated in the study. They were distributed within the sampled five out of the eight villages of Korogocho informal settlement (Table 4.1).

Table 4.1 Socio demographic information of caregivers

VARIABLE	CATEGORY	FREQUENCY	PROPORTION (%)
Age completed in	15-20	4	1.1
	21-30	206	58.2
	31-40	119	33.6
	41-50	23	6.5
	>50	2	0.6
Sex	Female	348	98.3
	Male	6	1.7
Level of Education	No schooling	36	10.2
	Primary	203	57.3
	Secondary	101	28.5
	Tertiary	14	4
Marital Status	Single	98	27.7
	Married	171	48.3
	Separated	64	18.1
	Widowed	21	5.9
Type of Caregiver	Mother	316	89.3
	Grandmother	23	6.5
	Aunt	9	2.5
	Father	6	1.7
Occupation	Housewife	275	77.7
	Casual	53	15
	Small scale trading	26	7.3
Monthly Household	5000-9999	90	25.4
Income in Ksh	10,000-14,999	189	53.4
	15,000-19,999	55	15.5
	20,000-24,999	20	5.7

4.2 Child demographic characteristics

The study included children aged 0-59 months with a mean age of 15.7 months. The age group 6-11 months had most of the children who participated in the study (38.4%). Male children were more than the female children (Table 4.2).

Table 4.2 Demographic characteristics of the study children

VARIABLE	CATEGORY	FREQUENCY	PROPORTION (%)
Child Sex	Male	181	51.1
	Female	173	48.9
Age in Months	6-11	136	38.4
	12-17	120	33.9
	18-23	38	10.7
	24-59	60	17.0
Birth Order	1	66	18.6
	2	78	22
	3	94	26.6
	4	75	21.2
	5	41	11.6

4.3 The occurrence of diarrhoea

Sixty three children (17.8%) had diarrhea two weeks to the study. However, the prevalence was different across the age groups (Table 4.3).

Table 4.3 Occurrence of diarrhoea among the children

VARIABLE	CATEGORY	FREQUENCY n=63	PROPORTION (%)
Child Sex	Male	34	54
	Female	29	46
Age in Months	6-11	29	46
	12-17	20	31.8
	18-23	6	9.5
	24-59	8	12.7

4.4 Caregivers knowledge on nutritional management of childhood diarrhoea

Sixteen multiple choice questions in the questionnaire (Appendix 6.2) were used in developing the knowledge index score. Total expected correct responses from the questions were twenty six.

The questions were on general knowledge of diarrhoea such as causes and prevention, continued feeding including breastfeeding, zinc supplementation, and fluid intake including ORS during and after diarrhoea.

After scoring for each questionnaire, percentages were computed to know the level of knowledge of each caregiver in the knowledge index score. A few of the caregivers (5.1%) scored above 69 percent in the knowledge index score, one hundred and thirty one caregivers (37%) scored 37-68 per cent in the knowledge index score while majority of the caregivers (57.9%) scored below 37 per cent in the knowledge index score.

4.5 Feeding practices during and after diarrhea episodes

Only 5.1% of caregivers would give more food during childhood diarrhea. More than a third of the caregivers (36.4%) would give the same amount of food while majority of the caregivers (58.5%) would give less amount of food during diarrhea. Therefore, only 41.5% would continue feeding by giving more or same amount of food. More than half of the caregivers (53.1%) would restrict some individual type of foods during childhood diarrhea irrespective of whether they were giving the child more, same or lesser amount of food (Table 4.4).

Table 4.4 Feeding practices among children during diarrhoea

Amount of food given to the child per meal during diarrhea								
		More	Same	Less	Total	$\chi 2$	df	p-value
Individual food restriction in a meal during diarrhea	Yes	10	57	121	188	12.992	2	0.002
	No	18	72	76	166			
	Total	28	129	197	354			

Most of the caregivers with children who had diarrhea two weeks preceding the study (84.1%) would restrict protein rich foods in the diets of their children. Foods such as meat, fish, egg, chicken, milk, pulses and soups were perceived to be harmful during diarrhea since caregivers thought that they could aggravate diarrhea.

More than half of the caregivers (60.3%) with children who had diarrhea two weeks preceding the study preferred giving their children the traditional dry foods such as boiled yams and cassava. They believed that such foods could 'strength the bowel' and 'hold the stool'. However, even though caregivers preferred those foods during childhood diarrhea, they were not readily available to them because of the cost.

Thick unsweetened porridge was also reported as one of the foods given to children when they had diarrhea. Caregivers in the FGDs, perceived porridge as a food that requires less digestion as compared to other foods. They also recommended porridge because it could be given with ease. The porridge was mainly prepared from millet, sorghum or maize flour. In one of the focus group discussion, one caregiver reported that porridge made from wheat flour or mashed sorghum locally referred to as s*orghum ugali* is also good in managing diarrhea among the children. The caregiver reported that she had used the wheat flour porridge and the mashed sorghum to manage diarrhea in all her five children.

Less than a quarter of the caregivers with children who had diarrhea two weeks preceding the study (22.2%) gave their children fruits and fruit juices. Most of the fruits were avoided because caregivers believed that sweet foods slow recovery during diarrhea.

Almost all caregivers with children who had diarrhea two weeks preceding the study (92.1%) restricted oily foods. Fried foods were believed to trigger more diarrhea. Participants in the FGDs also reported that foods with fiber such as vegetables, fruits and whole grains were also avoided. The caregivers believed that those foods were not easily digested and should only be given when the child fully recovers.

Fifty five children out of 294 children who were below two years had experienced diarrhea two weeks preceding the survey. None of the caregivers restricted breast milk. However, only a few caregivers (7.3%) gave more breast milk to their children. In the FGDs, caregivers reported that breastfeeding should continue during diarrhea but none said that it should be increased during and after diarrhea.

4.6 Oral rehydration therapy and zinc supplementation

Most of the caregivers with children who had diarrhea (57.1%) did not visit a health facility immediately a child had diarrhea for treatment.

Among caregivers with children who had diarrhea two weeks preceding the survey, only 7.9% gave zinc supplements as recommended to their child, which is 10mg per day for children below six months and 20mg per day for children above six months for 10 – 14 days in the management of childhood diarrhea. Only 6.3% of caregivers gave zinc

supplements and increased amount and frequency of feeding among their children during and after diarrhea.

Forty one caregivers (65.1%) out of the sixty three caregivers who had children with diarrhea two weeks preceding the survey administered ORS correctly to their children. Caregivers were asked to produce or identify the ORS sachet and the zinc tablet/syrup to confirm availability and utilization.

4.7 Nutrition status of the children

4.7.1 Height for age for the children

The height for age index provides an indicator of linear growth retardation (stunting) and cumulative growth deficits. It represents long term effects of malnutrition in a population and is not sensitive to recent, short term changes in dietary intake. Overall 29.1% of the children were stunted. Male children were more likely to be stunted (32.6%) than female children (25.4%). Stunting in the age group 6-11 months age group was 25.7%, 12-17 months age group was 24.2%, 18-23 months age group was 42.1% and in the 24-59 months age group it was 38.3% (Table 4.5).

Table 4.5 Height for age indicator

	Height for Age N=354			
Sex	**Normal**	**Mild (<-1)**	**Moderate (<-**	**Severe (<-3)**
Male	87	35	44	15
Female	95	34	32	12
Age in Months				
6-11	79	22	26	9
12-17	66	25	22	7
18-23	13	9	12	4
24-59	24	13	16	7
Totals	182	69	76	27

4.7.2 Weight for height for the children

The weight for height index measures body mass in relation to body height or length and describes current nutritional status (wasting). Overall 6.8% of the children were wasted. Male children were more likely to be wasted (7.2%) than female children (6.4%). Wasting in the age group 6-11 months was 7.4%, 12-17 months age group was 7.5%, 18-23 months age group was 5.3% and 24-59 months age group was 5% (Table 4.6).

Table 4.6 Weight for height indicator

	Weight for Age n=354			
Sex	**Normal**	**Mild (<-1)**	**Moderate (<-**	**Severe (<-3)**
Male	140	28	11	2
Female	129	33	8	3
Age in Months				
6-11	99	27	8	2
12-17	92	19	8	1
18-23	29	7	1	1
24-59	49	8	2	1
Totals	269	61	19	5

The MUAC gave similar results as WHZ. Only one child who was severely malnourished had bilateral piting oedema (Table 4.7).

Table 4.7 MUAC for the children

MUAC (cm)	Nutrition status	Children with diarrhea 6-59 months n=63	Children 6-59 months N= 354	Bilateral Piting Oedema	Proportion of malnutrition (%)
<11.5	Severe	3	6	1	50
11.5 - 12.4	Moderate	10	25	0	40
12.5 – 13.4	Mild	19	62	0	30.7
>13.5	Normal	31	261	0	11.9

4.7.3 Weight for age for the children

Weight for age is a composite index for height for age and weight for height (underweight). It takes into account both chronic and acute malnutrition. Overall, 16.7% of the children were underweight. Male children were less likely to be underweight (15.5%) than female children (17.9%). Underweight in the age group 6-11 months age group was 16.9%, 12-17 months age group was 17.5%, 18-29 months age group was 15.8% and 24-59 months age group was 15% (Table 4.8).

Table 4.8 Weight for age indicator

	Weight for Age N=354			
Sex	Normal	Mild (<-1)	Moderate (<-2)	Severe (<-3)
Male	109	44	18	10
Female	101	41	23	8
Age in Months				
6-11	77	36	17	6
12-17	71	28	14	7
18-23	24	8	4	2
24-59	38	13	6	3
Total	210	85	41	18

4.8 Nutrition status of children who had diarrhoea in the two weeks preceding the survey

The level of under nutrition (wasting) among children who had diarrhea two weeks preceding the survey was 12.7% and 5.5% among children who did not have diarrhea. The null hypothesis that malnutrition among children 6-59 months old does not significantly contribute to diarrheal occurrence was rejected as the p value was <0.05 (Table 4.9).

Table 4.9 Diarrhoea and nutrition status of the children

		Nutrition status (wasting)							
		Severe <-3SD	Moderate <-2SD	Mild <-1	Normal	Total	$\chi 2$	df	P-Value
Diarrhea	Yes	3	5	15	40	63	10.530	3	0.015
	No	2	14	46	229	291			
	Total	5	19	61	269	354			

Prevalence ratio was used to determine the relationship between diarrhea and malnutrition. Prevalence ratio is used when outcome occurs over a short period of time. The prevalence ratio and proportion indicated that the children with diarrhea were 2.3 times as likely to be malnourished (wasted) compared to those who did not have diarrhea (Table 4.10).

Table 4.10 Prevalence ratio of diarrhea to malnutrition among children with and without diarrhoea

	Severely & moderately malnourished <-2 SD	Normal nutrition status ≥ -2 SD	Total
Children with diarrhea	8 (a)	55 (b)	63
Children without diarrhea	16 (c)	275 (d)	291
Total	24	330	354

Prevalence ratio: = (a/a+b) / (c/c+d)

= (8/63) / (16/291)

= 2.3

Percentage of malnutrition showed that stunting was highest in the age groups 18-23 months, while wasting and underweight was highest in the 12-17 months age group (Figure 4.1).

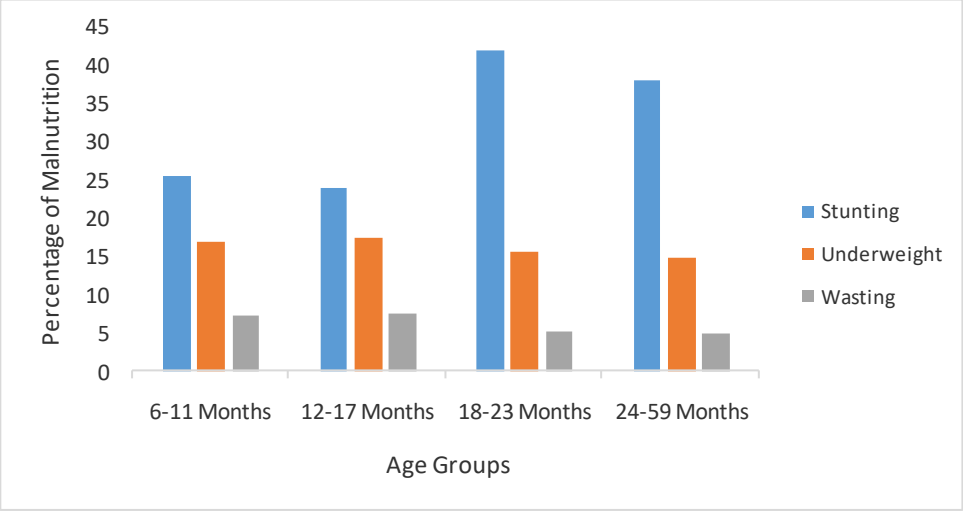


Figure 4.1 Percentage of malnutrition across the age groups

4.9 Association between the number of children under a caregiver and the nutritional management practices of caregivers regarding childhood diarrhoea

Only a few caregivers with one child (18.2%), two to four children (16.6%) and five or more children (17.1%) gave zinc supplements when the child had diarrhea. Very few caregivers with one child (13.6%), two to four children (13.4%) and five or more children (17.1%) gave the child more food and zinc supplements during diarrhea (Table 4.11).

Table 4.11 shows the $\chi 2$ calculated values with their corresponding P values at 2 degree of freedom. Zinc supplementation when child had diarrhea ($\chi 2=0.093$, df=2, p=0.954), continued feeding and zinc supplementation when child had diarrhea ($\chi 2=0.409$, df=2, p=0.815). Therefore, number of children under a caregiver did not significantly affect the diarrheal disease management as the P value was >0.05 level of significance.

Table 4.11 Association between the number of children under a caregiver and the nutritional management practices of caregivers regarding childhood diarrhoea

	Number of children under the caregiver N=354								
	One Child n=66		2 - 4 Children n=247		5 or More n=41		$\chi 2$	df	P Value
	Yes	No	Yes	No	Yes	No			
Zinc supplementation during diarrhea	12	54	41	206	7	34	0.093	2	0.954
Continued feeding and zinc supplementation during	9	57	33	214	7	34	0.409	2	0.815

4.10 Association between age of the caregiver and the nutritional management practices of caregivers regarding childhood diarrhoea

Only a few caregivers below thirty years (12.4%), thirty one to forty years (10.9%) and above forty years (16%) gave zinc supplements when the child had diarrhea. Very few caregivers below thirty years (9.5%), thirty one to forty years (6.7%) and above forty years (4%) gave the child more food and zinc supplements during diarrhea (Table 4.12). Table 4.12 shows the $\chi 2$ calculated values with their corresponding P values at 2 degree of freedom. Zinc supplementation when child had diarrhea ($\chi 2=0.525$, df=2, p=0.769), continued feeding and zinc supplementation when child had diarrhea ($\chi 2=1.421$, df=2, p=0.491). Therefore, age of a caregiver did not significantly affect the diarrheal disease management as the P value was >0.05 level of significance.

Table 4.12 Association between age of the caregiver and the nutritional management practices of caregivers regarding childhood diarrhoea

	Caregivers' age in years N=354								
	< 30 Yrs n=210		31 – 40 Yrs n=119		>40 Yrs n=25		$\chi 2$	df	P Value
	Yes	No	Yes	No	Yes	No			
Zinc supplementation during diarrhea	26	184	13	106	4	21	0.525	2	0.769
Continued feeding and zinc supplementation during diarrhea	20	190	8	111	1	24	1.421	2	0.491

4.11 Association between level of education and the nutritional management practices of caregivers regarding childhood diarrhoea

Only a few caregivers with no schooling (8.3%), primary education (4.4%) and with post primary education (15.7%) gave zinc supplements when the child had diarrhea.

Very few caregivers with no schooling (2.8%), primary education (1.9%) and with post primary education (10.4%) gave the child more food and zinc supplements during diarrhea (Table 4.13).

Table 4.13 shows the $\chi 2$ calculated values with their corresponding P values at 2 degree of freedom. Zinc supplementation when child had diarrhea ($\chi 2=11.913$, df=2, p=0.003), continued feeding and zinc supplementation when child had diarrhea ($\chi 2=11.864$, df=2, p=0.003). Therefore, level of education of a caregiver significantly affected the diarrheal disease management by the caregivers as the P value was <0.05 level of significance.

Table 4.13 Association between level of education and the nutritional management practices of caregivers regarding childhood diarrhoea

	Level of education of caregiver N=354								
	No Schooling n=36		Primary Education n=203		Post Primary n=115		$\chi 2$	df	P Value
	Yes	No	Yes	No	Yes	No			
Zinc supplementation during diarrhea	3	33	9	194	18	97	11.913	2	0.003
Continued feeding and zinc supplementation	1	35	4	199	12	103	11.864	2	0.003

Seventeen caregivers (47.2%) with no schooling, 55.7% of caregivers with primary education and 69.6% of caregivers with post primary education would continue feeding their children during diarrhea (Figure 4.2).

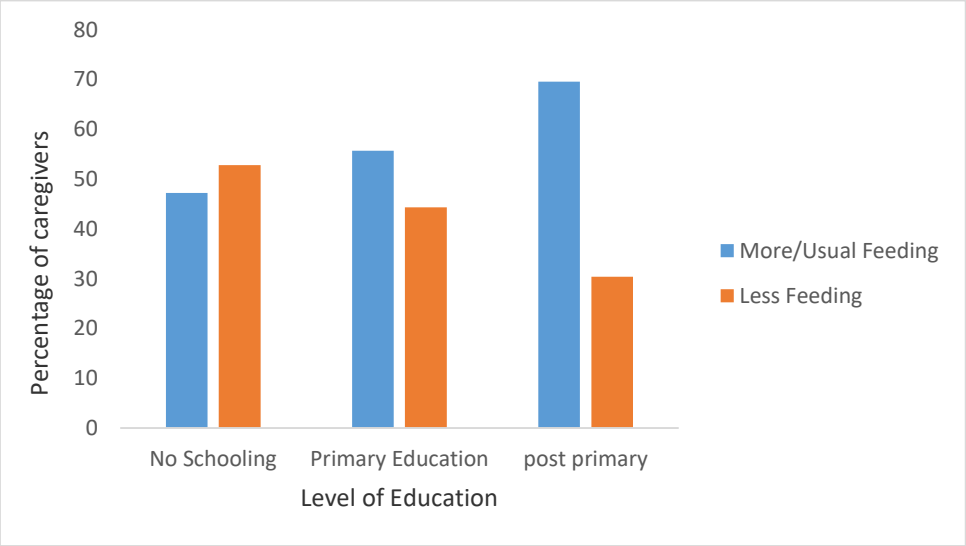


Figure 4.2 Percentage of caregivers feeding their children according to the level of education

CHAPTER FIVE: DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Discussion

5.1.1 Relationship between diarrhoea and malnutrition among the children

Overall, 29.1% of children were stunted, 6.8% were wasted, and 16.7% were underweight. This figure was close to findings from KDHS 2013/2014 which indicated stunting levels for under-fives at 26%, wasting level at 4% and underweight at 11% (KNBS, 2015). The level of under nutrition (wasting) was higher in children who had diarrhea preceding the survey (12.7%) compared to those who did not have diarrhea (5.5%).

The prevalence of childhood diarrhea among under-five children was 17.8%. This is in line with findings from KDHS 2013/2014 which showed 15% of children under age 5 had diarrhea and diarrhea prevalence was highest among children 6-11 and 11-23months (27% and 24%) (KNBS, 2015). This figure was relatively low compared with findings from a study done in Nairobi informal settlements which showed that Kasarani division, where Korogocho informal settlement is located had the highest prevalence of diarrheal cases (33.5%) in Nairobi City County (Mberu *et al*., 2014). A study by Ikua (2009) found the prevalence of diarrhea to be 36% in Korogocho informal settlement.

In this study, the age group 6-11 months had the highest prevalence of diarrhea. However, Mberu *et al*. (2014) reported that the age group 12-23 months had the highest prevalence of diarrhea followed by the age group 6-11 months.

5.1.2 Caregivers knowledge on nutritional management of diarrhoea

A few of the caregivers (5.1%) had an excellent knowledge in nutritional management of childhood diarrhoea because they scored above 69% in the knowledge index score. More than a third of the caregivers (37%) of the caregivers had good knowledge in nutritional management of childhood diarrhoea because they scored 37-68 per cent in the knowledge index score. Majority of the caregivers (57.9%) had poor knowledge because they scored below 37% in the knowledge index score. A study by Lata (2016) reported similar findings where 3.3% of the caregivers had excellent knowledge on diarrhoea management, while 51.7% and 45% of the caregivers had good and poor knowledge about diarrhoea management.

5.1.3 Feeding during and after diarrhoea

Beliefs regarding food restrictions during childhood diarrhea were common among caregivers. Children were not encouraged to eat during diarrhea. Caregivers feared that continued feeding would induce vomiting. Another reason for not continued feeding was that the child suffering from diarrhea was usually tired and needed to rest for quick recovery. Only 5.1% and 36.4% of the caregivers with children who had diarrhea continued feeding by giving more amount of food and normal amount of food, while the rest of the caregivers, 61.3% gave lesser amount of food. There was a significant difference between amount of food given to the child per meal during diarrhea and individual food restriction in a meal during diarrhea as the P value was <0.05 level of significance.

The caregivers perception observed in this study is consistent with the findings of study by Ogunbiyi and Akinyele (2013) where 71.2% of the caregivers reported food withdrawal during episodes of diarrheal and 28.8% reported sustained feeding. A study in Kibera informal settlement, in Nairobi City County reported continued feeding at 46% (Olson *et al*., 2011). A study in Nairobi informal settlements by Mberu *et al*. (2014) reported reduced food intake among children at 60.3% and 15.1% eating nothing at all. The study results on feeding practices were in line from findings from KDHS 2013/2014 which showed that 32% of children were given same amount of food, 3% were more given more to eat, 31% somewhat less to eat, 18% much less to eat and & 7% nothing to eat (KNBS, 2015).

The data collected through FGDs was analyzed through thematic content analysis. The researcher identified two categories; amount of food given to children and types of foods restricted during diarrhea and after diarrhea. Only a few caregivers knew that a child below six months should be breastfed more when he/she has diarrhea. However, breast milk was not withdrawn, restricted or given in lesser amounts. This shows that caregivers had been sensitized on the importance of breast milk in the growth and development of children. Children six months or older with diarrhea were not given a variety of foods, fruits and more breast feeding. The caregivers did not encourage the sick children to eat and drink more. After the diarrhea had finished, the children were not given extra food and fruits to help them recover.

The reduction in feeding practices or food withdrawal practices were to ‘rest’ the gut since caregivers believed that feeding would enhance the passage of more frequent watery stools. The three focus group discussions held with the caregivers were

consistent with findings from several studies which reported that caregivers restricted and withdrawn sugary and sweet foods which they perceived to be causes of diarrhea (Ogunbiyi & Akinyele, 2013).

5.1.4 Use of zinc and ORS in childhood diarrhoea management

Less than half of the caregivers with children who had diarrhea (42.9%) took their children to a health facility immediately when their children fell ill. The figure was low compared to a study in western Kenya which reported that 79% of the caregivers were taking their children to a health facility when they had diarrhea (Njeru *et al*., 2017). KDHS 2013/2014 had 58% of children with diarrhea taken to health facility, provided with treatment or advice (KNBS, 2015).

Among the caregivers with children who had diarrhea two weeks preceding the survey, only 7.9% gave their child zinc supplements correctly for the treatment of diarrhea, this is similar to 2013-14 KDHS which reported the use of zinc to treat diarrhea at 8%, and that one in six caregivers (17%) were aware of zinc tablets (KNBS, 2015). Only 6.3% of the caregivers with children having diarrhea two weeks to the study gave zinc supplements and increased amount and frequency of feeding in their children during diarrhea. The results of this study are consistent with findings from Otieno *et al*. (2013) who found that 11% of caregivers were unsure about how to administer zinc and 2.8% did not know about the existence of zinc treatment. In the focus group discussion, most of the foods that were withheld or restricted such as eggs, meat and fish are good sources of zinc.

The use of ORT for this study was 41.3%, this was in line with findings from a study in the Nairobi informal settlements by Mberu *et al*. (2014) who reported that 48.2% of children suffering from diarrhea were given ORS. Similar findings were reported by a study in western Kenya where 40.9% of the caregivers gave their children ORS as they were instructed by health care workers in the hospital (Njeru *et al*., 2017). In another study of an informal settlement in Nairobi City, County called Kibera, 43% of the children were provided with ORS (Olson *et al*., 2011). However, the figures were low compared to KDHS 2013/2014 which showed the percentage of children with diarrhea treated with a solution prepared from an ORS packet at 54% (KNBS, 2015). Caregivers in the FGDs reported that they discontinued giving ORS and zinc when they thought that the child had recovered.

5.1.5 Nutritional management of childhood diarrhoea according to number of children of a caregiver

There was no significant difference in the nutritional management of childhood diarrhea by caregiver's number of children as the P value was greater than 0.05. The findings of this study are in line with a study by Ebunoha (2011) which reported continued feeding especially when the baby had diarrhea ($\chi 2=0.170$, df=2, p=0.918).

A study conducted in the Nairobi City County informal settlements showed that there was no relationship between birth order and occurrence and management of diarrhea among children (Mberu *et al*., 2014). However, households with many children below five years of age were reported as a risk factor of diarrhea (Bado *et al*., 2016).

5.1.6 Nutritional management of childhood diarrhoea according to the age of the caregiver

There was no significant difference in the nutritional management of childhood diarrhea by caregivers according to age as the P value was greater than 0.05. The findings of this study are in line with a study by Ebunoha (2011) which reported continued feeding especially when the baby had diarrhea ($\chi 2=0.931$, df=2, p=0.628). The findings of this study are different from Bado *et al*. (2016), which reported maternal age as a risk factor for the occurrence of childhood diarrhea in Sub-Saharan countries.

5.1.7 Nutritional management of childhood diarrhoea according to caregiver's level of education.

There was significant difference in the nutritional management of childhood diarrhea by caregivers according to level of education as the P value was lesser than 0.05. The findings of this study are in line with a study by Ebunoha (2011) which reported continued feeding especially when the baby had diarrhea ($\chi 2=7.959$, df=3, p=0.047). Similar findings were reported by a study in Asia where children of mothers with less than five years of education were three times more likely to have diarrhea than children of mothers with more than five years of education (Nahar, Ahmed, Brown & Hussain, 2010).

Mberu *et al*. (2014) in a study of the informal settlements of Nairobi City County reported that caregivers with secondary education or more were more likely to seek treatment for their children who had diarrhea (44.6%), than those with incomplete primary education (34.1%). Less educated caregivers may have challenges in accessing

formal health care services hence poor health and nutritional status among their children. However, Ikua (2009) reported different findings from this study where an increase in caregivers' level of education did not lower the disease morbidity among children.

5.2 Conclusions

1. The study demonstrated that caregivers were not knowledgeable with optimal feeding of children during and after diarrheal episodes.
2. It was evident that caregivers were not aware of zinc supplementation as a first line treatment of diarrhea.
3. It was established that children suffering from diarrhea were 2.3 times more likely to become malnourished than children who did not have diarrhea.
4. The study demonstrated that caregivers' level of education affected childhood diarrhea management practices while caregivers' age and number of children under caregiver did not affect the caregiver management practices.

5.3 Recommendations

1. Health care workers should carry out trainings among caregivers at community level with the aim of improving feeding of children during diarrheal illness. This will help in changing caregivers' perceptions of the effect of food during and after diarrheal episodes.
2. The Ministry of Health should carry out sensitization programs on the importance of zinc supplementation as first line treatment during childhood

diarrhea. This would lead to more episodes of pediatric diarrhea being treated with zinc in the informal settlements where its utilization is low.

3. Health care workers should screen all children with diarrhea for malnutrition and rehabilitate them accordingly. This will prevent deterioration of the child nutrition status in case the child suffers from diarrhea.
4. The county health services should ensure that there is an information, education and communication strategies to empower caregivers on diarrheal occurrence and management among their children.

5.4 Further research

It is important that further studies on dietary patterns during childhood diarrhea should be carried out to correct local perceptions and prevailing beliefs in the community, and also come up with guidelines to be used for counseling the caregivers on nutritional management of diarrhea episode and after.

REFERENCES

Abu-Baker, N.N, Gharaibeh, H.F. (2012). Mothers' knowledge and practices of managing minor illnesses of children under five years. *Journal of Research in Nursing 7, 1177-1185.*

Adeyemi, A. (2008). Knowledge, Attitude and Practice of mothers of under-five children on Home Management of Acute Diarrhea in Ajasse-Ipo Community, Kwara, Nigeria. A dissertation submitted to the Department of Epidemiology and Community Health, University of Ilorin. Nigeria

Adimora, G.N. Ikefuna, A.N. Ilechukwu, G. (2011). Home management of childhood diarrhoea: need to intensify campaign. *Niger Journal of Clinical Practice 14, 37-41*

African Population and Health Research Center (APHRC). (2014). *Population and Health Dynamics in Nairobi's Informal Settlements: Report of the Nairobi Cross-sectional Slums Survey (NCSS) 2012.* Nairobi: APHRC.

African Population and Health Research Center (APHRC). (2008). Urbanization, Poverty and Health Dynamics Study in Nairobi, Kenya. NAIROBI: APHRC

Afroza, et al. (2013). A Cross Sectional Study on Prevalence of Diarrhoeal Disease and Nutritional Status Among Children Under 5-Years of Age In Kushtia, Bangladesh. Science *Journal of Public Health,* 1: 56-61

Agunbiade, O.M., & Ogunleye, O.V. (2012). Constraints to exclusive breastfeeding practice among breastfeeding mothers in Southwest Nigeria: Implications for scaling up. *International Breastfeeding Journal*, 7: 1746 - 4358

Ahmed, I.S, Eltom, A.R, Karrar, L.G, & Gibril, A.R. (2009). Knowledge, Attitude and practices of mothers regarding Diarrhoea among children in a Sudanese rural community. Department of community Health, Ministry of Health, Khartoum Sudan, *East Africa medial Journal* 71(11) 716-719.

Aiken, A.M. Mturi, N. Njuguna, P. Mohammed, S. Berkley, J.A. et al (2011). Risk and causes of paediatric hospital-acquired bacteraemia in Kilifi District Hospital, Kenya: a prospective cohort study. *Lancet 378, 2021–2027.*

Akech, S.O. Karisa, J. Nakamya, P. Boga, M. Maitland, K. (2010). Phase II trial of isotonic fluid resuscitation in Kenyan children with severe malnutrition and hypovolaemia. *BMC Pediatr 10, 71*

Alkizim F, Matheka D, & Muriithi A (2011). Childhood diarrhoea: failing conventional measures, what next? *Pan Afr Med J,* 8: 47

Ashur, S.S. (1977). An Ealuation Plan for Updating Curriculum at the Upper Elementary and Preparatory Levels in Jordan. IUUS/UNESCO International Conference in Nutrition Education. NE/Oxford. 115-118.

Armah, G.E. Sow, S.O. Breiman, R.F. et al (2010). Efficacy of pentavalent rotavirus vaccine against severe rotavirus gastroenteritis in infants in developing countries in sub- Saharan Africa: a randomised, double-blind, placebo-controlled trial. *The Lancet, 376, 606–614.*

Arthur, H.F. et al (2009). Survey on the distribution on the gene 4 allelles of human rotaviruses by polymerase chain reaction. *Epidemiology of Infectious Disease 112, 61-622*

Atherly, D.E. Lewis, K.D. Tate, J. Parashar, U.D. Rheingans, R.D. (2012). Projected health and economic impact of rotavirus vaccination in GAVI-eligible countries: 2011- 2030. *Vaccine. 30, 7–14.*

Babatunde, R.O. Olagunju, F.I. Fakayode, S.B., & Sola-Ojo, F.E. (2011). Prevalence and determinants of Malnutrition among Under-five Children of Farming Households in Kwara State, Nigeria. *Journal of Agricultural Science*, 1

Bado, A.R. Susuman, A.S. & Nebie, E.I. (2016). Trends and risk factors for childhood diarrhea in Sub-Saharan countries (1990-2013): Assessing the neighborhood inequalities. *Global health Action 9, 1-13*

Beguy, D. Elungata, P. Mberu, B. Oduor, C. Wamukoya, M. Nganyi, B. & Ezeh, A. (2015). HDSS Profile: The nairobi Urban Health and Demographic Surveillance System (NUHDSSS) African Population and Health Research Center, Nairobi, Kenya. *International Journal of Epidemiology 10, 1-10*

Bhandari, N. Mazumder, S. & Taneja, S. et al (2008). Effectiveness of Zinc supplementation plus oral rehydration salts compared with oral rehydration salts alone as treatment for acute diarrhoea in a primary care setting: A cluster randomized trial. *Journal of Pediatrics 121, 1279-1285.*

Bhutta, A. Z. et al, (2008). What works? Interventions for maternal and child under nutrition and survival. *The Lancet*, 90

Binns C, Lee M. (2006). Will the new WHO references do more harm than good? Lancet 2006; 368: 1868 – 9

Black, R.E. Cousens, S. Johnson, H.L. Lawn, J.E. Rudan, I. et al. (2010). Global, regional, and national causes of child mortality in 2008: a systematic analysis. *Lancet 375, 1969–1987.*

Blessing M, Patricia, E. & Diana, W. (2013). The Fading Fad of Flying Toilets Improves Health in Urban Slums. *Journal of APHRC 2, 3-4*

Boschi-Pinto, C. Lanata, C. Black, R. (eds). (2009). *The Global Burden of Childhood Diarrhoea Maternal and Child Health: Global Challenges, Programs, and Policies.* New York: Springer-Verlag.

Boschi-Pinto, C. Velebit, L. & Shibuya, K. (2008). Estimating child mortality due to diarrhoea in developing countries: a meta-analysis. *Bulletin of the World Health Organization, 86*

Breiman, R.F. Olack, B. Shultz, A. Roder, S. Kimani, K. Feikin, D.R. et al. (2011). Healthcare-use for Major Infectious Disease Syndromes in an Informal Settlement in Nairobi, Kenya. *Journal of health population Nutrition 29, 123-133.*

Britaninica student Library (2009). Dehydration. Encyclopaldia Britainica student and Home Edition. Chicago: Encyclopaedia Britannica.

Caincross, S. and Valdamanis, V. (2007). Water supply, sanitation and hygiene promotion in disease control priority projects. Disease control priorities in developing countries (2ndedition). Maryland: National institute of health

Cairncross, S. Hunt,C. Boisson, S. Bostoen, K. Curtis, V. & Fung, C.H. (2010). Water, Sanitation and hygiene for the prevention of diarrhoea. *International Journal of Epidemiology 39,93–205.*

Carol, M.A. & Latifat I. (2014). *Health care-seeking practices of caregivers of under-five children with diarrheal diseases in two informal settlements in Nairobi, Kenya.* APHRC: Nairobi

Carter, E. Bryce, J. Perin, J. & Newby, H. (2015). Harmful practices in the management of childhood diarrhea in low and middle income countries: a systematic teview. *BMC Public Health 15, 1-34*

Checkley, W. Buckley, G. Robert, H. Gilman, M. Guerrant, R. Morris, S. Mølbak, K. Valentiner, P. Lanata, C. Black, R. (2008). The Childhood Malnutrition and Infection Network. Multi-country analysis of the effects of diarrhoea on childhood stunting. *International Journal of Epidemiology 37, 816 – 830.*

Chiabi, A. Monebenimp, F. Bogne, J. & Takou, V. (2010). Current Approach in the Management of Diarrhea in Children: from Theory and Research to Practice and pragmatism. Journal of Clinics in mother and Child Health 7, 1-7

Collins, S. (2007). Treating severe acute malnutrition seriously. *Arch Dis Child 92, 453–461*

Collins, T. (2014). *Unit of Vaccines and Immunization Services Ministry of Health, Kenya.* Nairobi: The International Congress of Tropical Paediatrics

Dahiru, T. (2008). P value, a true test of statistical significance? A cautionary note. *Ann Lb Postgr and med. 6(1): 21-26.*

de Sherbinin, A. (2011). The Biophysical and Geographical Correlates of Child Malnutrition in Africa. Johannesburg: Space and Place

Diaz, T. George, A.S. Rao, S.R., Bangura, P.S. Baimba, J.B. McMahon, S.A. & Kabona, A. (2013). Healthcare seeking for diarrhoea, malaria, and pneumonia among children in four poor rural districts in Sierra Leone in the context of free health care: Results of a cross-sectional survey. *BMC Public Health*, 13: 1471-2458

Eashin, G. (2015). Can mothers care for acute diarrheal disease of their under five children effectively at home? A cross sectional study in slum community in bankura. *Journal of evidence based medicine and health care.*

Ebunoha, H.U (2011). *Childhood diarrhea knowledge and management practices of childbearing mothers in Ezeagu L.G.A of Enugu State.* Unpublished dissertation, University of Nigeria, Nsukka.

Elliot, E.J. (2007). Acute gastroenteritis in child. *Journal of Clinical Microbiology 334, 35-40*

Emilly, W.J et al, (2012). *Pneumonia and Diarrhea: Tackling the deadliest diseases for the world's poorest children.* New York: Unicef

Emina, J. Beguy, D. Zulu, E. Ezeh, A. Muindi, K. Elung'ata, P. et al. (2011). Monitoring of Health and Demographic Outcomes in Poor Urban Settlements: Evidence from the Nairobi Urban Health and Demographic Surveillance System. *Journal of Urban Health 88, 200-218.*

Ene-Obong, H. Iroegbu, C. & Uwaegbute, A.C. (2009). Perceived causes and management of diarrhoea in young children by market women in Enugu State, Nigeria. *Journal of Health Population and Nutrition 18: 97-102.*

Farzana F. et al. (2013). *Severity of Diarrhea and Malnutrition among Under Five-Year-Old Children in Rural Bangladesh.* International Centre for Diarrheal Disease Research, Bangladesh: Dhaka.

Ferdous, et al. (2013). Severity of diarrhea and malnutrition among under five old children in rural Bangladesh. *Am J Trop Med Hyg 89: 223 – 228.*

Fischer, W.C. & Black, R. (2010). Zinc for the treatment of diarrhoea: effect on diarrhoea morbidity, mortality and incidence of future episodes. *International Journal of Epidemiology 39, 63–69.*

Fotso, J.C. & Mukiira, C. (2011). Perceived quality of and access to care among poor urban women in Kenya and their utilization of delivery care: harnessing the potential of private clinics. *Journal of Health Policy and Planning, 1-11.*

George A.O et al (2013). Caretakers Perception towards using zinc to treat childhood diarrhea in rural western Kenya. *J Health Popul Nutr (3): 321-329*

Gill, C.J. Young, M. Schroder, K. Carvajal-Velez, L. McNabb, M. Aboubaker, S. & Bhutta, Z.A. (2013). Bottlenecks, barriers, and solutions: Results from multicountry consultations focused on reduction of childhood pneumonia and diarrhoea deaths. *The Lancet*, 381, 1487-1498.

Ghasemi, A.A. et al. (2013). Knowledge of mothers in management of diarrheal in under five children in Kashan, Iran. *Nursing and widwifery studies.*

Ghimire, S. (2015). Maternal knowledge and management practice towards childhood diarrhea in Bhaktapur, Nepal. International journal of recent scientific research.

Guerrant, R.L. Oria, R.B. & Moore, S.R. et al (2008). Malnutrition as an enteric infectious disease with long-term effects on child development. *Nutr Rev*, 66: 487–505.

Heikens, G.T. Bunn, J. Amadi, B. Manary M, Chhagan M, et al (2008). Case management of HIV-infected severely malnourished children: challenges in the area of highest prevalence. *Lancet 371: 1305–1307*

Igboeli, C.C. (2009). An evaluation of the training of mothers on the preparation of salt sugar solution (SSS) in Njikoka L.G.A. of Anambra state *Nigeria journal of Health education*. 11(1), 204 – 205.

Ikua, M.D. (2009). Risk factors influencing diarrheal occurrence among children under five years old in informal urban settlements: A case study of Korogocho, in Nairobi County, Kenya. A dissertation submitted to the department of Geography and Environmental studies, University of Nairobi.

International Vaccine Access Center, (2013). *Pneumonia and Diarrhea Progress report 2013.* Baltimore: John Hopkins.

International Vaccine Access Center, (2015). *Pneumonia and diarrhea progress report. Sustainable progress in the post 2015 era.* John Hopkins.

Irena, A.H. Mwambazi, M. Mulenga, V. (2011). Diarrhea is a major killer of children with severe acute malnutrition admitted to inpatient set-up in Lusaka, Zambia. *Nutr J 10, 110*

Izadnegahdar, R. Cohen, A.L. Klugman, K.P. & Qazi, S.A. (2013). Childhood pneumonia in developing countries. *The Lancet Respiratory Medicine*, 1, 574-584.

Jacqueline, E. et al, (2009). *Rotavirus Disease Burden and Impact and Cost-Effectiveness of a Rotavirus Vaccination Program in Kenya.* Atlanta: CDC

Jamison, D.T. et al. (eds) (2009). *Disease Control Priorities in Developing Countries (Second Edition).* London: London School of Hygiene and Tropical Medicine

John Njuguna & Charles Muruka (2011). Diarrhoea And Malnutrition Among Children In A Kenyan District: A Correlational Study. *JRuralTropPublicHealth 2011 10,35 - 38*

Joseph, R. and Mwambete, K.D. (2010). Knowledge and perception of mothers and caregivers on childhood diarrhea and its management in Temeke municipality Tanzania. Dar es Salaam: University of Health & Allied Sciences.

Kabiru, C. W., et al. (2013). Growing up at the margins: Concerns, aspirations, and expectations of young people living in Nairobi's slums. *Journal of Research on Adolescence*, 1: 81–94.

Katia, B. et al. (2010). Association between malnutrition in Children living in Favelas, Maternal Nutrition status and environmental factors. Brasileira: Brasilia

Kenya National Bureau of Statistics (KNBS), ICF Macro. (2010). *Kenya Demographic and Health Survey 2008-09.* Calverton: KNBS and ICF Macro.

Kenya National Bureau of Statistics (KNBS), ICF Macro. (2015). *Kenya Demographic and Health Survey 2003-14.* Rockville: ICF Macro.

Kimani-Murage, E.W. & Ngindu, A.M. (2007). Quality of Water the Slum Dwellers Use the Case of a Kenyan Slum. *Journal of Urban Health 84, 829-838.*

Khagayi, S. Burton, D.C. Onkoba, R. et al (2014). High burden of rotavirus gastroenteritis in young children in rural western Kenya, 2010-2011. *The Pediatric Infectious Disease Journal. 33, 34-40.*

Khan, M.M. Arina, Z. Katrin, B. & Alexander, K. (2013). *Determinants of Diarrhoea in 'Urban' Slums of Dhaka and Adjacent Rural Areas: a Household-level Analysis.* Berlin: Wiley.

KNBS and ICF Macro, (2010). Kenya Demographic and Health Survey 2008-09. Calverton, Maryland: KNBS and ICF Macro.

Krämer, A. Buttenheim A.M. Krickeberg, K. (eds) (2008). *The Sanitation Environment in Urban slums: Implications for Child Health Population and Environment.* London: Longman

Kyobutungi, C. et al (2008). The burden of disease profile of residents of Nairobi's slums: Results from a Demographic Surveillance System. *Journal of Population Health Metrics 6, 1*

Larson, C.P. Henning, L. Luby, S. Faruque, A.S. (2010). *Infectious Childhood Diarrhoea in Developing Countries.* New York: Kliegman

Larson, C.P. Koehlmoos, T.P. & Sack, D.A. (2011). Scaling up zinc treatment of childhood diarrhoea in Bangladesh: theoretical and practical considerations guiding the SUZY Project. *Health Policy Plan, 1–13.*

Lata, S. (2016). Knowledge and practices regarding prevention from diarrhea, effectiveness of planned health teaching. Nursing and Midwifery Research journal 12, 25-32.

Liu, L. Johnson, H.L. Cousens, S. et al (2012). Global, regional, and national causes of child mortality: An updated systematic analysis for 2010 with time trends since 2000. *The Lancet 379, 2151–2161*

MacDonald, E. Moralejo, D.G. and Mathews, M.K. (2007). Maternal Understanding of Diarrhoea – Related Dehydration & its influence on ORS use in Indonesia. *Asia Pacific Journal of Public Health, 19, 34 – 39.*

Madhi, S.A. Cunliffe, N.A. Steele, D. et al (2010). Effect of human rotavirus vaccine on severe diarrhoea in African infants. *New England Journal of Medicine 362, 289–298.*

Mamboleo, D.M. Njoroge, S.M. Okaru, F.N. & Ayuku, D. (2016). The Prevalence of Diarrheal Diseases in Child Care Institutions, Uasin Gishu County, Kenya. International Journal of Research in Environmental Science 6, 5-11

Mandomando, M.I, et al (2007). Etiology of diarrhea in children younger than 5 years of age admitted in a rural hospital of Southern Mozambique. *American Journal of tropical medicine and Hygiene 76, 522-527.*

Manijeh et al (2013). Maternal knowledge and practice regarding childhood diarrhea and diet in Zahedan, Iran. *Internal Quarterly Journal, 11-19*

Maria, C. José, A. Daniel, I. Camilo, I. RitaFranca, M. et al (2010). Incidence of diarrhea in children living in urban slums in Salvador, Brazil. *Brazilian Journal of Infectious Diseases 12, 89-93*.

Masibo, P.K. & Makoka, D. (2012). Trends and determinants of under nutrition among young Kenyan children: Kenya Demographic and Health Survey; 1993, 1998, 2003 and 2008–2009. *Public Health Nutr*, 15: 1715–1727.

Maitland, K. Kiguli, S. Opoka, R.O. Engoru, C. Olupot-Olupot, P. et al (2011). Mortality after fluid bolus in African children with severe infection. *N Engl J Med 364, 2483–2495*

Mengistie, B. Yemane, B. & Alemayehu, W. (2012). Predictors of Oral Rehydration Therapy use among under-five children with diarrhea in Eastern Ethiopia: a community based case control study. *BMC Public Health*

Mengistu, K. Alemu, K. Destaw, B. (2013). Prevalence of Malnutrition and Associated Factors Among Children Aged 6-59 Months at Hidabu Abote District, North Shewa, Oromia Regional State.

Merkel, S. et al. (2007). *Meeting the Health Needs of the Urban Poor in Informal Settlements: Best Practices and Lessons Learned*. Nairobi: JHPIEGO.

Ministry of Health (2007). *National Environmental Sanitation and Hygiene Policy.* Nairobi: Government printer.

Ministry of Public Health and Sanitation, (2010). *Policy Guidelines and Management of Diarrheal Diseases in Children Below Five Years in Kenya.* Nairobi: Government Printer.

Mugenda, O.M. & Mugenda, A.G. (1999). Research Methods: Quantitative and Qualitative Approaches. Nairobi: Acts Press.

Mugo, J.M. (2012). Mother's knowledge and practice of home care management of diarrhoea and risk factors in under 5 years in Nakuru, Kenya. A dissertation submitted to the Department of Public Health, Kenyatta University Kenya

Muindi, K. (2014). Population and Health Dynamics in Nairobi's Informal Settlements: Report of the Nairobi Cross-Sectional Slums Survey (NCSS) 2012. Nairobi: APHRC

Mukiira, C.A. & Latifat I. (2014). *Health care-seeking practices of caregivers of under-five children with diarrheal diseases in two informal settlements in Nairobi, Kenya.* APHRC: Nairobi

MOH and USAID (2013). Maternal, infant and young child nutrition. National operational guidelines for health worker; Nairobi

Mondal, D. Haque, R. and Sack, R.B. (2009). Attribution of malnutrition to cause-specific diarrheal illness: evidence from a prospective study of preschool children in Mirpur, Dhaka, Bangladesh. *Am J Trop Med Hyg,* 80: 824–826.

Moore, S.R. et al (2010). Prolonged episodes of acute diarrhea reduce growth and increase risk of persistent diarrhea in children. *Gastroenterology,* 139(4):1156-64

MoPHS, (2011). Kenya situation analysis for Transform Nutrition. *Kenya Nutrition Bulletin*, 3

Nahar, A.B. (2010). Risk Factors Associated with Severe Underweight among Children Reporting to a Diarrheal Treatment Facility in Bangladesh; Journal of Health, Population and Nutrition 28: 476-483.

National AIDS/STI Control Programme (NASCOP), Kenya (2009). 2007 Kenya AIDS Indicator Survey: Final Report. NASCOP: Nairobi.

Navanneethan, U. and Giannella, R.A. (2008). Mechanisms of infections diarrhea. *Nature Clinical Practice Gastroenterology and Hepatology 5, 637-647*

Ndugwa, R. & Zulu, E. (2008). Child morbidity and care-seeking in Nairobi slum settlements: the role of environmental and socio-economic factors. *Journal of Child Health Care 12, 314.*

Nel, E. (2010). Diarrhoea and malnutrition. South African Journal of Clinical Nutrition 23: 15-18.

Njeru, P.M. Kariri, J.M. Murigi, M.W. Waweru, H.M. & Muriithi, F.M. (2017). Management of diarrheal diseases among children under five years: a case bstudy of mothers at Kakamega County, Kenya. Int J Community med public Health 8, 2762-2766

Nnadi, C. (2010). *Human resource management* A practical guide. Nsukka, Nigeria Great AP express publishers Limited.

Nyeko, R. Kalyesubula, I. Mworozi, E. Bachou, H. (2010). Lactose intolerance among severely malnourished children with diarrhoea admitted to the nutrition unit, Mulago hospital, Uganda. *BMC Pediatr 10, 31*

Ogunbiyi, B.O, Akinyele I.O. (2013). Knowledge and Belief of Nursing Mothers on Nutritional Management of Acute Diarrhea in infants, Ibadan, Nigeria. Ibadan: University of Ibadan

Oketch, M. O. and Mutisya M. (2012). Education, training and work among youth living in slums of Nairobi, Kenya: Urbanization and education in East Africa. African Population and Health Research Center: Nairobi.

Onyango, A. (2010). Epidemiology of Waterborne Diarrhoeal Diseases among Children Aged 6-36 Months Old in Busia - Western Kenya. *International Journal of Biological and Life Sciences,* 6:2

Olson, C.K. Oria, P.A. Wamae, A.W. Blum, L.S. Patel, K.N. Feikin, D.R. Laserson, K.F. Bartlett, A.V. Breiman, R.F. & Ram, P.K. (2011). Community case management of childhood diarrhea in a setting with declining use of oral rehydration therapy: findings from cross-sectional studies among primary household caregivers, Kenya. *Am J Trop Med Hyg*, 85(6):1134-1140

Osinem, E.C. (2008). *Managing agricultural education and training*. Resources, Principles and Methods. Nsukka. Belong books.

Othero, D. Orago, A. Groenewegen, T. & Kaseje, D. (2008). Home Management of Diarrhea among Underfives in a Rural Community in Kenya: Household Perceptions and Practices. *East African Journal of Public Health 5, 142-146.*

Otoo, G.E. Lartey, A.A. & Perez-Escamilla, R. (2009). Perceived incentives and barriers to exclusive breastfeeding among periurban Ghanaian women. *Journal of Human Lactation,* 25, 34-41.

O'Reilly, C.E. Tate, J. Yee E. et al (2008). Risk factors and age differentials for death among children hospitalized with diarrhea in rural western Kenya, 2005–2007. *Program and abstracts of the 6th International Conference on Emerging Infectious Diseases (Atlanta).*

Pahwa, S. Kumar, G.T. Toteja, G.S. (2010). Performance of a community-based health and nutrition-education intervention in the management of diarrhoea in a slum of Delhi, India. Journal of Health, Population, and Nutrition 28, 553–559.

Paintal, K. & Aguayo, V.M. (2016). Feeding practices for infants and young childrenduring and after common illness. Evidence from South Asia. *Maternal and Child Nutrition 12, 39-71*

Park, K., (2009). *Park's Textbook of Preventive and social medicine*. India: Ms Banarsidas Bhanot Publishers.

Pantenburg, B. etal (2014). Feeding of Young Children during Diarrhea: Caregivers Intended Practices and Perceptions. *Institute of Social medicine, occupational Health and public health, University of Leipzig, Germany.*

PATH, (2014). *Vaccine Access and Delivery. Rotavirus Disease and Vaccines in Africa Bulletin.* Rheingans R, (2009). Economic costs of rotavirus gastroenteritis and cost-effectiveness of vaccination in developing countries. *Journal of Infectious Disease 1, 16–27*

Petri, W.A. and Miller, M. (2008). Enteric infections, diarrhea, and their impact on function and development. *J Clin Invest* 118: 1277–1290

Roy, S.K. et al (2011). Risk factors of mortality in severely-malnourished children hospitalized with diarrhoea. *J Health Popul Nutr,* 29: 229–235.

Senbanjo, I.O. Adeodu, O.O, Adejuyigbe, E.A. (2009). Influence of socio-economic factors on nutritional status of children in a rural community of Osun State, Nigeria.

Seyal, T. Hanif, A. (2009). Kowledge, attitude and practices of mothers and doctors regarding feeding, oral rehydration solution and use of drugs in children during acute diarrhea. *Journal of Knowledge and Practice 15, 1-15.*

Shrimpton, R. and Saldanha, L. (2011). The Kenya Nutrition Programme Review (KNPR). Public Nutrition Solutions Limited (PNSL): Nairobi

Simiyu, S. (2010). Water risk factors pre-disposing the under five children to diarrhoeal morbidity in Mandera district, Kenya. *East Afr J Public Health,* 7: 353–360.

Strand, T.A. et al. (2012). Risk factors for extended duration of acute diarrhea in young children. *PLoS One,* 7:5

Sumananjali, M. (eds) (2010). *Nairobi Urban Social Protection Programme.* Nairobi: OXFAM

Tate, J.E. Burton, A.H. Boschi-Pinto, C. et al. (2012). Estimate of Worldwide Rotavirus associated mortality in children younger than 5 years before the introduction of universal rotavirus vaccination programmes: a systematic review and meta-analysis. *The Lancet Infectious Diseases 2012, 136–141.*

Talbert, A. Thuo, N. Karisa, J. Chesaro, C. Ohuma, E. et al (2012). Diarrhoea Complicating Severe Acute Malnutrition in Kenyan Children: A Prospective Descriptive Study of Risk Factors and Outcome. *PLoS ONE 7, 6*

Thuo, N. Ungphakorn, W. Karisa, J. Muchohi, S. Muturi, A. et al (2011). Dosing regimens of oral ciprofloxacin for children with severe malnutrition: a

population pharmacokinetic study with Monte Carlo simulation. *J Antimicrob Chemother*

United Nations. (2008). The Millennium Development Goals Report. New York.

United National International Children's Education Fund (UNICEF). (2008). *The State of the World's Children*. New York: United Nations Children's Fund (UNICEF).

United Nations Children's Fund (UNICEF), World Health Organization (WHO) (2009). *Diarrhoea: Why Children Are Still Dying And What Can Be Done.* New York: UNICEF.

UNICEF, et al. (2010). Levels & Trends in Child Mortality. Estimates Developed by the UN Inter-agency Group for Child Mortality Estimation. UNICEF: NewYork

UNICEF, WHO (2010). *The State of World's Children.* New York: UNICEF

UNICEF, (2012). Qualitative study to identify solutions to local barriers to care-seeking and treatment for diarrhoea, malaria and pneumonia in select high burden countries: Report on findings from Kenya. *Kenya working paper*.

UNICEF (2013). *Committing to Child Survival: A Promise Renewed. Progress Report 2013*. New York: UNICEF

Vania, D.P. Juliana, C.P. & Débora, F.D.(2011). Integrated Management of Childhood Illness With the Focus on Caregivers: an Integrative Literature Review. Rev. *Latino-Am. Enfermagem, 19, 203-211*.

Vania, D. & Juliana, (eds) (2007). *Acute Diarrhea and Oral Rehydration*. New York: Kliegman:

Wamalwa, P.N. (2010). Prevalence of and factors associated with diarrheal disease in moderate to severely malnourished children aged 6 to 59 months at Mbagathi District Hospital. A dissertation submitted to the department of Pediatrics and Child Health, UON

Wardlaw, T. Salama, P. Brocklehurst, C. Chopra, M. & Mason, E. (2010). Diarrhoea: why children are still dying and what can be done. *Lancet 375: 870-872.*

Wolfson, L.J. (2008). *WHO Immunization Coverage Estimates and Trajectories*. Geneva: World Health Organization.

WHO (2008). *Oral Rehydration Salts: Production of the New ORS.* Geneva: WHO

WHO, UNICEF (2008). Integrated Management of Childhood Illnesses. *Chart Booklet.*

WHO (2013). *Diarrhoeal Disease Fact Sheet*. New York: WHO

WHO/UNICEF (2013). *Ending Preventable Child deaths from Pneumonia and Diarrhea by 2025. The integrated Global Action plan for Pneumonia and Diarrhea.* Geneva: WHO

WHO (2014). *Global Rotavirus Information and Surveillance Bulletin Vol 9.*

WHO/UNICEF Joint Monitoring Program for Water Supply and Sanitation (2010). A snapshot of drinking water and sanitation in the MDG region sub-Saharan Africa – 2010 Update. A regional perspective based on new data.

Winch, P.J. Gilroy, K.E. Doumbia, S. Patterson, A.E. Daou, Z. et al. (2008). Operational issues and trends associated with the pilot introduction of zinc for childhood diarrhoea in Bougouni district, Mali. *Journal of Health Population Nutrition 26, 151–162.*

Wilson, S.E. Oue´draogo, C.T. Prince, L. Oue´draogo, A. Hess, S.Y.(2012). Caregiver Recognition of Childhood Diarrhea, Care Seeking Behaviors and Home Treatment Practices in Rural Burkina Faso: A Cross-Sectional Survey. *PLoS ONE 7, 3*

Zafar, M. (2014). Knowledge and Attitude towards and Preventive Practices Relating to Diarrhea among Mothers Under Five Years of Children: Findings of a Cross-Sectional Study in Karachi, Pakistan. *J Infect Dis Ther 2, 126*

APPENDICES

Appendix 6.1: Consent Form For Respondents

Introduction

Good morning/afternoon? My name is …… I am part of research team conducting a research study on nutritional management of childhood diarrhea in Korogocho slum, Nairobi County.

Procedure for the study

The study will involve asking you some questions concerning you and your child.

Benefit and risks

You will benefit from information on nutritional management of childhood diarrhea. Referrals will be made to local health facilities through community health volunteers if a child will be diagnosed with danger signs of diarrhea or malnutrition during the study. Policy makers, donors, Nongovernmental organizations and other stakeholders will utilize results of this study to inform policy guidelines and programming on diarrhea management in the slums.

Confidentiality

All the information collected will be treated in confidence and used only for purposes of this study. The dissemination of results will be by way of summarized information that will have no reference to any particular individual.

Voluntary consent

You are free to choose whether to take part in the study or not, and feel free to withdraw at any time during the interview. Feel free to ask any question before, during or after the interview. For any issues/questions concerning your right and that of your child please contact the Ruaraka Sub County Medical Officer of Officer P.O Box 30108-00100 Nairobi, Telephone 020-803715 and/or Kenyatta University Ethics Review Committee P.O Box 43844 – 00100 Nairobi, Telephone 254-020-8710901 EXT 57530. For any questions concerning this study please contact researcher through the following contact address: Matthew Mwaniki, P.O. Box 6 – 10111 Gakindu, and telephone 0723517101. I hereby invite you to take part in the interview on the above subject. The interview will take approximately 25 minutes.

Statement of informed consent

The above information has been clearly explained to me and I have read/understood it. I do here by voluntarily agree to participate in this study.

Respondent's signature/thumb print….....

Name of research assistant eliciting consent.....…

Signature…….....Date….....……

Appendix 6.2: Respondents' Questionnaire

Nutritional management of childhood diarrhea in Korogocho slum Nairobi City County

Questionnaire No…… Date of interview……..

Interviewer…….. Village……..

Date of Birth……

SECTION A. Socio demographic characteristics

(a) Socio – demographic characteristics of the child

Question	**Coding Category**		
1. How old is the child under study? (In months)	0-5 Months	1	
	6-11 Months	2	
	12-17 Months	3	
	18-23 Months	4	
	24-59 Months	5	
2. Do you have other children below five years?	Yes	1	**If No, go to Qn 4**
	No	2	
3. How many children are they?	1	1	
	2	2	
	3	3	
4. What is the birth order of the child?	1	1	
	2	2	
	3	3	
	4	4	
	5+	5	

(b)

(c) Socio – demographic characteristics of the caregiver

Question	**Coding Category**		
5. What is your relation to the child?	Mother	1	
	Father	2	
	Other (Specify)……..	3	
6. How old are you? (Probe for best estimate) in years	15 - 20	1	
	21 -30	2	
	31 – 40	3	
	41 -50	4	
	Above 50	5	
7. What is your highest level of education?	Not gone to school	1	
	Primary	2	
	Secondary	3	
	Tertiary	4	
	Non Formal	5	
	Other, specify……	6	
8. What is your present occupation?	House wife	1	
	Casual	2	

	Business/ Trading 3 Employed/Salaried 4 Other, specify…… 5	
9. What is your religion?	Christian 1 Islam 2 Other, specify…… 3	
10. What is the Household's total Income per month (in Kshs).	Less than 1000 1 1000 – 4999 2 5000 – 9999 3 10, 000 – 14999 4 15000 – 19999 5 20,000 – 24, 999 6 >25,000 7	

SECTION B: General knowledge of diarrhea

Question	**Coding Category**	**Total Correct Scores**
11. According to you what is diarrhea? (Write verbatim in the space below; Total Correct Score of 1) ……		
12. What do you think causes diarrhea?	Germs 1 Inadequate sanitation 2 Insufficient Hygiene 3 Unsafe water 4 No ExclusiveBreastfeeding5 Malnutrition 6 Don't know 7 Other, Specify…….. 8	Total Correct Score of 6 (If code1-6)
13. According to you what cures diarrhea in the child	ORS + ZINC 1 ORS 2 Improved Nutrition 3 Home available fluids	Total Correct Score of 5 (If code 1-5)

	4 Medicines 5 Don't Know 6 Others, Specify… 7	
14. Why is Zinc important?	Reduces Diarrhoea Duration 1 Reduces Diarrhoea Severity 2 Prevents Diarrhoeal 3 Don't Know 4 Other, Specify..... 5	Total Correct Score of 3 (If code 1-3)
15. What amount of Zinc should be given to A. Infants under six months per day	10mg 1 Don't Know Other, Specify 3	Total Correct Score of 1 if code 1
B. Children older than six months	20mg 1 Don't Know Other, Specify 3	Total Correct Score of 1 if code 1
16. How many days should Zinc be administered to a child with diarrhea?	10 – 14 days 1 Don't know 2 Other, Specify 3	Total Correct Score of 1 if code 1
17. For children given ORS solution, how is it mixed?	1 sachet in 1 litre of water 1 Don't know 2 Other, Specify..... 3	Total Correct Score of 1 if code 1
18. How many times (how frequent) a day should ORS solution be administered to a child with diarrhoea?	After every watery stool 1 Once a day 2 Two to three times a day	Total Correct Score of 1 if code 5

	3 If the child wants to drink 4 As much as possible 5 Other, Specify..... 6	
19. How much ORS solution should be given to the child each time the child has lose stool?	As much as the child can drink 1 Don't Know 2 Other, Specify..... 3	Total Correct Score of 1 if code 1

SECTION C: Knowledge on feeding practices during diarrhea

Breastfeeding		
20. Is breast-feeding continued during diarrhea?	Yes 1 No 2	Total Correct Score of 1 if code 1
21. Is breast-feeding done less frequently during diarrhea?	Yes 1 No 2	Total Correct Score of 1 if code 2
22. Is breast-feeding stopped during diarrhea?	Yes 1 No 2	Total Correct Score of 1 if code 2
23. Is water intake restricted?	Yes 1 No 2	Total Correct Score of 1 if code 2
Food Intake		
24. Is food intake restricted?	Yes 1 No 2	If no go Q31 Total Correct Score of 1 if code 2
25. If so, is restriction complete?	Yes 1 No 2	
26. How long does it continue?	…… ……	
27. Is the restriction partial	Yes 1 No 2	
28. How long does it continue?	…… ……	
29. What foods are avoided during and after diarrhea?	…… ……	

	…… …… …… ……	
30. Why are they avoided?	…… …… …… …… …… ……	
31. Are there foods that are recommended during diarrhea	Yes 1 No 2	If no go to Q36 Total Correct Score of 1 if code 2
32. What foods are recommended during diarrhea?	…… …… …… ……	
33. When are they given?	…… …… …… ……	
34. How much is given?	…… …… …… ……	
35. How are they prepared?	…… …… …… ……	
36. What foods and feeding methods are advised by local health workers, including doctors and traditional practitioners?	…… …… …… ……	
38. Weight in kg (To the nearest 0.1kg) Height/Length (To the nearest 0.1cm) MUAC (To the nearest 0.1cm)	…… …… ……	
39. Edema present on both feet	Yes 1 No 2	

Appendix 6.3: Focus Group Discussion Guide

Introduction:

Welcome and thank you for taking time to participate in this discussion today. My name is [Moderator] and this is [note-taker] and we are conducting a study on Nutritional management of childhood diarrhea in Korogocho slum Nairobi City County. Caregivers will benefit from information on nutritional management of childhood diarrhea. Referrals will be made to local health facilities through community health workers if a child will be diagnosed with danger signs of diarrhea or if malnutrition during the study. Policy makers, donors, Nongovernmental organizations and other stakeholders will utilize results of this study to inform policy guidelines and programming on diarrhea management in the slums.

Ground rules

We are interested in all of your opinions and feelings. There is no right or wrong answer. We need your ideas, so any criticisms you have will not hurt our feelings. We encourage you to provide frank comments that will improve our study. Some of you may agree or disagree with each other, which is perfectly normal and we encourage you to openly share your ideas. Do not wait for the moderator to ask for your opinion, feel free to speak at any time. However, please try to avoid interrupting others while they are talking. Everyone will have a chance to speak and all ideas, concerns, and opinions are of value. The session will take about 1 hour.

Confidentiality

Everything that you will say is confidential and we will not tell anyone that you participated in this discussion. My assistant will also take some notes to help us in this task. Does anyone have any questions?”

Introduction of participants

We would like each of you to introduce yourself. Also, please tell us how many children you have and also tell me how old your youngest child is.

Research questions

All of you said you have a young child who is under five years.

What causes diarrhea in young children? **Probe** for list of different causes

Now we'd like to talk about what caregivers do when a young child gets diarrhea.

Are there participants who do not treat diarrhea? If so, ask why not.

Probe: What is the first thing that they do? What is the next thing they do?

Probe: Do they give the child more fluids? Why or why not? What do they give them?

Probe: Do they give the child more food? Why or why not? What do they give them?

We have discussed a lot of issues about diarrhea in young children today and we want to thank you for your participation. Before we close, do you have any questions for us?

Appendix 6.4: Research Authorization From Kenyatta University Graduate School

KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: dean-graduate@ku.ac.ke

Website: www.ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 8710901 Ext. 4150

Our Ref: P57/CTY/PT/23707/2011

DATE: 6th August, 2015

Director General,
National Commission for Science, Technology
and Innovation
P.O. Box 30623-00100
NAIROBI

Dear Sir/Madam,

RE: RESEARCH AUTHORIZATION MATTHEW MWANIKI MAINA – REG. NO.P57/CTY/PT/23707/2011

I write to introduce **Mr. Matthew Mwaniki Maina** who is a Postgraduate Student of this University. He is registered for M.P.H degree programme in the **Department of Community Health.**

Mr. Maina intends to conduct research for a M.P.H proposal entitled, **"Nutritional Management of Childhood Diarrhoea in Korogocho Slums Nairobi County, Kenya."**

Any assistance given will be highly appreciated.

Yours faithfully,

f.r. MRS. LUCY N. MBAABU
FOR: DEAN, GRADUATE SCHOOL

LNM/rwm

Appendix 6.5: Ethical Clearance Letter From Kenyatta University Ethical Review Committee

KENYATTA UNIVERSITY
ETHICS REVIEW COMMITTEE

Email: chairman.kuerc@ku.ac.ke
secretary.kuerc@ku.ac.ke
ercku2008@gmail.com
Website: www.ku.ac.ke

P. O. Box 43844 - 00100 Nairobi
Tel: 8710901/12
Fax: 8711242/8711575

Our Ref: KU/R/COMM/51/606

Date: 18th January, 2016

Matthew Mwaniki Maina,
Kenyatta University,
P.O Box 43844,
Nairobi

Dear Mwaniki,

RE APPLICATION NUMBER PKU/431/I 340 – "NUTRITIONAL MANAGEMENT OF CHILDHOODDIARRHOEA IN KOROGOCHO SLUMS NAIROBI COUNTY, KENYA"

1. IDENTIFICATION OF PROTOCOL
The application before the committee is with a research topic **"Nutritional management of childhood Diarrhoea in Korogocho Slums Nairobi County, Kenya"** received on 29th October, 2015.

2. APPLICANT
Matthew Mwaniki Maina, Department of Community Health

3. STUDY SITE
Korogocho, Nairobi 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 18th January,2016.**

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.

When replying, kindly quote the application number above.
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.

KENYATTA UNIVERSITY OFFICE OF THE CHAIRMAN 18 JAN 2016 ETHICS REVIEW COMMITTEE P.O. BOX 43844 - 00100 NAIROBI

DR. TITUS KAHIGA
CHAIRMAN ETHICS REVIEW COMMITTEE

I MATTHEW MWANIKI MAINA accept the advice given and will fulfill the conditions therein.

Signature..... Dated this day of 29TH FEBRUARY, 2016.

cc. Vice-Chancellor
DVC-Research Innovation and outreach

Appendix 6.6: Research Permit From National Council For Science And Technology

NACOSTI

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone:+254-20-2213471,
2241349,3310571,2219420
Fax:+254-20-318245,318249
Email:dg@nacosti.go.ke
Website: www.nacosti.go.ke
when replying please quote

9th Floor, Utalii House
Uhuru Highway
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No. NACOSTI/P/16/34436/10027

Date: 28th June, 2016

Matthew Mwaniki Maina
Kenyatta University
P.O. Box 43844-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Nutritional management of childhood diarrhoea in Korogocho Slums Nairobi County, Kenya,"*** I am pleased to inform you that you have been authorized to undertake research in **Nairobi County** for the period ending **27th June, 2017.**

You are advised to report **the County Commissioner, the County Director of Education and the County Coordinator of Health, Nairobi 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.

BONIFACE WANYAMA
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Nairobi County.

COUNTY COMMISSIONER
NAIROBI COUNTY
P. O. Box 30124-00100, NBI
Tel: 331608

The County Director of Education
Nairobi County.

MINISTRY OF EDUCATION
P. O. Box 74629, NAIROBI

The County Coordinator of Health
Nairobi County.

Appendix 6.7: Clearance Letter From Nairobi City County

NAIROBI CITY COUNTY

Telephone 020 344194

web: www.nairobi.go.ke

City Hall,
P. O. Box 30075-00100,
Nairobi,
KENYA.

COUNTY HEALTH SERVICES

08 AUG 2016

REF: CHS/1/13/ (10) - 016

TO: MATTHEW MWANIKI MAINA
KENYATTA UNIVERSITY
P O BOX 43844 - 00100
NAIROBI

Noted & Forwaided
Please ensure you give a feedback report at the end of the research
Dr. F. Ndeto
For SCMOH
5/8/16.

DATE: 2ND AUGUST, 2016

RE: RESEARCH

Reference is made to a letter from the Director Human Resource Management

Ref. CHS/3/4/553/2016 dated 25th July, 2016.

Authority is hereby granted to you to carry out research on **"Nutritional Management of Childhood Diarrhea in Korogocho Slums Nairobi CITY County."**

CC:- Facility I/C Korogocho H/C

Please note that your research runs for One (1) months w.e.f from 1st to 26th August, 2016.

During the course of your research you are expected to adhere to the rules and regulations governing the Nairobi City County.

You will also be expected to submit a copy of your research project to the office of the undersigned.

You will be expected to pay a research fee of Kshs. 5,000/-.

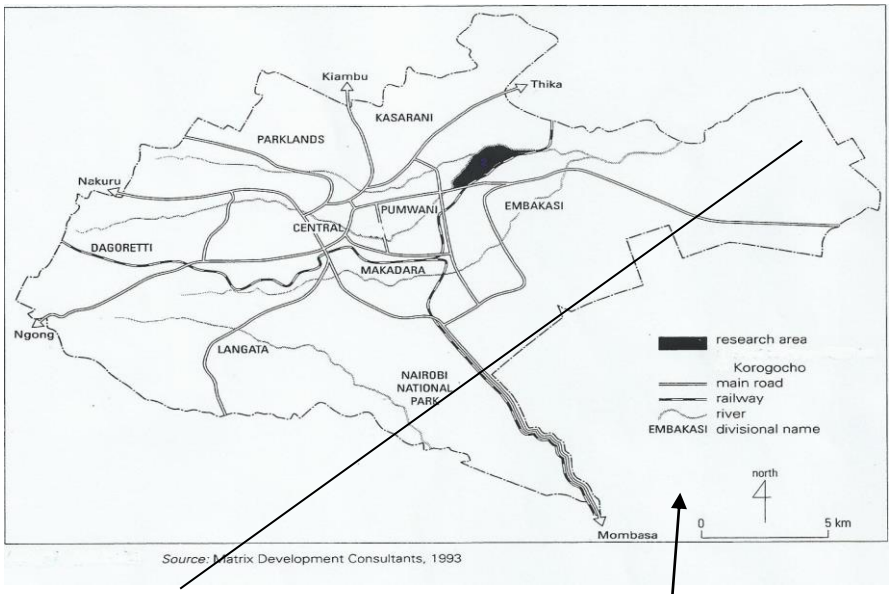
By a copy of this letter, the SCMOH Ruaraka Sub – County is requested to accord you the necessary assistance.

EUNICE MUSAU
CHIEF ADMINISTRATIVE OFFICER – (CHS)

Cc:- SCMOH – Ruaraka
SCHAO – Ruaraka
Nutritionist – Ruaraka
In/charge – Korogocho H/C

Appendix 6.8: Study Location Maps

Map of Nairobi City County showing Korogocho informal settlement (study area)



Korogocho informal settlement

Map of Kenya showing Nairobi City County