DETERMINANTS OF MALNUTRITION AMONG CHILDREN AGED 6 TO 24 MONTHS ATTENDING A WELL-BABY CLINIC AT MBAGATHI HOSPITAL, NAIROBI

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Determinants of malnutrition among children aged 6 to 24 months attending a well-baby clinic at Mbagathi hospital, Nairobi

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DECLARATION

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

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DEDICATION

I dedicate this work to my mother Beatrice Nyaguthii

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ACRONYMS AND ABBREVIATIONS

CITI	Collaborative Institute Training Imitative
CM	Centimeters
DF	Degree of freedom
DHS	Demographic Health Survey
FAO	Food and Agriculture Organization
FGD	Focus Group Discussion
HAZ	Height for Age Z-scores
IRC	Institute Regulation Committee
KG	Kilogram
KII	Key Informant Interviews
KNBS	Kenya National Bureau of Statistic
MDGS	Millennium Development Goals
MOH	Ministry of Health
PMTCT	Prevention of Transmission of Mother to Child Transmission
REF	Reference
SD	Standard Deviation
SERU	Scientific and Ethical Review Unit
SPSS	Software for Social scientists
UN	United Nations
UNICEF	United Nation Children's Fund
UNICEFUK	United Nation Children's Emergency Fund, United Kingdom
WAZ	Weight for Age Z-scores
WBC	Well Baby Clinic
WFP	World Food Program
WHO	World Health Organization
WHZ	Weight for Height Z-scores

DEFINITION OF TERMS

Anthropometric measurement- Refers to physical measurement of the body parameters

Complementary feeding- Period during which other foods or liquids are provided along with breast milk which is recommended to begin after the sixth month.

Exclusive Breastfeeding- Period when all fluid, energy, and nutrients are provided by breast milk, with the possible exception of small amounts of medicine, vitamins, or minerals and exclude even water.

Household- Includes people living under the same roof, sharing the same resources

Malnutrition- A term used to describe under-nutrition and over-nutrition that refers to an insufficient, excessive or imbalanced consumption of nutrients resulting in a measurable adverse effect on body composition, function and clinical outcome

Nutritional status- Physiological condition that results from a balance between nutrient requirements and intake and the ability of the body to use these nutrients

Over nutrition- A condition where the body has excess of food, especially fats and sugars

Under nutrition- A condition in which the body does not have enough of the right kind of food to meet its energy, macronutrient and micronutrient requirement

Z-Scores- A score that indicates how far the measurement is from the median value of the reference population

ABSTRACT

Malnutrition in children poses a heavy burden on global society and continues to be a significant public health concern. Developing countries are the most affected accounting for over 90% of the global burden of malnutrition. Evidence indicates that 42% of children in Sub-Sahara Africa under-five years are stunted. In Kenya, stunting is estimated at 26%. The study on determinants of malnutrition among children aged 6 to 24 months aimed to assess the prevalence of malnutrition and associated risk factors in order to generate evidence that can form the basis for strategic interventions. A cross-section study was conducted targeting children aged 6 to 24 months attending a well-baby clinic at Mbagathi hospital. Anthropometric measurements to determine prevalence of wasting, underweight and stunting were taken. In addition, structured questionnaire to gather socio-demographic information, focus group discussions and in-depth interviews with key informants were conducted to identify risk factors. Anthropometric data was analyzed on WHO Anthro 2005. Beta version Feb 17th 2006 software. Descriptive statistics, Pearson Chi-square test of association and binomial logistic regression were analyzed on Software for Social Scientists (SPSS) Version 20 to determinant the predictors of malnutrition. Qualitative data was analyzed using the grounded theory approach to develop themes related to research question. Triangulation of qualitative and quantitative data was done to draw conclusions. The study found that 15.3% of children were wasted, 22% underweight and 14.3% stunted. Child illness two weeks before the study, low birth weight, gender, family income and maternal education were significant ($p<0.05$) factors associated with malnutrition. The study alluded to existence of malnutrition among the study population. Building capacity for staff working at Mbagathi to provide evidence-based interventions and create awareness on malnutrition, stakeholders' engagement to strengthen nutrition care and support, enhancing girl-child education and a pro-poor policy are recommendations that have the ability to impact on malnutrition.

CHAPTER ONE

INTRODUCTION

1.1 Background information

Malnutrition despite being a preventable disease consistently contributed to the burden of diseases among children admitted at the children's ward in the hospital. To generate an in-depth understanding of factors contributing to the observed burden of malnutrition a mixed method of data collection was adopted combining the strength of quantitative or “hard science" with the subjective aspect of qualitative study method.

The term malnutrition has no universally accepted definition and technically includes under-nutrition and over-nutrition, which is used to describe an insufficient, excessive or imbalanced consumption of nutrients resulting in a measurable adverse effect on body composition, function and clinical outcome (Saghir Ahmad, 2015). Under-nutrition encompasses a range of conditions including acute malnutrition, chronic malnutrition and micronutrient deficiencies occurring when an individual does not consume enough food that has the right balance of basic food groups (Reinhardt & Fanzo, 2014). Though over-nutrition is becoming a concern in many developing countries of the world, under nutrition remains of great concern (Tzioumis & Adair, 2014). The study on prevalence and determinants of malnutrition will focus mainly on under-nutrition and the word “malnutrition” will be synonymous with under nutrition.

Though prevalence of malnutrition seems to be declining globally, nearly a billion people still suffer from malnutrition worldwide translating to one in every nine people being malnourished (FAO, 2010). In 2013, 51 million children were moderately wasted and 17 million severely wasted representing a global prevalence of 8% and 3%, respectively, 161 million children were stunted with Sub-Sahara Africa (SSA) accounting for 36% of global burden (Kramer & Allen, 2015).

Developing countries of SSA and Asia have seen little progress against malnutrition. A joint UNICEF, WHO and World Bank report 2012 indicated that developing countries are home to over 90% of global burden of malnutrition (UNICEF et al 2012). Conversely, of the 34 countries in the world with high burden of malnutrition, 22 are in Africa content (Onis, 2013) where 42% of children in Sub-Saharan Africa are stunted (Bain et al., 2013).

As a result, malnutrition has been described as both a consequence and a determinant of under development (Bain et al., 2013a). In Kenya, the prevalence of malnutrition remains relatively high. According to the most recent Demographic and Health Survey (KNBS-GOK, 2014) stunting in children below five years is estimated at 26%, wasting at 4% and 11% underweight portraying a slight reduction from previous surveys. However, despite apparent reduction Kenya still portrays a wide variation in distribution of malnutrition with counties of West Pokot, Kilifi, Mandera and Bomet posting high rates of stunting above 35%. Nyeri and Kiambu had the lowest prevalence rates of less than 16% (KNBS-GOK, 2014).

In Nairobi, where the study focused, it is estimated that more than 60% of the population resides in the informal settlements (Korir, 2013). Rapid urbanization evidence (Pridmore, 2011) has shown normally outpace the ability to build essential infrastructures resulting to widespread social inequity and stratification subjecting the inhabitants to social constraints and increasing vulnerability and degradation (Olack et al., 2011). Mbagathi hospital draws most of clientele from the informal settlements of Kibera, Embakasi and Dagorreti. These setting are characterized by high rates of unemployment, poor sanitation, and inadequate health services. Consequently these factors impact on household food insecurity and disease burden heightening the risk of malnutrition (Abuya et al., 2012).

Malnutrition in children takes the form of stunting, wasting or underweight (UNICEF et al., 2012). Children are considered stunted when height for age is less than minus two standard deviation for moderate and less than minus three standard deviation for severe stunting in comparison to the reference population (UNICEF, 2013a)

Wasting defined as low weight for height is an indication of acute malnutrition Wasting is associated with heightened risk of disease and death in children accounting for 7.4% of global mortality (Munthali et al., 2015). Children become wasted when they lose weight usually as a result of a combination of infection and poor diet limiting absorption and utilization of available nutrients (WHO, 2010). Other causes of wasting include high rates of infection with poor access to timely and affordable health care, inadequate feeding and caring practice, as well as poor household food safety (UNICEF, 2013a).

Underweight defined as weight for age that is less than two standard deviations in comparison to reference population is a combination of low weight for age and low height for age when compared to the reference population (Mushtaq et al., 2012). Underweight captures two dimensions of child growth and is mostly used to approximate the magnitude of malnutrition ((Subramanyam et al., 2010).

Conceptual framework on malnutrition identified pathways through which malnutrition manifests in children under five years. Inadequate dietary intake coupled with diseases are considered the immediate risks factors (Ahmed at el., 2013). Poor socio-economic status, household food insecurity, inadequate sanitation and inaccessible health care create vicious cycle condemning of malnutrition (Ihuoma, 2015). At the basic level are the multifaceted root causes; cultural barriers, political and socio-economical structures and religious ideologies that work in tandem to influence community and households ability to access to good nutrition (Nisbett, at el., 2014).

1.2 Statement of the Problem

Despite adequate nutrition being a basic human right, globally it remains an unmet need (Bhutta et al., 2013). Malnutrition in children contributes to over a third of child mortality, accounting for approximately 35% of the disease burden and 11% of disability adjusted life years (Cossio et al., 2012). Malnutrition weakens the immune system, putting children at higher risk of more severe, frequent and prolonged bouts of illnesses. Pneumonia and diarrhea remain major killers of young children with malnutrition accounting for at least 29% of deaths (WHO, 2013). A severely stunted child faces a four times heightened risk of dying, while a severely wasted child has nine times higher risk of death compared to a well-nourished child (WHO, 2014). The synergetic and cyclic role played by malnutrition and infection inhibits the immune response exacerbating an already diminished health status (Rodríguez et al., 2011). In adulthood, malnutrition is thought to play a critical role in development of lifestyle related diseases subsequently increasing the risk of premature death (Moore, 2017).

Having worked at Mbagathi district hospital for over 10 years, the researcher witnessed a high prevalence of morbidity related to malnutrition in children below five years. The table below presents data from the in-patient on management of Severe Acute Malnutrition from April to August 2015. A total of 288 children were attended to in the pediatrics wards during this period. The results acknowledge the existence of burden of malnutrition, emphasizing the need to investigate factors associated with malnutrition (Table 1.1).

Table 1:1 In-patient monthly admissions of children with severe acute malnutrition at Mbagathi hospital from April to August 2015

Gender	Male		Female		Male		Female		Male		Total		Grand Total
Age in months	<6		< 6		6-59		6-59		>60				
Category	O	N	O	N	O	N	O	N	O	N	O	N	
April	8	0	5	0	3	12	4	17	0	0	20	29	49
May	0	3	0	3	4	19	1	14	0	0	5	39	44
June	3	0	2	1	8	12	6	16	0	0	19	29	48
July	0	3	0	4	9	25	10	24	0	0	19	58	77
August	0	6	0	3	15	21	13	12	0	0	28	42	70

Courtesy of Medical Superintendent Mbagathi District Hospital

Key:

O- Old (Patients in the ward at the beginning of the month)

N-New (admission during the months)

1.3 Justification of the study

Given the significance of the above statistics, undertaking the study at Mbagathi hospital helped to identify factors that contribute to malnutrition and provided practical evidence to support nutritional interventions. Well-baby clinic provided an ideal place to conduct the study because it provided a wide clientele base of both mothers and children presenting for routine check-up and immunization within the hospital.

1.4 Research Questions

1. What is the prevalence of malnutrition in children aged 6 to 24 months attending a WBC at Mbagathi hospital?
2. What is the effect of childhood illnesses on nutritional status of children aged 6 to 24 attending a WBC at Mbagathi hospital?
3. What is the effect of feeding practice on nutritional status of children aged 6 to 24 months attending a WBC at Mbagathi hospital?
4. How do maternal socio-economic factors affect nutrition status of children aged 6 to 24 months attending a WBC at Mbagathi hospital?

1.5 Objectives

1.5.1 Broad objective

To determine prevalence and identify contributing factors to malnutrition among children aged 6 to 24 months attending a well-baby clinic at Mbagathi hospital, Nairobi.

1.5.2 Specific objectives

1. To determine the prevalence of malnutrition among children aged 6 to 24 months attending a well-baby clinic at Mbagathi hospital
2. To determine the effects of common illnesses on nutrition status of children aged 6 to 24 months attending a well-baby clinic at Mbagathi hospital
3. To determine the effects of feeding practices on nutrition status of children aged 6 to 24 months attending a well-baby clinic at Mbagathi hospital
4. To determine effects of maternal socio-economic factors on nutrition status of children aged 6 to 24 months attending a well-baby clinic at Mbagathi hospital

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction to literature review

The first two years of life are a critical stage for child growth and development as nutritional deficiencies occurring during this time lead to irreversible damage (Ravi, 2016). Actions targeting this age group have the greatest benefits and have been viewed as “a window of opportunity". This chapter presents a review of the literature that has been studied in similar contexts, and looks at factors that influence malnutrition as defined in the UNICEF conceptual framework on causes of malnutrition which are classified as immediate, underlying and basic factors. Also included are studies on nutritional and non-nutritional interventions that have been implemented globally with positive impact on malnutrition. The chapter concludes by providing a conceptual framework illustrating the relationship of study variables.

2.2. Global distribution of malnutrition

Globally, malnutrition appears to be declining though still unacceptably high with close to one billion people malnourished (Food and Agriculture Organization of the United Nations, 2010). In the past two decades levels of stunting has declined from 39.6% to 23.8%, (255 million to 159 million) from 1990 to 2014 while prevalence of overweight increasing over the same period from 4.8% to 6.1% (3.1 million to 4.1 million). Asia has seen a steady decline almost reducing prevalence of stunting by half (47.6 to 25.1%). In Africa though prevalence of stunting declined from 42.3% to 32.0%, the number of stunted children has instead increased from 47 million to 58 million (UNICEF & Bank, 2014).

2.3. Distribution of malnutrition in Sub-Sahara Africa

Sub-Sahara Africa is the only part of the world that has continued to experience high malnutrition, of the 800 million malnourished people in the world, 204 million are found in SSA (Bain et al., 2013a). SSA has been considered as home to the world most nutritionally insecure people (Fanzo, 2012). For instance, in 2011, 1 in 3

children in SSA was stunted and boys were more likely to be stunted than girls (UNICEF, 2013). A meta-analysis of 32 Demographic and Health Survey (2006-206) conducted in SSA to estimate the prevalence of child under nutrition, the study found high rates of malnutrition compared to WHO millennium development goals 2015 targets. Counties in Eastern and Western part of the continent had the highest rate of malnutrition. Burudi had the highest rates of stunting and underweight at 57.7% and 28.8%, respectively. Niger had the highest rate of wasting at 18.0% (Akombi et al., 2017).

2.4. Distribution of malnutrition in Kenya

The recent Demographic and Health Survey conducted in 2014 indicates that 26% of children are stunted, 4% wasted and 11% underweight,(National Bureau of Statistics-Kenya and ICF International, 2015). This is an apparent reduction from previous survey in 2008/9 where 35% of children were stunted, 6.7% wasted and 16.1% underweight (KNBS and Macro, 2010). In spite of this reduction, Kenya portrays a wide variation in rates of malnutrition with marginalized counties of Kilifi, Mendera, Turkan and Boment posting high rates of stunting that is above 35%. Nairobi, Kiambu have the lowest stunting rates of less than 16%, North Eastern has highest rates of wasting and underweight at 13% and 19%, respectively (KNBS, 2014).

2.5. Risk factors for malnutrition

The UNICEF conceptual framework on malnutrition provides a tool for analyzing the multiple and interrelated factors that act in synergy to determine children's nutritional outcome (Danida, 2009). Three levels of determinants of malnutrition have been identified; at the basic level are the deep rooted factors that influence socio economic, political, environmental, cultural and religious ideologies that determine resource availability and utilization (Morteza et al., 2017). The underlying factors (WHO, 2009) are the socioeconomic, biological and behavioral factors that act at the family and community levels influencing household food security, social and child care, access to health care and the health of living environment (Solar & Irwin, 2010). The immediate influences are factors that determine dietary intake and disease presence and act directly on an individual to determine the nutritional status

(Pal et al., 2017). In particular, child inherent characteristics, maternal factors, immediate living environments, vaccination status, food supplementation as well as dietary diversity (Abubarkar et al., 2011). Figure (2.1) adapted from UNICEF summarizes the interrelated factors that directly influence malnutrition.

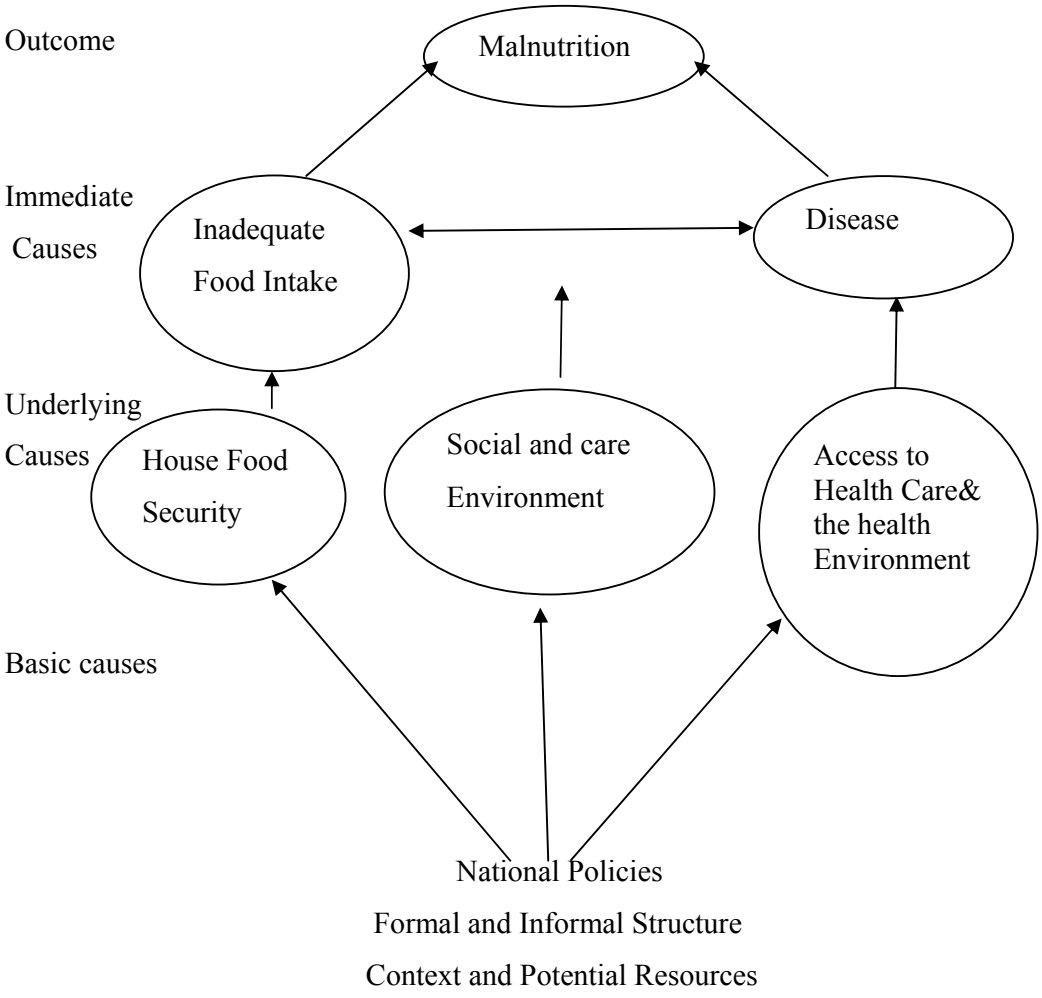


Figure 2.1: UNICEF conceptual framework on causes of malnutrition.

Adapted from UNICEF (2009)

The model highlights the complexity of the multiple causal elements that act at different levels to influence the nutritional outcome. It provides a broader understanding of factors impacting on the nutrition status, emphasizing the need to look beyond food needs of a population and address other factors that directly influence health (UNICEF, 2013b). Of importance is incorporating access to health

care, cultural practices, behavioral factors and gender issues into nutritional programming and embrace a more collaborative approach in addressing malnutrition (Solar & Irwin, 2010).

2.5.1. Immediate causes of malnutrition

Inadequate food intake manifests when there is a difference between the amount of nutrients absorbed by the body and the amount required (Brhane & Regassa, 2014). This can result from consumption of inappropriate diet in quality and quantity or having an infection that increases body nutrient requirement, altered intestinal absorption or sequestration of nutrient required for tissue synthesis and growth (Rodríguez et al., 2011). For instance, malnutrition and infection are often related with malnutrition, increasing the risk of infection, while infection contributes to malnutrition leading to a vicious cycle known as infection-malnutrition cycle (Rodriguez-Morales et al., 2015) as demonstrated in figure 2.2.

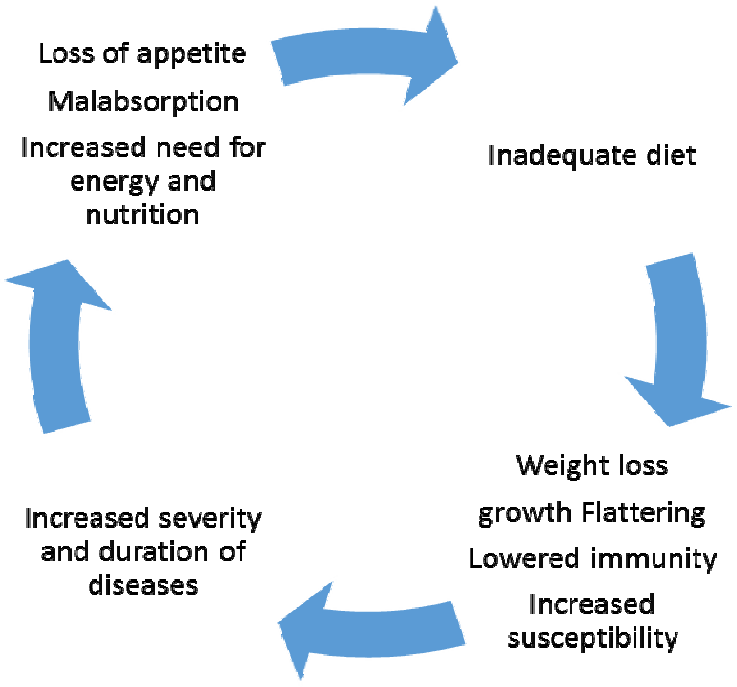


Figure 2.2: Illustration of infection-malnutrition cycle

Adopted UNICEF & WHO, 2015)

Diarrheal diseases, respiratory conditions and malaria have been identified among the most important childhood morbidities associated with under nutrition (Lassi et al., 2014).

Diarrhea, defined as 3 or more loose stools in 24 hours, causes about 30-50% of deaths in children in developing countries (Lamberti, et al., 2012). In children, the risk of death due to persistent diarrhea is related to lack of breastfeeding, systemic infections, malnutrition and young age (Rodriquez et al., 2011).

Persistent diarrhea contributes to a vicious cycle between nutrition, poverty, poor hygiene, environmental contamination, inappropriate feeding practices and early weaning. The association between the immune system and the gut is an important factor in the development of malnutrition which is compounded by poor health seeking behavior and inaccessible health services (Webair & Bin-Gouth, 2013).

The peak incidence for diarrheal disease is the second half year of infancy, when intake of complementary food starts to replace breast milk (Ogbo et al., 2017). There is also increasing recognition that optimal complementary feeding does not only depend on what is fed, but on how, when, where and by whom the child is fed (Engle & Pelto, 2011).

As well, strong and consisted association has been demonstrated between malnutrition and mortality from respiratory infections (Rodriguez et al., 2015). Acute respiratory infections (ARIs) are a leading cause of high mortality and morbidity among children below five years (Asghar et al., 2017). Risk factors associated with respiratory infections include poverty, low socio-economic status, low parental education, lack of breastfeeding and most important, malnutrition (Ujunwa & Ezeonu, 2014).

The association between malaria and malnutrition has been recognized as important cause of morbidity and mortality in children below five years (Shikur et al., 2016). For example, children who are underweight have an increased susceptibility to malaria probably from reduction in the function of the immune system (Kwena & Wakhisi, 2012). In addition, an undernourished child may not be able to mount an

appropriate immune response to the malaria parasite due to reduction in T lymphocytes, impairment of antibody formation, atrophy of thymus or other lymphoid tissues (Rytter et al., 2014).

2.5.2. Underlying causes of malnutrition

Underlying factors for malnutrition are suboptimal household food security, poor child care practices, inadequate access to health services and unhealthy living environment (Tette et al., 2015). These factors are interrelated and act singly or in combination to influence nutritional outcomes (Ihuoma, 2015). Therefore, efforts to address malnutrition require addressing all these categories together to create a synergistic effect (UNICEF, 2015).

Households are regarded as food secure when everyone has access to enough food at all times to meet dietary requirements from either own production, purchase or food safety net programming (Simon, 2012). Moreover, one must consider the capacity of the body to utilize the food eaten, which is dependent on adequate knowledge on food nutrient, child care practices, health and sanitation (WHO, 2015).

Child care practices identified as underlying factor to malnutrition include how well their needs are articulated. Inadequate care is associated with disease incidence and increasing the magnitude of malnutrition (Bain et al., 2013b). For example, children under five years are regarded as vulnerable and require special attention (Kassahun et al., 2013). In turn, care practices are dictated by cultural values and available resources such as income, time and knowledge (Alonso, 2015). Women's education and status in the community is a critical determinant of nutritional wellbeing and care given to children (Senbanj et al., 2013). Education gives women a sense of empowerment and confidence to make decisions regarding their health and that of children (Osamor & Grady, 2016).

Child feeding practices, a component of child care is another underlying determinant of malnutrition (Zhou et al., 2012). Infant and young children feeding practices recommend early initiation of breastfeeding within one hour of birth, exclusive breastfeeding for the first six months of life, introduction of adequate and appropriate

complementary feeding for up to two years (Salim et al., 2014). In Kenya for example, introduction of other types of feeds is common to children below six months. A study assessing optimizing WHO guidelines in infant and young children feeding practices in the urban slum of Nairobi in Kenya concluded that though mothers had the knowledge on appropriate breastfeeding the living conditions could not allow them to exclusively breast feed their children and early initiation of other food was common (Kimani-Murage et al., 2015). These practices have a deleterious effect on child nutrition, because other foods are inferior to breast milk (Mitchodigni et al., 2017). Furthermore, the practice is associated with the introduction of pathogens, increases the risks of diarrheal diseases, and in turn increasing the chances of children becoming malnourished (Saleh et al., 2014).

Though appropriate infant and young child feeding is a prerequisite for optimal child growth and development (Duan et al., 2018), globally only about 35% of children are exclusively breastfed for the first 6 months of life (Maonga et al., 2016). A study on maternal education to support complementary feeding observed that children of mothers who received nutritional counseling were associated with improvement in both height and weight (Imdad et al., 2011).

Even when children have access to adequate nutrition, living condition can determine nutritional status. A cross-sectional study in Western Uganda a place referred to as "the bread basket" found unequally high rates of malnutrition. Stunting which is regarded as chronic form of malnutrition was estimated at 46% against a national prevalence of 47.8%. These are regarded as very high considering the availability of food. Inadequate water and sanitation, poor feeding practices and inadequate nutrition knowledge were the underlying determinants (Kikafunda et al.,2014).

Another essential element that impact on nutrition outcome is quality of health care, its accessibility and affordability to both curative and preventive health services (Levesque et al., 2013). Diseases lower children appetite while food ingested is not fully utilized contributing to growth retardation and reduced immunity leading to malnutrition (Rytter et al., 2014). Improving living environment, access to safe

drinking water and sanitation are critical in disease control and nutrition status of children (UNICEF, 2013a).

2.5.3 Basic determinants of malnutrition

Political, economic, legal and ideological factors (religion, cultures and tradition) have an effect on people's efforts to attain good nutrition. These include the degree of women's and girls' rights and how they are protected by law and customs (Smith & Haddad, 2015). Basic factors reflect how much resources women are able to control and define political and economic structures that influence women's empowerment, income and assets distribution in the household (Makoka, 2013).

Evidence, (Liverani et al., 2013) correlates economic, political, social and ideological contexts with resource utilization. Overcoming entrenched poverty and under-development requires knowledge, skills and resources which refer to greater and better targeted resources and improved collaboration between development partners at all levels (Carothers & Brechenmacher, 2014). Of greater importance is the inclusion of the poor as major partner in the decision making process concerning their wellbeing (Adamkovič & Martončik, 2017).

Nutrition has been recognized as a basic pillar for social and economic development (Daba et al., 2013). Furthermore, social inequality has been known to reduce social cohesion, weaken local institutional governance and accountability increasing social conflicts rendering such basic services as health infrastructure, social security, water and sanitation inaccessible to the majority of the population (Peterson, 2017). Malnutrition reflects government failure to meet the basic human right of its people to adequate food and nutrition (UNICEF, 2013a). In retrospect, inadequate investment in human capital results in reduced national productivity and increases poverty levels. Actions to reduce current rates of under-nutrition will involve more than just the usual numbers of potentially disparate interest, often working with imperfect and asymmetric information and power. It will necessitate the inclusion of many actors working in concerted efforts to address particular gaps in health, food, sanitation, social protection and most important, women empowerment (Thomson et al., 2015).

2.6. Nutritional and non-nutritional interventions

Food, health and care are prerequisite for good nutrition (UNICEF, 2013a). In turn, these prerequisites are underpinned by social, economic, political, environmental, cultural and religious structures that govern how food, health and care are accessed. Children 6 to 24 months present a unique challenge in regard to nutritional requirements. Inadequate nutrition leads to growth faltering and increased risk of mortality and overall diseases burden (Salam etal., 2015). To prevent malnutrition in children, (Burchi., 2011) advocate access to affordable and diverse nutrient-rich food, appropriate child-care, adequate health services, a healthy living environment including safe water and sanitation. Promotion of optimal breastfeeding, introduction of appropriate and timely complementary feeding, micronutrient supplementation, child care and hygienic environment are feasible measures to prevent malnutrition (Saleh et al., 2014).

Exclusive breastfeeding has been identified as an unequalled way of providing the ideal food for the healthy growth and development of infants and also as an integral part of the reproductive process, which has important implications on the health of mothers and child (Duan et al., 2018). Setegn and colleague stress the importance of exclusive breastfeeding for 6 months as the only optimal way to feed infants because breast milk is wholesome and provides all the energy and nutrient that the infant needs during the first months of life (Setegn et al., 2012). Besides, breast milk promotes sensory and cognitive development and protects the infant against infectious and chronic diseases. While breastfeeding is advantageous the world over (Amosu et al., 2011) it may be argued that it is particularly more important in the developing countries. First, because families are generally poorer, second, because health services are less adequate, and third, because of the generally hazardous environment (Cai et al., 2012). Consequences of poor breastfeeding practices are increasingly being recognized. Evidence (Yotebieng et al., 2013) from reviewed studies in developing countries show that infants who are not breastfed are 6 to 10 times more likely to die in the first months of life than infants who are breastfed. In addition, diarrhea and pneumonia are common and more severe in children who are artificially fed accounting for many of these deaths.

While exclusive breastfeeding provides nourishment and protects children from infection, children need additional or 'complementary' food from about six months of age to ensure good health, growth and development (Dewey, 2013). The target age range for complementary feeding is generally taken to be 6 to 24 months of age though breastfeeding may continue beyond two years (Cai et al., 2012). Appropriate complementary foods should aim to provide sufficient energy, protein and micronutrient to cover a child's energy and nutrient requirements (Mitchodigni et al., 2017). To provide successful complementary feeding, evidence (Fabrizio et al., 2014) advocates the use of good quality, locally available and affordable diet supported by adequate nutritional education.

Alongside food intake and health services, children also require care for survival, growth and development (Elder et al., 2014). Child care is a complex set of behaviors that range from child feeding practices, responses that promote a safe and healthy environment, psychosocial interactions and emotional support. Child care behaviors affect children's nutritional outcomes by influencing nutritional intake and disease incidences (Chege et al., 2015). Child care practices are influenced by care giver individual characteristics, the demographic characteristics of the household and the socio-support received from her family, community and the larger policy environment (Chege et al., 2015). In particular, child care is closely linked to women's status in the society, responsibilities, power and education that determine their autonomy and decision making (Osamor & Grady, 2016).

Quality health care that encompass a component of treatment and prevention of diseases equally affects nutrition status of children. An essential element of good health care is access to affordable, good quality curative and preventative health services and a healthy household environment (Levesque et al., 2013). Effective treatment can reduce the duration and the severity of infection and lower the risk of spreading the disease and increased risk of malnutrition (Unicef, 2013). Unfavorable environment as a result of inadequate water and unsanitary disposal of waste can increase the probability of infectious diseases and indirectly influence nutritional outcomes in children with a bias to malnutrition (WHO, 2010a).

Other forms of non-nutritional interventions like agriculture and major development in technology of food production can lead to drastic increase in food availability across the globe (Food and Agriculture Organization of the United Nations, 2010). The adaption of biotechnology and bio-fortification as pathways to increase quality and quantity of food production in agriculture especially in developing countries where malnutrition is a major concern is promising (Gillespie & van den Bold, 2017).

Social transfers to protect the chronically food insecure and promote improved livelihood can be complementary to investment in agriculture (Devereux, 2016). Through their regularity and predictability, social transfers can insure the poor against shock and stresses associated with food insecurity (Wible, 2013).

The different rights, responsibilities and access to decision-making of women and men need to be understood in an effort to improve nutrition (Osamor & Grady, 2016). While women's reproductive, productive and social roles are nutritionally taxing, (Bhutta et al., 2013) advocate inclusion of interventions that can enhance gender equality. For example, enabling women gain access to new resources; implementing social transfer programs that promote girl's education and health care; introducing technologies that reduce household labor and subsidizing child care for working parents.

Kenya is one of the developing countries in the world with a high prevalence of Malnutrition. The study at Mbagathi hospital to determine prevalence and risk factors for malnutrition of children at well-baby clinic will provide baseline information required to improve the quality of care by incorporating evidence-based interventions.

2.7. The conceptual framework for the study variables

The conceptual framework demonstrates variables for this study. The framework illustrates the relationship of child specific characteristics and maternal characteristics that act either directly or indirectly (through intervening variables) to influence children nutrition status (Fig.2.3).

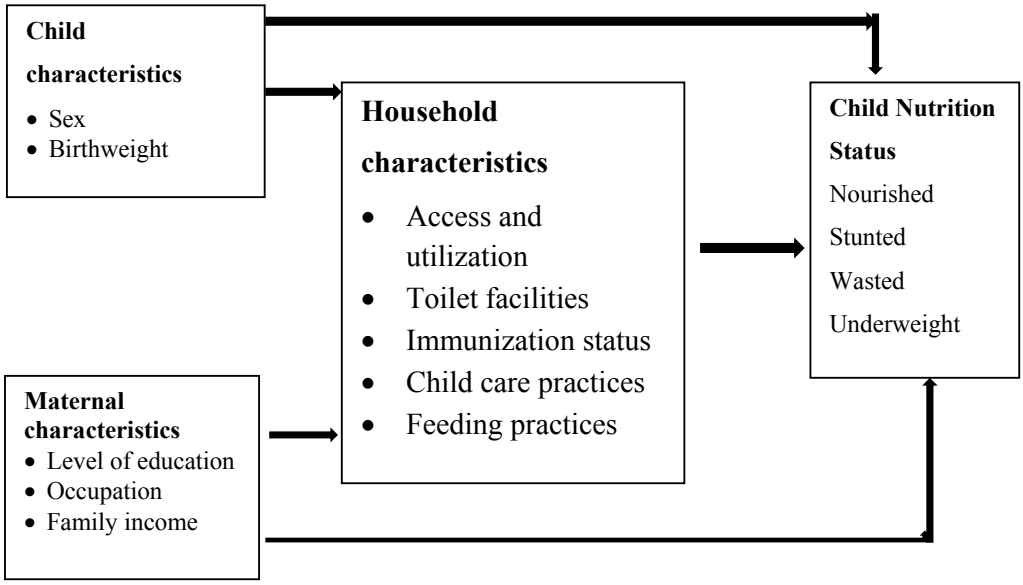


Figure 2.3: Conceptual framework developed for study variables

CHAPTER THREE

MATERIALS AND METHODS

3.1 Study area

The study was carried out at Mbagathi Hospital in Nairobi at the well-baby clinic. Mbagathi Hospital is one of the three public hospitals in Nairobi County and is situated in Dagoretti Division about 3 kilometers from the City Centre. Mbagathi hospital provide services at level 4 according to the government of Kenya classification of health care system and has both in and out patients. Services offered in the facility include Maternal Child Health, Reproductive Health, Internal Medicine and General Surgery.

3.2 Study design

A cross-sectional descriptive study using a mixed method of data collection applying the principles of two well-developed distinct strands of data collection (quantitative and qualitative) each complete with its own data collection tools, data analysis and inferences. Quantitative research design follows a systematic form of investigation using questions that have measurable variables with the aim of explaining, predicting or controlling (Nyklícek, 2012). Equally, qualitative form of study design employs an interpretivist approach and is concerned with the social environment (Lawrence & Tar, 2013).

3.3 Study population

- Children aged 6 to 24 months attending the well-baby clinic (WBC) at Mbagathi Hospital and who met eligibility criteria.
- Mothers of the children aged 6 to 24 months who gave their consent to participate were recruited as respondents to questionnaires.
- Mothers of children aged 6 to 24 months who participated in focus group discussions

- Health care workers with one year or more of clinical experience working at the well-baby clinic and who gave consent participated as key informants.

3.3.1 Inclusion criteria for quantitative data

- Children aged 6 to 24 months visiting WBC at Mbagathi hospital for routine health services.
- Mother of children aged 6 to 24 months who gave their consent to participate in the study.

3.3.2 Exclusion criteria for quantitative data

- Children aged 6 to 24 months whose mothers declined to participate in the study
- Mothers of children aged 6 to 24 months who did not give their consent to participate.

3.4 Sample size determination for quantitative data

Using Cochran formula, (Cochran, 1977) a sample size was determined based on Kenya national prevalence of stunting which was estimated at 26 % (National Bureau of Statistics-Kenya and ICF International, 2015).

Cochran formula: $n=z^2 (pq)/e^2$

$$n=1.96 \times 1.96 \frac{(0.26 \times 0.74)}{0.05 \times 0.05}$$

$$n=295.649$$

$$n=300$$

n= Sample size

z= Linked to 95% confidence interval (1.96)

p= Expected prevalence (as fraction of 1) (0.26)

q= 1-P (expected non-prevalence) (0.74)

e^2= Desired precision of 0.05 for this study.

3.5 Sampling procedure for quantitative data

The study was conducted over a period of 2 months from 23rd November 2015 to 26th January 2016. Based on previous clinic attendance of 300 children per months, a purposive sampling of study children was employed. Every morning, the principle investigator picked the first who met inclusion criteria child randomly and there after every child who met inclusion criteria and whose mother consented to participate was enrolled to the study. This process was commenced every Monday to Thursday of every week until all the 300 children were enrolled.

3.6 Study variables

3.6.1 Dependent variables

Dependent variables were defined as wasting, underweight and stunting measured by weight-for-height z-scores (WHZ<-2SD), weight-for-age z-scores (WAZ<-2SD) and height for age z-scores (HAZ<-2SD), respectively. The z-scores were calculated based on WHO growth standards on WHO Anthro 2005 which was developed by World Health Organization in 2006 specifically to aid calculations of age specific z-scores of children below five years. The variables were interpreted according to the deviations from the median of reference population of children who were studied under optimal conditions across the word.

3.6.2 Independent variables

Child characteristics; gender and birthweight and maternal characteristics; level of education, occupation and family incomes were direct independent variables. Household characteristics; water sources, toilet facilities, and household size; child

immunization status, diseases two week to interview, feeding practices and care practices indirectly influenced children nutrition status

3.7 Study tools

3.7.1 Questionnaires

A questionnaire was used to gather data on social demographic, child care practices, health seeking behaviors and household related factors that impacted on children's nutritional status.

The interview was conducted by the research team (the principal investigator and two research assistants) who were responsible for administering the questionnaire and entering all the data. The investigators read out the question to the participants and then documented the answer by either ticking, circling or writing the answer given by the participant on the space provided (Appendix 1)

3.7.2 Anthropometric measurements

Anthropometric measurements were conducted by the Principal Investigator (PI) and two research assistants, trained in all aspects of data collection procedures. The PI assisted by one research assistant took measurement of weight and height of every child enrolled while the second assistant recorded the measurements in the questionnaire. Unless there was gross disparity that required a third measurements, only two measurements were taken for every child and recorded.

3.7.3 Weight measurements

Infant electronic weighing scale model RCS-20 designed to take baby weight of up to 20 kilograms was used to take weight of all the children. Every child was weighed while wearing only a vest and no diaper. A clean nappy/clothing was placed on the weighing scale. Children 6 to 12 months were weighed lying supine while older children (above 12 months) were weighed seated on the scale. The weight was taken to the nearest 0.1kg.

3.7.4 Height/Length measurements

With the measuring board placed flat on the surface, every child whose height was 85cm and below was made to lie down on the board. By supporting the child's head with one hand and the trunk of the body with the other hand, the child was gradually lowered onto the measuring board. With cupped hands over child ear, the head was placed against the base of the board to ensure that the child looks up straight with line of sight perpendicular to the ground. The assistant laid the child flat at the center of the board with the knee firmly pressed against the board and foot piece placed firmly against the child's heel. Children whose height was above 85cm were measured standing on a height scale. The child stood straight on the board with knees firmly held against the measuring board. The head piece was lowered until the child head and measurements were taken. All the measurements were taken to the nearest 0.1cm.

3.7.5 Focus group discussion

A purposive sampling technique for the FGD was designed to pick a small group of mothers/guardians based on pre-determined criteria; these included their age, sex, socioeconomic status and their children's nutritional status. To get different perspectives, mothers were grouped and interviewed based on children nutrition status. One group consisted of mothers/guardians of malnourished children; by definition, children with anthropometric measurements that were below minus two standard deviation from the reference population were considered malnourished. The other group consisted of mothers/guardians of well-nourished children; by definition, children with measurements of minus two standard deviations and above from the reference population were considered well nourished. The aim was to identify particular characteristics and background factors that are associated with either the nourished or the malnourished children.

A brief introduction explaining the purpose of the study was provided and consent to participate acquired. The discussion was conducted in a well-ventilated room with adequate sitting space at the clinic to ensure that the participants were relaxed. The discussion was moderated by the PI who used an interview guide (appendix 11). One

of the assistants took notes of the discussion while the second one was responsible for operating the audio tape to ensure that recording was done for every session and debriefing the participants.

3.7.7 In-depth interviews

A purposive sampling technique for knowledgeable and experienced health care workers was used to identify and enroll Key Informants (KI). A small sample size of KI was determined based on required information. Two nutritionists, two nurses and one clinical officer were identified as KI based on pre-determined criteria.

It was easier to identify KI from interactions with staff during data collection at the clinic. Health workers who had worked at the clinic for more than one year and who consented were included to participate in the in-depth interviews.

The in-depth interviews with KI were conducted using an interview guide prepared for this specific activity (Appendix 111). The KI was approached by the PI and requested to participate in the in- depth interview. The investigators gave a brief explanation of the purpose of the study, the importance of the findings and how they were to be used to enhance clinical services at the health facility. Health workers who agreed to participate were taken through the key informant pre-set interview guide. The PI moderated the discussion while one of the assistants took short notes. The session was audio taped to enable the team to capture all the information provided.

3.8 Data management

Data management including all aspects of data planning, handling, analysis, documentation and storage took place throughout the study process. The rationale was to maintain a reliable data base that contained high quality information.

3.8.1 Data Entry and Validation

Data processing errors are errors that occur after data have been collected (Abedjan et al., 2016). To prevent such errors, the researchers ensured that all data collection tools were properly completed with required information at the end of each day. During data entry, the investigator conducted manual data checks for completeness and handwriting legibility, range and consistency to prevent impossible results, such as ages greater than stipulated in the study, and screening for outliers during data analysis. A double entry of the collected data into the computer program was conducted to reinforce data quality and credibility. Errors noted during this process were counter checked with the hard copies of the questionnaires and rectified. In addition, the computer programs used to analyze the data; WHO Athro 2005 and SPSS version 20 software have in built quality assurance systems that increases data validation.

For qualitative data, the moderator took note of any observation made during the interactions of FDG and Key Informants Interviews (KII) sessions. These observations were combined with short notes made by the assistant and tapes of recorded conversations. The information was then transcribed word for word, entered and coded into thematic areas. The information formed the basis for qualitative data analysis.

3.8.2 Data Backup and Storage

To preserve data, the PI was in charge of all data collection and storage. Once received, all data were entered into the computer for further processing and 3 copies of each data type made and stored in different location of the computer. Additionally, external hard disk that have capacity to back up the data was made, detached from the computer and kept in a secure place. The data was protected by password and only accessed by key research staff. Internet backup for final format of the data was made using FileFort Backup Software provided by Google. The backup is suitable for critical documents and could only be accessed through Google Account login and protected by password. All hard copies of the questionnaires and files generated during data analysis were kept secure from unauthorized access and safeguarded

from damage or loss at the study site. In addition, the researcher established an anonymous data file that helped identify each study participant. This file has been kept secure but can be made available to key staff and the local Ethical Regulating Committee (ERC), should there be need to reveal true identities of the participants.

3.8 Data Analysis and Presentation

3.8.1 Quantitative data

WHO Anthro 2005 Beta version Feb 17 2006 software was used for the analysis of children's nutritional status. The anthropometric indices were expressed in terms of z-scores (Height for Age, Weight for Height and Weight for Age) and reflected as adequately nourished, stunted, wasted or underweight in comparison to a reference population of well-nourished children provided by World health organization (Rutledge & Boyd, 2010). The z-scores (or Standard Deviation score) is the deviation of the value of the child measurements from the median value of the reference population, divided by the standard deviation of reference population;

$$\text{Z-score or SD-score} = \frac{\text{Observed value} - \text{Median reference value}}{\text{Standard deviation of reference population.}}$$

Z-scores were interpreted as normal when the calculations were $\geq$-2 standard deviations, moderate when they were -3 to <-2 standard deviations and severe, when the readings were <-3 standard deviations in comparison to the reference population of healthy children using data from across the world for all indicators.

Statistical Package for Social Scientists (SPSS) version 20 was used to analyze numerical and categorical data. After questionnaires were counter checked for completeness and legibility, double entry of all the data into SPSS computer program and database established for all variables. Descriptive statistics on demographic characteristics of respondents, socio-economic, household characteristics and characteristics of study children were analyzed. Measures of central tendencies, dispersion and percentages were analyzed and presented as tables and bar graphs. A cross-tabulation using Chi-square test of association was used to assess the

association between dependent variables; wasting, underweight and stunting and independent variables; demographic characteristics of respondents, socio-economic factors, child characteristics, feeding practices, and household characteristics. Chi-square values, degree of freedom and p-values described the association and significance level.

To determine the predictive factors, a binomial logistic regression was modeled. All variables that were found to be significant at bivariate level were entered into the regression model. The logistic regression model adapted for this study;

Let;

$$P1=Pr(y=1) \mid x=xi)$$

Then,

$$\text{Log } (P1)/ (1-Pr) = \text{Logit } (P1) = Bo+B1Xi$$

$$=P1/ (1-P1) = \text{Exp } (Bo+B1Xi)$$

$$=P1=\text{exp } (Bo+B1X1)/ (1+\text{exp } (Bo+B1Xi))$$

3.9.2 Qualitative data analysis

Qualitative data collection was conducted alongside quantitative data at the WBC. Data management and analysis followed grounded theory approach for qualitative study (Lawrence & Tar, 2013).Two members of research team manually transcribed recorded information, short notes and memos into word documents. The information was broken down line for line into small structures and coded independently. Common codes were merged to elicit broader categories which generated specific patterns addressing specific areas of research question. Developed patterns of categories were finally re-coded into emerging themes in line with research question. Themes relating to; description of malnutrition, breastfeeding practices, complementary feeding, balanced diet, child care practices, diseases and socio-

economic factors. Final analysis generated themes on factors related to malnutrition, use of direct quotes to emphasis respondents' opinions were included.

3.9.3 Triangulation and interpretation of study results

To draw conclusions and recommendations from the study, the two research approaches were triangulated to provide a richer and more enhanced result (Yeasmin & Rahman, 2012). For example, conclusions drawn from quantitative methods were triangulated and supported or dispelled using findings from qualitative research methodology. Use of direct quotes, references to specific FGD comments and conversation with KI were used to clarify quantitative results. The aim was to generate a report that is more encompassing and covers a broad range of explanatory on factors that impact on nutritional status of study children.

3.10 Ethical considerations

3.10.1 Informed consent

A written and informed consent from children's parents/guardians was obtained that detail the purpose of the study, focus study population, benefits of the study, risks involved and contacts of all relevant personality to whom clarification of the study can be sort.

3.10.2 Introduction to study purposes

Mothers/ guardians of the sampled children were taken through the research procedures that included the interviews process, confidentiality of the data collected and voluntarily nature of the study. On anthropometric measurements, the mothers/guardians were explained on the importance of taking the measurements and how they are related to the study, privacy and confidentiality and importance of weighing the child with minimal clothes.

3.10.3 Confidentiality of study participants

To protect the confidentiality of study participants, no names were entered into the questionnaire but every questionnaire was identified using a serial number. However, the principal investigator established a separate identification list that corresponds with serial numbers of every study participant. The rationale is that that the file can be made available to key research staff, and the local Ethical Review committee in case a need to reveal the true identify of study participant becomes necessary.

All data and information collected during the research process such as field notes, memory sticks, questionnaires, tapes, were kept in strict confidence and secure by the principal investigator. The principal investigator was in-charge of all correspondences and the security of study materials. Hard copies of the questionnaires, tapes, disks and files established during this process were kept secure in a cupboard under lock and key at study site by the PI, soft copies were secured by use of password and through authorized access only.

3.11 Ethical clearance

Ethical clearance to undertake the study was obtained from Scientific and Ethics Review Unit (SERU) at Kenya Medical Research Institute (KEMRI) (Appendix IV). Permission to undertake the study at the hospital was obtained from the hospital administration. The principal investigator had an introductory letter from the University.

3.12 Limitations of the study

- Being a facility based study would limit the generalizations of the research findings beyond the population under study.
- Data collected through the questionnaire relied on recall, which is subject to respondent bias.
- The subjectivity of focus group discussion limits reproducibility.

CHAPTER FOUR

RESULTS

4.1 Demographic characteristics

4.1.1 Demographic characteristics of the study respondents

Three hundred mothers of children aged between 6 and 24 months were interviewed using structured questionnaires. Table 4.1 presents the characteristics of the respondents. The mean maternal age was 26.99(± 5.21) years, and a third (33%) resided in Kibera. Majority of women (81%) were married in a monogamous marriage and only 0.3% were divorced. About three quarters (70.6%) of the mothers had attained either primary or secondary education, only 2.7% had no formal education. Most mothers were aged between 21 and 30 years (67%). The mean number of births per woman was 1.94(±1.047).

Table 4.1: Demographic characteristics of the respondents at Mbagathi hospital

Variable	n	Percentage (%)
Respondent ages in years (N=300)		
<20	30	10.0
21-30	201	67.0
31-40	64	21.3
>40	5	1.7
Place of residence of the study participants (N=300)		
Kibera	100	33.3
Embakasi	46	15.3
Highrise	33	11.0
Dagoretti	33	11.0
Others	88	29.3
Marital status of respondents (N=300)		
Single	53	18.0
Married	246	81.7
Divorced	1	0.3
Types of marriage (N=246)		
Monogamous	231	94
Polygamous	15	6.0
Mothers level of education (N=300)		
No formal education	8	2.7
Primary	109	36.3
Secondary	103	34.3
Tertiary	80	26.7
No. of births per mother (N=300)		
1	133	44.3
2	86	28.7
3	55	18.3
4	20	6.7
>5	6	2.0

4.1.2. Socio Economic characteristics of study respondents at Mbagathi hospital

Most women (44.3%) were housewives, 28% were engaged in small scale businesses, 19% were employed in private companies/organizations, 6% were government employees while 2.7% were engaged in other activities such as causal work (Table 4.2). Total family income had a minimum of Ksh. 2500 and a maximum of Ksh. 200,000 and a median of Ksh. 20,000 (IQR 20,000). Over half of the families (55.7%) had an income of Ksh.20, 000 and below, only 7.3% had total income above

Ksh. 50,000. Three quarters (71%) of families had a total monthly expenditure of less than ksh.20, 000. When mothers were asked how they could finance an unexpected emergency expenditure of Ksh 5,000, almost three quarters (71%) said they would finance from personal savings, 22% would borrow from families/friends and 7% said they would not be able to raise the money.

Table 4.2: Social Economic characteristics of study respondents at Mbagathi hospital

Variable	n	Percentage %
Mother's occupation (N=300)		
Housewife	133	44.3
Business	84	28.0
Civil servant	18	6.0
Private employment	57	19.0
Others	8	2.7
Family income per month in Kes. (N=300)		
≤10,000	59	19.7
10,001-20,000	108	36.0
20,001-30,000	63	21.0
30,001-40,000	27	9.0
40,001-50,000	21	7.0
≥50,001	22	7.3
Family expenditure per month in Kes. (N=300)		
≤10,000	81	27.0
10,001-20,000	132	44.0
20,001-30,000	64	18.0
30,001-40,000	20	6.7
40,001-50,000	4	1.3
≥ 50,001	9	3.0
Source of funding for emergency (Kes. 5,000) (N=300)		
Family savings	213	71.0
Borrow from family/friends	66	22.0
Would not (no definite source)	21	7.0

Key: Kes= Kenya Shilling

4.1.3 Household characteristics of the study population at Mbagathi hospital

Mothers were asked to give the number of persons in the household (adult and children. The mean household size was 4.19(±1.49) with a maximum of ten and minimum of two. Two adults and one child per house were the majority accounting for 64.3% with a mean of 2.23(± 0.781) and 1.96(± 1.072), respectively. Three quarters (75.0%) of households drew water from the public water tap and boiling was the most common form of treating drinking water (73.7%) (Table 4.3). Almost everyone households stored drinking water in clean and covered containers (96.3%). About half of respondents (48.0%) used the public pit latrine for human waste disposal. When asked if children wash hands before meals, 84.7% said that they always wash children's hand before taking any meals.

Table 4.3: Household characteristics of study respondents at Mbagathi hospital

Variable	n	Percentage
Source of drinking water (N=300)		
In house water tap	63	21.0
Public water tap	225	75.0
Purchase water from vendors	7	2.3
Others	5	1.7
Methods of treating drinking water (N=300)		
Use water guard	54	18.0
Boil	221	73.7
Others	25	8.3
Storage of drinking water (N=300)		
Clean open container	11	3.7
Clean closed container	289	96.3
Types of toilet facilities (N=300)		
In house flush toilet	74	24.7
Public flush toilet	72	24.0
Private pit latrine	10	3.3
Public pit latrine	144	48.0
Children hand washing practices (N=300)		
Always wash hands before meal	254	84.7
Wash hands sometimes before meal	46	15.3
Never washed hands	0	0.0

4.1.4 The characteristics of study children attending a well-baby clinic at Mbagathi hospital

Among the 300 study children, 51% were boys and 49% were girls. The mean age in months was 11.85 (±4.561) with a minimum of 6 and maximum of 24 months (Table 4.4). Approximately half of the children (56%) were below one year of age. The lowest birth weight was 1.0kg and the highest 4.5kg with a mean of 2.97kg (±0.495).

Table 4.4: Age in months and birth weight of children aged 6 to 24 months attending a well-baby clinic at Mbagathi hospital

Variable	n	Percentage (%)
Age in months (N=300)		
6-8	80	26.7
9-11	88	29.3
12-17	81	27.1
18-23	47	15.6
24	4	1.3
Birth weight in grams (N=300)		
<2500	56	18.7
≥2500	244	81.3

4.2 Breastfeeding practices

4.2.1. Breast Feeding Practices of children aged 6 to 24 months attending awell – baby clinic at Mbagathi hospital

Almost all the children (99.3%) in this study were breastfed at birth (Table 4.5). When mothers were asked to explain when their children were first put to breast, over three quarters (81.7%) said the breastfeeding was initiated immediately after birth, 15% of the children were breastfed within hours and 2.7% of the children were breastfed within days. Mothers who had undergone a caesarean section were most likely to delay the initiation of breastfeeding. Nearly all mothers (99.7%) fed their

children with colostrum. Only 0.3% of mothers said they discarded the first milk produced instead of giving to the children. At the time of the study, most of the children (80%) were still breastfeeding while the rest (20%) were no longer breastfeeding.

Table 4.5: Breast feeding practices of children aged 6 to 24 months attending well-baby clinic at Mbagathi hospital

Variable	n	Percentage (%)
Initiation of breast feeding at birth (N=298)		
Immediately	245	82.2
Within hours	45	15.1
Within days	8	2.7
Feeding with colostrum (N=298)		
Breastfed the child with colostrum	297	99.7
Discarded the colostrum	1	0.3
Child currently Breastfeeding (N=298)		
Currently breastfeeding	240	80.5
Currently not breastfeeding	58	19.5
Reason for stopping to breastfeed (N=58)		
Child old enough	8	13.8
Child did not want breast milk	9	15.5
Did not have enough breast milk	14	24.1
Others	27	46.6

4.2.2 Exclusive breastfeeding of children aged 6 to 24 months attending a well-baby clinic at Mbagathi hospital

Figure 4.1 presents the duration of exclusive breastfeeding of study children by months. Nearly three quarters (73%) of the children were exclusively breastfed for the entire recommended six months from birth, 18.3 were exclusively breastfed for less than six months while 8.7% were exclusively breastfed beyond the recommended period of six months. At least 0.7% of children were exclusively breastfed for less than 1 month. Water (46.3%), infant formula (6.3%) and uji (94.7%) were the common introductory foods given to the children. However, despite the impressive prevalence of exclusive breastfeeding (73%), levels of malnutrition observed is high. During routine maternal and child health services, health care providers should emphasis the importance exclusive breastfeeding in improving nutrition status of children.

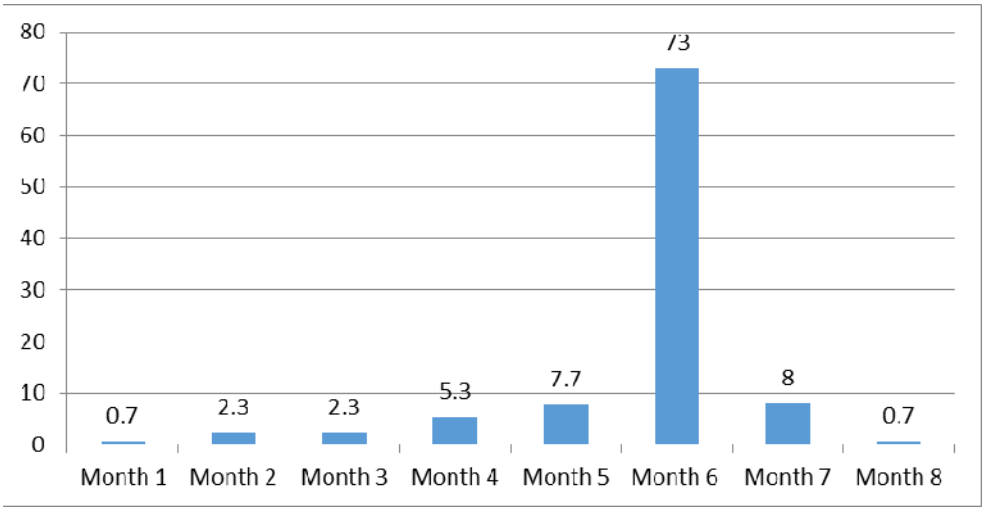


Figure 4.1: Age in months of exclusive breastfeeding period of study children at Mbagathi hospital

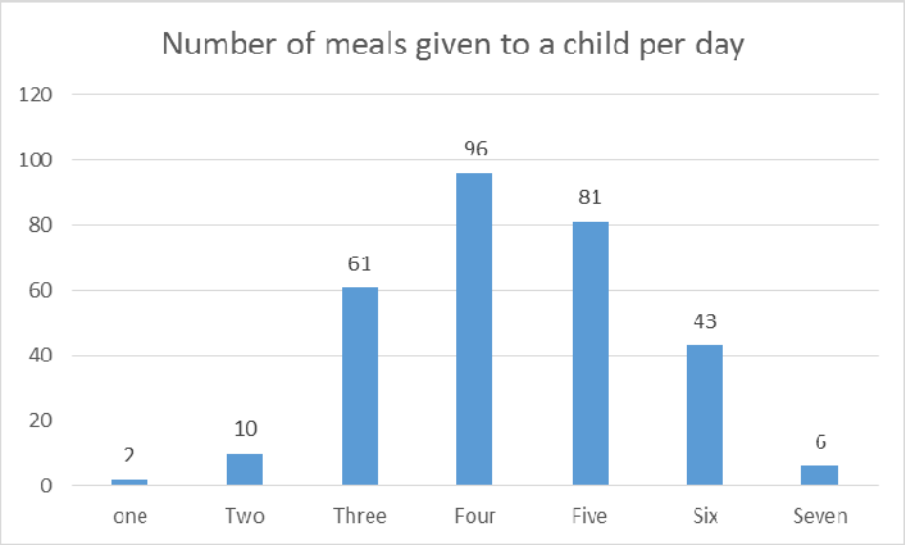
4.3 Complementary feeding

4.3.1 Common types of complementary foods given to children aged 6 to 24 months attending a well-baby clinic at Mbagathi hospital

Mothers were asked to select from a list of different types of food that are given to children as complementary food (Table 4.6). Cereal porridge was mentioned by almost every mother (94.7) as significant complementary food for their children, mashed bananas (76.3% and mashed potatoes (74.0%) were the second and third most preferred foods, respectively. More than half of all children were fed mashed fruits (69.0%). Infant formula was the least (6.3%) form of complementary foods. Most of children (32%) received four meals in a day (Figure 4.2).

Table 4.6: Types of complementary foods given to children aged 6 to24 months attending a well-baby clinic at Mbagathi hospital

Variable	n	Percentage (%)
Infant formula (N=300)	19	6.3
Animal milk (N=300)	222	74.0
Cereal porridge (N=300)	284	94.7
Mashed potatoes (N=300)	241	80.3
Mashed bananas (N=300)	229	76.3
Mixed fruits (N=300)	207	69.0



Number of meals per day

Figure 4.2: Number of meals per day given to children aged 6 to 24 months attending a well-baby clinic at Mbagathi hospital

4.4 Morbidity among children at aged 6 to 24 months attending a well-baby clinic at Mbagathi hospital

4.4.1 Illness in the two weeks preceding the study

Mothers were asked if the child had been ill the two weeks preceding the interview. Almost half of the children (47%) were reported to have been ill two week prior to study. Most common causes of illnesses were diarrhea (23.4%), vomiting (14.9%), fever (24.8%) and cough (22.0%). Other diseases mentioned were rickets, skin condition, pneumonia and malaria accounting for 14.9%. Among the sick children, three quarters (74.5%) sought treatment or advice on how to manage the ailment. The majority of the children were taken to a public health facility (69.5%), 14.3% were taken to private health facility, 15.3% bought drugs from drug stores while 0.9% consulted family/friends.

Table 4.7 Illness among children aged 6 to 24 months attending a well-baby clinic at Mbagathi hospital (previous two weeks)

Variable	n	Percentage (%)
Common morbidities (N=141)		
Diarrhea	33	23.4
Vomiting	21	14.9
Fever	35	24.8
Cough	31	22.0
Others	21	14.9
Facility where child taken for treatment (N=105)		
Public health facility	73	69.5
Private health facility	15	14.3
Pharmacy/chemist	16	15.3
Consulted family/friends	1	0.9

4.5 Prevalence of malnutrition

4.5.1 Prevalence of malnutrition of children aged 6 to 24 months attending a well-baby clinic at Mbagathi hospital

Prevalence of malnutrition among the study children is presented in Table 4.8. The prevalence of wasting (WHZ <-2SD) was 15.3%, with 4.7% severely wasted. The proportion of children who were underweight (WAZ <-2SD) was 22.0%, of whom 7.0% were severely underweight. The prevalence of stunting (HAZ <-2SD) was 14.3%, with 3.7% severely stunted. In all three forms of malnutrition (stunting, wasting and underweight), boys had a higher prevalence than girls.

Table 4.8: Prevalence of malnutrition among children aged 6 to 24 months attending well baby clinic at Mbagathi hospital

Cut-off points	Description	n	Percentage (%)
Weight for height Z-scores (N=300)			
<-3SD	Severe	14	4.7
-3SD to <-2 SD	Moderate	32	10.6
Weight for age Z-scores (N=300)			
<-3SD	Severe	21	7.0
-3 SD to <-2SD	Moderate	45	15.0
Height for age Z-scores (N=300)			
<-3SD	Severe	11	3.7
-3SD to <-2SD	Moderate	32	10.6
Prevalence of malnutrition by gender			
Weight for Height Z-scores			
Male (N=153)	Severe	9	5.9
	Moderate	19	12.4
Female (N=147)	Severe	5	3.4
	Moderate	12	8.8
Weight for age Z-scores			
Male (153)	Severe	13	8.5
	Moderate	30	19.6
Female (147)	Severe	8	5.4
	Moderate	15	10.2
Height for age Z-scores			
Male (153)	Severe	8	5.2
	Moderate	19	12.4
Female(147)	Severe	2	2.0
	Moderate	13	8.8

4.4 Bivariate analysis

4.4.1 Association of nutritional status on the gender of children aged 6 to 24 months attending a well-baby clinic at Mbagathi hospital

Children's nutritional status by gender (Table 4.10). Although the prevalence of malnutrition was evidently higher in boys (wasting 18.3%, underweight 28.1% and stunting 17.6%) than girls (wasting 12.2%, underweight 15.6% and stunting 10.8). Prevalence of underweight was statistically significant among boys (28.1%) than girls (15.6%) (p=0.018). Wasting and stunting were also higher among boys than girls, but the differences were not significant (p>0.05).

Table 4.9: Association of child gender on nutrition status of children aged 6 to 24 months attending well baby at Mbagathi hospital

Variable	WHZ<-2SD		WHZ≥-2SD		χ^2	Df	p- v
	n	%	n	%			
Gender							
Male (N=153)	28	18.3	125	81.7	2.23	1	0.327
Female (N=147)	18	12.2	129	87.7			
	WAZ<-2SD		**WAZ≥-2SD**				
Male (N=153)	43	28.1	110	71.9	8.056	1	0.018
Female (N=147)	23	15.6	124	84.4			
	HAZ<-2SD		**HAZ≥-2SD**				
Male (N=153)	27	17.4	126	88.9	2.157	1	0.142
Female (N=147)	16	8.9	131	89.1			

Key: WHZ=Weight for Height Z-scores WAZ=Weight for Age Z-scores, HAZ=Height for Age Z-scores

4.4.2. Association of Maternal education and nutrition status of children aged 6 to 24 months attending well-baby clinic at Mbagathi hospital

Low maternal education was significantly associate with malnutrition (Table 4.11). In all three forms of malnutrition, children whose mothers had low level of education were significantly associated with malnutrition with wasting ($\chi^2$26.921, p=0.001), underweight ($\chi^2$26.732, p=0.001) and stunted ($\chi^2$12.788, p=0.012). These finding are supported by findings of KIIs where lack of nutrition education was described as contributing factor to malnutrition. According to the clinical officer working at the clinic, *"poor and early complementary feeding were very common among the malnourished children, emphasizing the need for suitable feeding practices'*. A nurse working at the clinic emphasized the need to start nutrition education early during the antenatal period "nutrition *education should start early during the antenatal period so that mothers are aware of the available evidence based feeding practices for the infants and young children in order to prevent malnutrition"*.

Table 4.10: Association of maternal education on nutrition status of children aged 6 to 24 months attending a well-baby clinic at Mbagathi hospital

Variable	WHZ<-2SD		WHZ≥-2SD		χ^2	Df	P-v
	n	%	n	%			
Mothers' level of education (N=300)							
None	4	1.3	4	1.3	26.92	4	0.001
Completed primary	25	8.3	84	28.0			
Completed secondary	13	8.3	90	30.0			
Tertiary	4	1.3	76	25.3			
	WAZ<-2SD		**WAZ≥-2SD**				
None	4	1.3	4	1.3			
Completed Primary	34	11.3	75	25.0	26.73	4	0.001
Completed secondary	21	7.0	82	27.3			
Tertiary	7	2.3	73	24.3			
	HAZ<-2SD		**HAZ≥-2SD**				
None	3	1.0	5	1.7	12.78	4	0.012
Completed primary	23	7.7	86	28.7			
Completed secondary	11	3.2	97	30.7			
Tertiary	6	2.0	74	24.7			

Key: WHZ=Weight for Height Z-scores WAZ=Weight for Age Z-scores, HAZ=Height for Age Z-scores

4.4.3. The association of maternal occupation on nutrition status of children aged 6 to 24 months a attending a well-baby clinic at Mbagathi hospital

Table 4.12 presents the association of maternal occupation on children's nutritional status. The study found that though there was no significant association of maternal occupation on wasting and stunting ($p>0.05$); however, there was a significant association on low weight for age ($\chi^2$15.11, $p=0.048$). These findings are in contrast with what was observed at the clinic. For example, during focus Group discussion with mothers of malnourished children, the majority were either housewives, casual

laborers or run their own small scale businesses. In addition, work was largely seen as contributing to malnutrition whereby women are forced to leave their children in informal day cares. As one mother explained "*I exclusively breast fed my baby for six months, because I could not continue being at home, I took the child to a day care and went back to work. After only two months, my child who was previously crawling stopped, when I took him to the hospital, I was told he was suffering from malnutrition, I stopped working and now he is better*".

Table 4.11: Association of maternal occupation on nutrition status of children aged 6 to 24 months attending a well-baby clinic at Mbagathi hospital

Variable	WHZ<-2SD		WHZ≥-2SD		χ^2	Df	P-v
	n	%	n	%			
Occupation of the mother (N=300)							
Housewives	23	7.7	110	36.7	12.731	4	0.121
Business	11	3.7	73	24.3			
Private emp.	8	2.7	48	16			
Civil servants	0	0.0	18	6.0			
Others	4	1.3	4	1.3			
	WAZ<-2SD		**WAZ≥-2SD**				
Housewives	34	11.3	99	33.0	15.611	4	0.048
Business	14	4.7	70	23.3			
Private emp.	12	4.0	45	15.0			
Civil servants	14	4.7	70	23.3			
Other	5	1.7	3	1.0			
	HAZ<-2SD		**HAZ≥-2SD**				
Housewives	22	7.3	111	37.0	4.390	4	0.356
Business	11	3.7	73	24.3			
Private emp.	8	2.7	49	16.3			
Civil servants	0	0.0	18	6.0			
Others	2	0.7	6	2.0			

Key: WHZ=Weight for Height Z-scores WAZ=Weight for Age Z-scores, HAZ=Height for Age Z-scores

4.4.4 Association of family income on nutrition status of children aged 6 to 24 months attending well-baby clinic at Mbagathi hospital

Although a total of 300 participants were interviewed on sources of family's income (Table 4.13), the study found that 7 (2.3%) of the respondents could not comprehensively estimate the income because they were either dependent on their parents or residing with relatives who were the bread winner. There was a significant association (<0.005) between low family income and all the three forms of malnutrition; wasting ($\chi^2$23.874, p=0.001); underweight ($\chi^2$21.080, p=0.002) and stunted ($\chi^2$20, 490, p=0.002). Economic constraints, unemployment and low socio-economic status were some of the factors blamed for the increased rates of malnutrition during FGDs. According to one mother *"how do you prepare nutritious food for the baby when you do not have enough money to buy it*" To reverse the current trend of malnutrition observed, most mothers were in agreement that "*the government should create more job opportunities*", to enable them to provide for the family. This was collaborated by Key informants (KIs) who added that, "*poverty was the underlying factor contributing to malnutrition*".

Table 4.12: Association of family income on nutrition status of children aged 6 to 24 months attending a well-baby clinic at Mbagathi hospital

Variable	WHZ<2SD		WHZ≥-2SD		χ^2	Df	P-v
	n	%	n	%			
Family income (N=300)							
≤10,000	18	6.0	35	11.7	23.874	3	0.016
10,001-20,000	17	5.7	90	30.0			
20,001-30,000	6	2.0	57	19.0	.		
>30,000	3	1.0	67	22.3			
	WAZ<-2SD		**WAZ≥-2SD**				
≤10,000	23	7.7	30	10.0	21.080	3	0.002
10,001-20,000	22	7.3	85	28.3			
20,001-30,000	11	3.7	52	17.3	.		
>30,000	8	2.6	62	20.7			
	HAZ<-2SD		**HAZ≥-2SD**				
≤10,000	17	5.7	36	12.0	20.490	3	0.002
10,001-20,000	14	4.7	93	31.0			
20,001-30,000	8	2.7	55	18.3			
>30,000	4	1.3	64	22.0			

Key: WHZ=Weight for Height Z-scores; WAZ=Weight for Age Z-scores; HAZ=Height for Age Z-scores

4.4.5 Association of water sources on nutrition status of children 6 to 24 months attending well-baby clinic at Mbagathi hospital

Three quarters (75%) of the study population drew water from public water taps, 21% had water inside the house, 2.3% purchased from vendors and 1.7% from other sources (Figure 3). Table 4.14 presents the results of analysis showing the association of water sources on nutritional outcomes of study children. There was significant association of water sources on all three forms of malnutrition; wasting ($\chi^2$15.329, p= 0.018); underweight ($\chi^2$12.115, p= 0.006) and stunting ($\chi^2$7.941, p=0.047).

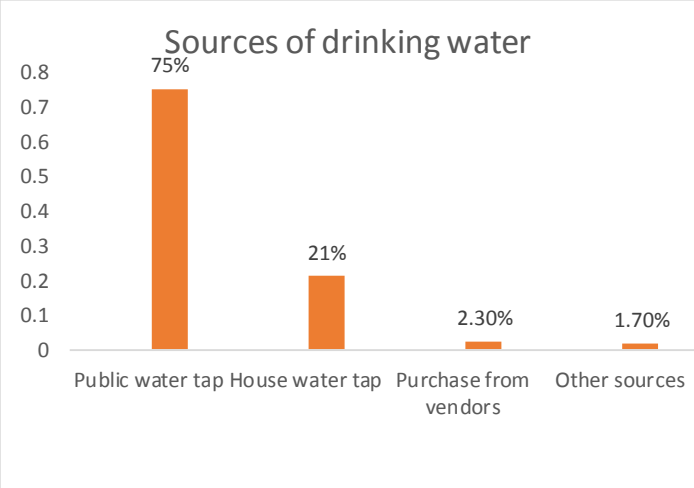


Figure 4.3: Sources of drinking water of study participants at Mbagathi hospital

Table 4.13: Association of water sources on nutrition status of children aged 6 to 24 months attending a well-baby clinic at Mbagathi hospital

Variable	WHZ<-2SD		WHZ≥-2SD		χ^2	Df	P-v
	n	%	n	%			
Water sources (N=300)							
House water tap	3	1.0	60	20.0	15.329	3	0.018
Public water tap	40	13.3	185	61.7			
Purchase from vendors	1	20.3	6	2.0	.		
Other sources	2	0.7	3	1.0			
	WAZ<-2SD		**WAZ≥-2SD**				
House water tap	4	1.3	59	19.7	12.11	3	0.006
Public water tap	58	19.3	167	55.7			
Purchase from vendors	2	0.7	5	1.7	.		
Other sources	2	0.7	3	1.0			
	HAZ<-2SD		**HAZ≥-2SD**				
House water tap	4	1.3	59	19.7	7.941	3	0.047
Public water	37	12.3	188	62.7			
Purchase from vendors	0	0.0	7	2.3			
Other sources	2	0.7	3	1.0			

4.4.6. Association of toilet facilities on nutrition status of children aged 6 to 24 months attending a well-baby clinic at Mbagathi hospital

Toilet facilities categorized as house flush toilet, public flush toilet, private pit latrines and public pit latrines were assessed for association on children nutritional status. Majority (48.0%) used public pit latrines, almost a quarter (24.7% and 24.0%) use in house flush toilet and public flush toilet. Only 10(3.3%) used private pit latrine (Figure 4.4). The study found a significant association (P< .05) on all three forms of malnutrition with wasting ($\chi^2$13.885, p=0.031); underweight ($\chi^2$17.234, p=0.008) and stunted ($\chi^2$11.112, p=0.011). Results (Table 4.15)

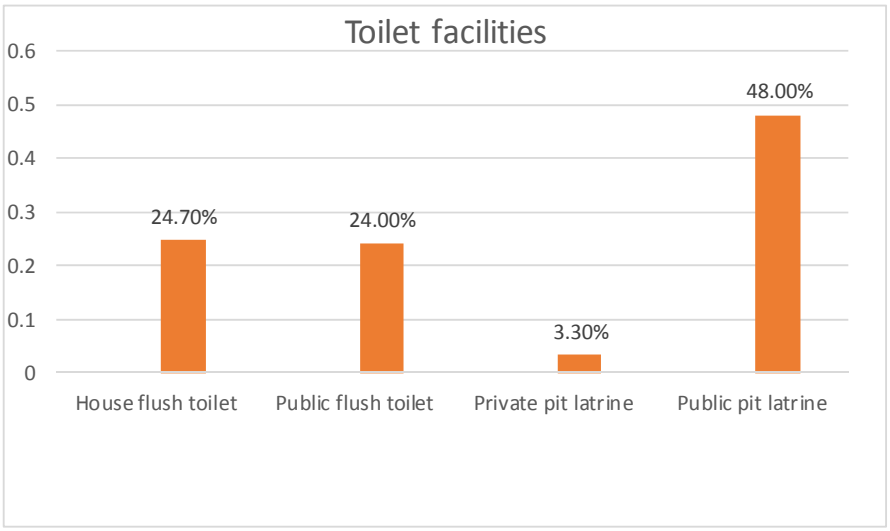


Figure 4.4: Toilet facilities used by study participants at Mbagathi hospital

Table 4.14: Association of toilet facilities on nutrition status of children aged 6 to 24 months attending a well-baby clinic at Mbagathi hospital

Variable	WHZ <-2SD		≥-2SD		χ^2	Df	p-v
	n	%	n	%			
Toilet facilities (300)							
Public pit latrine	25	8.3	119	48.0	13.883	3	0.013
Public flush toilet	16	5.3	56	18.7			
Private pit latrine	2	0.7	8	2.7			
House flush toilet	3	1.0	71	23.7			
	WAZ<2SD		**WAZ≥-2SD**				
Public pit latrine	35	11.7	109	36.3	17.234	3	0.008
Public flush toilet	22	7.3	50	16.7			
Private pit latrine	4	1.3	6	2.0			
House flush toilet	5	1.7	69	23			
Stunting	**HAZ<-2SD**		**HAZ≥-2SD**				
Public pit latrine	7	2.3	137	45.7	11.112	3	0.011
Public flush toilet	2	0.7	70	23.3			
Private pit latrine	2	0.7	8	2.7			
House flush toilet	0	0.0	74	24.7	Ref		

Key: WHZ=Weight for Height Z-scores WAZ=Weight for Age Z-scores, HAZ=Height for Age Z-scores

4.4.7: Association of child birth weights on nutrition status of children aged 6 to 24 months attending a well-baby clinic at Mbagathi hospital.

The study found a significant association ($p<0.05$) between child birth weight and malnutrition in all three forms of malnutrition. Wasting ($\chi^2$10.631, p=0.001), underweight ($\chi^2$13.489, p=0.001) and stunted ($\chi^2$10.062, p=0.002). The results are on Table 4.15.

Table 4.15: Association of child birth weight on nutrition status of children aged 6 to 24 months attending a well-baby clinic at Mbagathai hospital

Variable	WHZ<-2SD		WHZ ≥-2SD		χ^2	Df	P-v
	N	%	n	%			
Birthweight in grams (N=300)							
<2500gms (N=46)	13	28.2	33	77.8	10.631	1	0.001
≥2500gms (N=254)	30	11.8	224	88.2			
	WAZ<-2SD		**WAZ≥-2SD**				
<2500gms (N=46)	22	47.8	24	52.2	13.489	1	0.001
≥2500gms (N=254)	44	17.3	210	82.7			
	HAZ<-2SD		**HAZ≥-2SD**				
<2500gms (N=46)	15	32.6	31	67.4	10.062	1	0.002
≥2500gms (N=254)	28	11.0	226	89.0			

Key: WHZ=Weight for Height Z-scores; WAZ=Weight for Age Z-scores; HAZ=Height for Age Z-scores

4.4.9 Association of childhood illness two weeks to study on nutrition children aged 6 to24 months attending a well-baby clinic at Mbagathi hospital

Child illness two week to the interview and nutritional status of children (Table 4.18). There was a significant association between child illness two week before the study and wasting *($\chi^2$14.613*, p=0.012). There was no association of child illness two week to study and underweight (χ^2*28.919*, p=0.112), and on stunting (χ^2*22.263*,

p=0.812). These finding correlate well with the FGD where illnesses were associated with loss of weight due to poor appetite. Most mothers agreed that "*diarrhea, general body weakness and loss of appetite* "were signs of malnutrition. According to the clinical officer, one of the KI, "*diarrheal diseases, vomiting, fever and respiratory conditions were common in children suffering from malnutrition"*.

Table 4.16: Association of child illness two week to study on nutrition status of children aged 6 to 24 months attending well baby clinic at Mbagathi hospital

Variable	WHZ<-2SD		≥-2SD		χ^2	Df	p-v
	n	%	n	%			
Illnesses (N=300)							
Diarrhea	5	1.7	28	9.3	14.613	5	0.012
Vomiting	7	2.3	14	4.7			
Fever	7	2.3	28	9.3			
Cough	4	1.3	27	9.3			
Others	7	2.3	14	4.7			
None	16	5.3	143	47.7			
	WAZ<-2SD		**WAZ≥-2SD**				
Diarrhea	8	2.7	25	8.3	8.919	5	0.112
Vomiting	7	2.3	14	4.7			
Fever	8	2.7	27	9.0			
Cough	6	2.0	25	8.3			
Others	9	3.0	12	4.0			
None	16	5.3	143	47.7			
	HAZ<-2SD		**HAZ≥-2SD**				
Diarrhea	4	1.3	29	9.7	2.263	5	0.812
Vomiting	4	1.3	17	5.7			
Fever	5	1.7	30	10.0			
Cough	4	1.3	27	9.0			
Others	5	1.7	16	5.3			
None	21	7.0	138	46.0	.		

Key: WHZ=Weight for Height Z-scores WAZ=Weight for Age Z-scores, HAZ=Height for Age Z-scores

4.5 Binomial Logistic Regression analysis

4.5.1 Predictors of malnutrition among the study children at Mbagathi hospital

To identify the predictive factors for wasting, underweight and stunting, binomial logistic regression was modeled. Table 4.19 presents the results of the analysis.

Table 4.17: Predictor of wasting, underweight and stunting among children aged 6 to 24 months attending a well-baby clinic at Mbagathi hospital

	Wasting			**Underweight**			**Stunting**		
Variable	**OR**	**CI**	**P-v**	**OR**	**CI**	**P-v**	**OR**	**CI**	**P-v**
Child illness	**1.01**	**1.001-1.019**	**.025**	1.005	.99-1.39	.153	1.00	.99-1.008	.99
Birthweight	**2.23**	**1.22-4.07**	**.009**	**2.35**	**1.39-3.9**	**.001**	**2.44**	**1.34-4.4**	**.003**
Child sex	1.93	.944-3.93	.072	**2.61**	**1.39-4.89**	**.003**	1.97	.969-3.98	.061
Toilet Facility	1.16	.827-1.64	.384	1.06	.796-1.42	.67	.863	.615-1.21	.397
Water source	.679	.301-1.54	.353	.571	.28-1.16	.122	.878	.386-1.997	.756
Income	**1.57**	**1.14-2.23**	**.01**	1.17	.891-1.55	.253	1.20	.864-1.67	.274
Mother's occupation	.784	.593-1.04	.09	.796	.619-1.02	.89	.889	.669-1.18	.419
Mother's education	**1.85**	**1.134-3.005**	**.014**	**1.83**	**1.21-2.77**	**.004**	1.58	.982-2.546	0.06

Key: OR=Odds Ratio CI=Confidence interval (95%)

Predictors of malnutrition

From Table 4.17, the predictors of malnutrition were found to be child illness in the previous two weeks (OR 1.01; CI= 1.001-1.019; p=0.025); birthweight (OR 2.23; CI= 1.22-4.07; p=0.009); family income (1.57; CI=1.14-2.23; p=0.01) and mothers education (OR 1.85; CI=1.13-3.005; p=0.014) were predictive of low weight for age (wasting). Child birth weight (OR 2.35; CI= 1.39-3.902; p=0.001); child gender (OR 2.61; CI=1.39-4.89; p=0.003) and mother's education (OR 1.83; CI=1.21-2.77= p=0.004) were significant factors associated with underweight. Child birth weight (OR 2.44; CI=1.34-4.4; p=0.003) was found to be predictive of low height for age (stunted) among the study children.

4.6 Results of Focus Group Discussions (FGDs) and Key Informants Interviews (KIIs)

4.6.1 Demographic characteristics of FGDs

A total of 45 participants participated in FGDs. There were 6 FGD. Three groups comprised of mothers with well-nourished children and the other three groups mothers with malnourished children. In-depth interview with 5 key informants comprising of 2 nutritionist, 2 nurses and 1 clinical officers.

4.6.2 Characteristics of participants of FGD

A total of 40 mothers were enrolled to participate in FGD. All were mothers to the index child who was aged 6 to 24 months and had brought the children for routine immunization, growth monitoring or nutrition support (Table4.20).

Table 4.18: Characteristics of FGD participants at Mbagathi hospital

FGD	Age in years	Category according to nutritional status of child	No. of participants/Group
1	<25	Well-nourished	6
2	>25	Well-nourished	6
3	<25	Malnourished	8
4	>25	Well nourished	6
5	>25	Malnourished	8
6	<25	Malnourished	6

4.6.3 Characteristics of Key Informants

Characteristics of the Key Informants (Table 4.21). There were 4 female and 1 male. Two of the informants were senior health care providers with extensive experience in the health care system (1 nutritionist and 1 nurse), the other Two (I nutritionist and 1 nurses) had worked at the well-baby clinic for over 3 years while the clinical officer had worked for 1 year.

Table 4.19: Characteristics of Key Informants at Mbagathi hospital

Cadre	Gender	Years of experience at WBC
Senior nutritionist	Female	1 1/3
Nutritionist	Female	3
Senior Nursing Officer	Female	7
Nurse	Female	3
Clinical Officer	Male	1

4.7 Emerging themes

4.7.1 Limited maternal nutritional knowledge.

Inadequate nutritional knowledge to enable mothers make food choices for the child emerged as a critical factor contributing to malnutrition. When mothers were asked to explain what it means to have a balanced diet, majority could not clearly define

what it means. For example, balanced diet was summed up as mixing of different foods. As one mother said "*giving a balance diet mean mixing different foods"*. This was particularly exhibited when asked about complementary foods for the baby "*mixed flour of omena, bean, ground nuts, millet and other cereals*" was seen as balanced diet for the baby. Inadequate nutritional knowledge will mean mothers do not plan their children meals based on nutritional value. This is especially critical for complementary feeding when mothers with inadequate nutritional knowledge are not able to provide balanced diet that has the right ingredients, amount of food, consistency and appropriate feeding intervals. According to a senior nurse "nutrition *education should start early during the antenatal period so that mothers are aware of the available evidence based feeding practices for the infants and young children in order to prevent malnutrition."*. The word "*ignorance*" a contortion of lack of knowledge on nutrition was a commonly mentioned in both FDGs and KIIs. Infants and young children feeding guidelines recommended that children are fed from seven food groups; grains, roots and tuber, legumes and nuts, dairy products, flesh food, eggs, vitamin A rich fruits and vegetables and other vegetables.

4.7.2 Poverty

Poverty which was defined as lack of basic commodities including food was mentioned as the most frequent cause of malnutrition by both FGDs and KII. This was further supported by the fact that most mothers who participated in FGDs were from the neighboring slums of Kibera, Embakasi and Dagoretti. *"Lack of finance, lack of employments, being poor*" were terms used to describe poverty. When mothers were asked how the current trend of malnutrition can be reversed, most mentioned *"the government should create employment opportunities*" as the only way to help reduce malnutrition. According to one mother (FGD11) "*even if you know what food is good for the baby and you do not have the money to buy the food what can you do*". The clinical officer summed it "*poverty is the underlying factor contributing to malnutrition*". According to the senior nutritionist "*malnutrition at the clinic is high because the hospital serves mostly the population from the informal settlement of Kibera"*.

4.7.3 Poor complementary feeding practices

Complementary feeding is the phase when the infant is introduced to other foods besides breastfeeding. This is a critical period because evidence indicates that breastmilk is often compromised with poor quality foods increasing risk of malnutrition. It was evident that complementary feeding is either introduced too early before six months, not of right consistency and quality, and the food groups not observed to provide the infant with required nutrients. According to the clinical officer, "*early complementary feeding and poor feeding practices are common"*. This is coupled with lack of nutrition knowledge. Most mothers' listed common complementary foods "*ugali-thick porridge and vegetables*". One mother said (FGD 11) *"I buy mixed flour of beans, Njahi (cow peas) and omena*). The immature digestive system of the infant is unlikely to synthesis this type of food.

4.7.4 Work

Most of the mothers were engaged either in full time employment or were causal workers. Work was often associated with early complementary feeding because even if the mother had been advised to express breastmilk for the baby, the facilities to ensure the safety of the milk were not available. Again, once the mother goes back to work, the baby has to be taken care of by an alternative person. Day cares which are informal have become the best alternative because employing a nanny would be too expensive for most families. For example, one mother (FGD 1) shared her experience with day care "*I exclusively breast fed my baby for six months, because I could not continue being at home, I took the child to a day care and went back to work. After only two months, my child who was previously crawling stopped, when I took him to the hospital, I was told he was suffering from malnutrition, I stopped working and now he is better*". Another mother from the same FGD added that "*children in day care are not fed the food you left for your child. For example, a child can vomit beans yet the food you had left for your child did not contain beans".* This was collaborated by the nurse working at the clinic who said "*because mothers cannot afford to pay house help, the children are left in day care because it is cheap and the mother can afford.* When probed to describe the type of day cares, it emerged that these are informal centers established mostly by elderly women to host children while their mothers are out to work. Each morning, the mother delivers her child to the day care. Usually payment is daily and ranges between Ksh 50.00-60.00. There is no system to regulate the operations of the day cares homes and most of them are not compliant with standards of such a facilty. When asked to explain what a day care is, one mother (FGD 1) defined day care as "*... people open up their houses as day care home".* Another mother in the same FGD added that "*children are not taken care of properly in the day care because you find that the owner has employed only one girl yet the numbers of children are many. Children are always sick".*

4.7.5 Diseases

Diseases were associated with malnutrition. Most mothers mentioned "*poor appetite, diarrhea, vomiting fever, malaria*" among the most common causes of malnutrition. According to one mother (FGD 5) "a *child who is sick does not eat and this can lead to malnutrition".*

4.7.6 Maternal age

Young mothers were more likely to have malnourished children than the elder mother. This can be associated with the experience the mother has had and lack of social support system for the young mothers associated with urbanization. According to the clinical officer "young *mothers lack the basic knowledge of child care and this increases the risk of malnutrition".*

4.7.7 Unplanned pregnancy

Unplanned pregnancy which was defined as any pregnancy occurring when a mother is still breastfeeding was associated with malnutrition. Pregnancy has multiple effect on the baby because on one hand there are cultural beliefs that once a woman is pregnant, she should not continue to breastfeed the child because the milk is bad for the baby. A mother in FGD 6 said "*I conceived when my baby was only six months; my mother in-law told me to stop breastfeeding because it is bad for the child. I tried to breastfeed secretly but eventually I had to stop breastfeeding because the child started getting sick*". The influence of culture in child care cannot be underestimated in child care.

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CHAPTER FIVE

DISCUSSION

5.1. Prevalence of malnutrition among the study children

The main goal of the study at Mbagathi Hospital was to assess prevalence of malnutrition and determine factors associated with wasting, underweight and stunting among children aged 6 to 24 months attending well-baby clinic. Prevalence of wasting was estimated at 15.3%, the proportion of children who were underweight was 22. 0%, and 14.3% of children were stunted. Considering that the Well-Baby Clinic caters for healthy children, the prevalence of malnutrition reported in this study was relatively high particularly when compared to the findings of the most recent Kenya Demographic and Health Survey (KNBS and ICF International, 2015) for Nairobi County (2.5% wasting, 3.8% underweight and 17.2% stunting). Such high rates of malnutrition not only have health implications but also social and economic consequences (Matrins et al., 2011). In the short term, malnutrition lowers the immune system activity, increases burden of disease and risk of death among children below five years (Shikur & Tamiru, 2014). It is estimated that malnutrition is responsible for over 35% of child death annually, causes 11% of Disability Adjusted Life Years (DALYs) compromising physical and cognitive development (Bhutta & Das, 2013). Consequently, malnutrition lowers productivity and perpetuates poverty condemning generations into a vicious cycle (Vorster, 2010).

Conversely, high prevalence of malnutrition can differ from national rates because national studies are conducted across the country muffling such high prevalence of wasting and underweight observed in this study. A program analyst with United National Development Programme, cautions that the aggregate reduction in child malnutrition level across the country should not conceal the fact that not all segments of population benefit from improvement with same magnitude (Barker et al., 2011).

Equally, the high prevalence rates of underweight and wasting found in this study can be attributed to the study setting. Hospital based studies are likely to post high prevalence of malnutrition possibly due to availability of screen systems that identify

children even in early phases of malnutrition. A hospital based cross-sectional study in the rural parts of India among the pre-school children found a relatively high prevalence of malnutrition. Of the 516 children sampled 394 were malnourished with 53.86% underweight, 43.22% stunted and 60.67% wasted (Barker et al., 2011).

Similarly, children residing in the informal settlements were more likely to be malnourished when compared to other populations (Abuya et al., 2012). This can be attributed to conditions that are prevalent in the slums; overcrowding, poor health infrastructure, inadequate water supply, poor drainage and a high rate of unemployment impacting on household food security (Goswami, 2014). These findings are consistent with those of a study in two slums of Nairobi, Korogocho and Viwandani. The study found overwhelming evidence of under nutrition, particularly stunting (46%) emphasizing the existence of high rates of malnutrition in the informal settlements (Kimani-Murage et al., 2015). Across the global, a community based cross-sectional study in urban fields of Medical College in Pune, India, found a significantly high prevalence of malnutrition. Of the 319 children enrolled in the study 208 were under nourished representing 65.2% (Dhone et al., 2012).

5.2. Predictors of malnutrition (wasting, underweight and stunting)

To determine predictors of malnutrition, logistic regression modeled. Child gender, low birth weight, childhood illnesses two weeks to study, family income in the lower wealth category and low maternal education were associated with wasting, underweight and stunting. Wasting was associated with child being sick two weeks to study (OR 1.01-1.019, CI 1.001-, p=0.025), low birth weight of less than 2500g (OR 2.23 CI 1.22-4.07, p=0.009) low income category (OR 1.57 CI 1.14-2.25, p=0.01) and low maternal education (OR 1.85 CI 1.13-3.005, p=0.014).

Underweight was associated with child weight at birth of less than 2500g (OR2.35 CI1.39-3.9, p=0001), child sex being male (OR 2.6 CI 1.39-4.89, p=0.003) and low maternal education (OR 1.83 CI1.21-2.72, p=0.004)

Stunting mostly associated with child birth weight was less than 2500g (OR 2.44 CI 1.34-4.4, p=0.003).

5.2.1 Child gender

Child gender was significant predictor of underweight. The results are consistent with other studies indicating higher prevalence of malnutrition among boys than girls. Analysis of data from 16 Demographic and Health Surveys from 10 countries in Sub-Sahara Africa investigating sex difference in prevalence and mean z-scores of stunting found that pooled mean z-scores estimate were -1.59 for boys compared to -1.49 for girls with a prevalence of 40% for boys than 36% for girls (Wamani, Åstrøm, Peterson, Tumwine, & Tylleskär, 2007). A cross sectional study to assess the severity of malnutrition across ten village in rural India involving 1046 (523 males and 523 females found similar results. Overall the prevalence of wasting was 28.7 (36.5% males and 21.2 females0, underweight 43% 949.8% males and 36.7% females) and prevalence of stunting at 38% (40.1% males and 35.9%) which was found to be against the long held believe that males are usually preferred and well nourished (Jawaregowda & Angadi, 2015). However, cases of girls being more malnourished is also common. A study to assess if girls in India were more disadvantaged than boys found that girls were likely to receive less breastfeeding. Birth order and desire for more children were reasons cited for this disparity (Fledderjohann et al., 2014)

5.2.2 Child birth weight

Child weight at birth was a significant finding which was associated with all three forms of malnutrition (wasting, underweight and stunting). A child with low birth weight had more than 2 times odds of being wasted, underweight or stunted when compared to children of normal weight. Birth weight has long been known to influence nutritional status. For example, a review of Demographic and Health Survey from Bangladesh found a markedly high prevalence of malnutrition among children with low birth weight with stunting at 51% against 39% of normal weight; 25% against 14% wasted and 52 against 35% underweight (Rahman et al., 2016). A systematic review of 49 original research article that met inclusion criteria found low birth weight a consistent factor associated with wasting, underweight and stunting

alongside maternal education and sex of the baby being male among key predictors of malnutrition ((Akombi et al., 2017).

5.2.3 Child illness

Another important predictor of malnutrition was found to be related to childhood illnesses especially diarrheal diseases, fever, vomiting and coughing. Diseases in children increases the risk of malnutrition due to increased nutrition demand, poor appetite leading to poor intake, malabsorption of nutrient as well as increased demand due to disease process (Lassi et al., 2014). The conceptual framework on malnutrition identifies the unique relationship that exists between malnutrition and disease status which is among the immediate causes of malnutrition (Bhutta & Das, 2013). Malnutrition can lead to or increase the risk of infectious diseases, and many infectious diseases contribute to malnutrition creating a vicious cycle (Rodriguez-Morales et al., 2015). Practical interventions exist to reduce morbidities and mortality associated with malnutrition. A review of all health interventions recommended by WHO and Lancet series concluded that proven interventions included promotion of exclusive breast feeding for first six months, supportive complementary feeding strategies, management of malaria, pneumonias and diarrhea, vitamin supplementations and healthy living environment as critical (Lassi et al., 2014).

5.2.4 Family income

Family income, a determinant of socio-economic status was highly associated with malnutrition. A combined family income Kes 10,000 and below was 1.6 times more likely to be wasted. Wasting in children signifies recent food deprivation which can correlate well with fluctuation in family income. A community based cross sectional survey in Hawassa, South Ethiopia where prevalence of wasting was estimated at 28.2% found a highly association with children from lower wealth ranked households in socio-economic conditions (Tsedeke et at., 2016).

5.2.5 Maternal education

Low maternal education was a significant determinant of malnutrition increasing the odds of being malnourished by almost 2 times. These results are consistent with findings of other studies conducted to assess impact of maternal education on child nutrition. Demographic and Health Surveys of three countries; Malawi, Tanzania and Zimbabwe showed a significant relationship between maternal level of education and nutritional status where an increase in the level of maternal education was associated with significantly reduction in prevalence of child malnutrition (Makoka, 2013). Education is key in empowering women by giving them a sense self-confidence to make decision and is closely related to child welfare (Mitchodigni et al., 2017). Education enhances maternal ability to navigate health infrastructure, consume health information and mobilize family and community resources for the benefit of the children (Subramanyam et al., 2010), however, it was evident that for maternal education to have a significant impact on child health, mothers had to get education beyond the primary level to have a significant impact on child nutrition status. To mitigate lack of education (Abuya et al., 2012) supports nutritional education to mothers with low levels of education to increase their awareness. This is consistent with recommendations of FGDs to provide nutritional education to help them prepare nutritious food for their children. In addition, to reverse the current prevalence of malnutrition, key informants who were sampled from the health workers at the clinic recommended basic nutrition education, child care practices and growth monitoring as critical interventions.

Abuya et al. (2012), and Makoka (2013) in their studies found that women who were educated placed more value to their health and that of their children and were likely to seek health intervention whenever their children were sick and were able to read and interpret treatment instructions. Education endows the woman with knowledge and skills to create a healthier and stimulating environment that is conducive for the child. Other pathways through which maternal education impacts on child health include a high degree of autonomy, economic viability, food diversification and attitude towards modern health services (Bhutta et al., 2013).

CHAPTER SIX

CONCLUSION AND RECOMMENDATION

6.1 Conclusion

Prevalence of malnutrition remains significant burden at among children attending well-baby clinic at Mbagathi Hospital. The study found a high prevalence of malnutrition with 15.3% of children wasted, 22% underweight and 14.3% stunted. The results are way above the national prevalence of 4% wasted, 11% underweight. Only stunting found to be slightly lower than the 26% national prevalence, this can be attributed to the fact that the study children at Mbagathi hospital were between aged 6 and 24 months unlike the demographic survey which studied children aged below 5 years. Overall prevalence of malnutrition was high among boys than girls but wasting statistically significantly higher among boys (28.1) than girls (28.1%) (p=0.018).

Among the predictors of malnutrition, child illness two weeks to study was found to be a significant (<0.05) contributor of malnutrition. Children who reported being sick two weeks to the date of interview had a higher odd of being malnourished with wasting most affected (OR 1.01 CI1.001-1.019, p=0.025). Low birth weight, where children born with weight less than 2500gms at birth were 2 times likely to be wasted, underweight and stunted (OR 2.2, 2.3 and 2.2), respectively. Socio-economic predictors were families income of Kes 10,000 and less was associated with higher odds of malnutrition but was mostly statistically significant in children who were wasted (OR1.57 CI 1.144-2.225, p=0.01). Low maternal education another socio-economic factor was associated with all the three forms of malnutrition wasting, underweight and stunting but was statistically significant in children who were underweight almost 2 times likely to be malnourished.

The study did not find any significant association of malnutrition and mothers' occupation, sources of drinking and toilet facilities.

6.2. Recommendations

The conclusion drawn from this study points to the following recommendations;

1) Evidence based nutrition interventions and health messages to create awareness is critical. An observation of Mbagathi hospital work environment showed that nutritionists despite being few in numbers are charged with providing nutrition education at maternal child health clinic. However, to successfully change the course of malnutrition, a more inclusive approach is required where every health worker is able to provide health education on practical and evidence-based interventions that are scientifically proven and feasible.
2) Mbagathi hospital provide services to mostly the population from informal setting and also serves as receiving hospital for referrals coming from surrounding health facilities in Nairobi. This calls for all stakeholders working together to strengthen nutritional services at Mbagathi by capacity building health care providers to provider nutritional health education, nutritional supplementation programs and developing a community component to increase levels of awareness to the current state of malnutrition with emphasis on available interventions.
3) A policy to address the inequity at the community level to improving living conditions, provision of essential services and increasing access to health care to reduce burden of diseases that increase vulnerability to malnutrition.
4) Increasing opportunities for girl-child education can be the fundamental in reducing malnutrition. Maternal education is multi-pronged in that it increases woman capacity for decision making concerning health, is enables women to mobilize from family and community resources to improve child nutrition and can be channel to improve family income through productive income generating activities.

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APPENDICES

Appendix I: Questionnaire

DETERMINANTS OF MALNUTRITION AMONG CHILDREN AGED 6 TO 24 MONTHS ATTENDING WELL BABY CLINIC AT MBAGATHI HOSPITAL, NAIROBI.

Instructions: Put a tick or insert the response in the space provided.

QUESTIONNAIRE IDENTIFICATION			
ID 01	Serial number	_____	Codes
ID 02	Date of interview _____ __	Interview start: Hr_____Min _____ Interview ends: Hr_____ Min _____	
PART A. CHARACTERISTICS OF RESPONDENTS			
CR 01	How old are you	Years_____Residence_____ _____	
CR 02	What is your marital status	Single	1
		Married/living together	2
		Divorced	3
		Windowed	4
CR 03	If married/living together what type of marriage are you in ?	Polygamous	1
		Monogamous	2
		N/A	87
CR 04	If in a polygamous marriage, how many wives are officially recognized?	Two	1
		Three	2
		Any other specify	3
		N/A	87
CR 05	If in polygamous relationship, how many wives are unofficial	One	1
		Two	2
		Others specify	3
		N/A	87
CR 06	What is your highest level of education	None	1
		Completed primary education	2
		Completed Secondary education	3
		Midlevel college	4
		University	5

CR07	Child's Father highest level of education	None	1
		Completed primary education	2
		Completed secondary education	3
		Midlevel college	4
		University	5
		N/A	87
CR08	What is your occupation	Housewife	1
		Small scale business	2
		Civil servant	3
		Private employment	4
		Others	5
CR09	Child's father occupation	Not employed	1
		Small scale business	2
		Government employee	3
		Private employment	4
		Others	5
		N/A	87
SOCIO-ECONOMIC FACTORS			
SE01	Average monthly income	Ksh._____	
SE02	How many people are supported by the income/ month	Adult_____ Children_____	
SE03	Average monthly expenditure	Ksh_____ DK	88
SE04	If you get unexpected expenditure of Ksh. 5000 in one month how would you raise it? If yes how?	From saving	1
		Borrow from family/ friends	2
		Would not	3
SANITATION AND HOUSEHOLD HYGIENE			
EC01	What is the source of your drinking water	In house water tap	1
		Public water tap	2
		Purchase from vendors	3
		Others	4
EC02	How do you make drinking water safe for children	Treat with waterguard	1
		Boil	2
		Others	3
EC03	How do you store drinking water	Clean open container	1
		Clean closed container	2
		Others	3
EC04	What type of toilet facility does your	In house flush toilet	1
		Public flush toilet	2

	household use	Private new improved pit latrine	3
		Public new improved pit latrine	4
		Others	5
EC 05	Do you wash children hands before meals	Always	1
		Sometimes	2
		Never	3
PART B : CHARACTERISTICS OF THE CHILD			
CC 01	How many children do you have	_____	
CC 02	What is your relationship with the child	Mother	1
		Grandmother	2
		Father	3
		Others	4
CC 03	Is the child a boy or a girl	Boy	1
		Girl	2
CC 04	In what day, month, year was the child born (Confirm with RTHC)	Day_____ Months _____ Year_____	
CC 05	How old is the child	Year_____Months_____ ___	
CC 06	What was the birth weight (confirm with RTHC)	_____kg_____grams	
BREASTFEEDING (IF RESPONDENT NOT MOTHER SKIP, N/A)			
BF 01	Did you ever breast feed this child	Yes	1
		No	2
		N/A	87
BF 02	At what time after birth did you first put the child to breast	Immediately	1
		Within hours	2
		Within days	3
		N/A	87
BF 03	The breast milk produced the first 1 to 7 days is different than ordinary breast milk. Did you feed this milk to the child or disposed it?	Fed the child	1
		Disposed	2
		DK	88
		N/A	87
BF04	Are you currently breastfeeding	Yes	1
		No	2
		N/A	87
BF 05	How old was the child when you	_____Years_____ Months	

	stopped breastfeeding		
BF 06	Why did you stop breastfeeding	Child old enough	1
		Child did not want breast milk	2
		Did not have enough breast milk	3
		Work	4
		Other reasons	5
COMPLEMENTARY FEEDING			
CF 01	How old was the child when you started to give other types of foods	_____Months	
CF 02	What type of foods was the child introduced to (Tick all that are relevant)	Water	1
		Infant formula	2
		Animal milk (cow, goat)	3
		Uji	4
		Mashed potatoes	5
		Mashed bananas	6
		Mashed fruits	7
		Any other specify _____ __	8
CF 03	How many meals per day does the child eat	_____	
Tell me if you agree or disagree with the following statement on child feeding 1 Agree 2 Disagree 88 Do not know			
CF 04	Children should not start on any other food in addition to breast milk before six months		1 2 88
CF 05	By 12 months most children can eat the same food as the rest of family members		1 2 88
PART C: HEALTH CHARACTERISTICS			
HC 01	Has the child suffered from any of the following illness in the past two weeks	Diarrhea (Defined as more than 3 loose stool in 24 hours)	1
		Vomiting	2
		Fever	3
		Cough	4
		Others	5

		N/A		87
HC 02	Did you seek for help or advise during the child illness	Yes		1
		No		2
		N/A		87
HC 03	Where did you seek for help	Public health facility		1
		Private health facility		2
		Pharmacy		3
		Traditional medicine		4
		Relative/ friend		5
		N/A		87
HC 04	During the child illness, how much was he/she given to drink	Much less		1
		About the same		2
		Much more		3
		Nothing to drink		4
		N/A		87
VACCINATION AND VITAMIN SUPPLEMENTATION				
VV 01	Do you have a vaccination card	Yes (card seen)		1
		Yes (card not seen)		2
		No		3
VV 02	If yes tick all vaccination applicable	BCG		1
		Polio		2
		DPT		3
		Measles		4
		Others		5
VV 03	Has the child received Vitamin A supplement in the past six months	Yes		1
		No		2
		DK		88
VV 04	Has the child taken drugs to control worn infestation	Yes		1
		No		2
		DK		88
ANTHROPOMETRRIC MEASUREMENTS				
AM	Measurements	1st	2nd	3rd
Am 01	Weight (Kilograms)			
Am 02	Height (cm)			

Adapted from http://mics.unicef.org/tools

Appendix II: Interview Guide for FGD

FOCUS GROUP DISUSSION INTERVIEW GUIDE DATE----------

TITLE: DETERMINANTS OF MALNUTRITION IN CHILDREN 6 TO 24 MONTHS AT MBAGATHI DISTRICT HOSPITAL, WELL BABY CLINIC.

List of participants

No.	Unique participant identifier	Occupation	Marital status	Number of under five	Residence
1					
2					
3					
4					
5					
6					
7					
8					
9					

Step 1: Introduction.

I wish to thank you all for sparing your time to participant in this group discussion. My name is Catherine Shitemi and my colleagues are .... and ..... The study on determinants of nutritional status in children 6 to 24 months is part of study requirement at Jomo Kenyatta University of Agriculture and Technology in conjunction with Kenya Medical Research institute (KEMRI). By speaking to you today, we wish to learn more on factors that influence children nutritional status. As children's parents, you have a lot of experience in children rearing and the importance of nutrition for growth and development. The knowledge you share with us will help us improve service delivery and to make guidelines for children nutritional care.

I want to assure you that all information provided here will be confidential and will only be shared only with relevant people at the hospital and University. We would like, with your permission, to record this discussion so that no information is missed out. All information will be secured under key and lock by the PI and will only be access by key research team member and local Ethical and Review Committee. We will only use first name in this discussion therefore there will be no way someone can identify you or your contribution to the discussion.

Before we start, let me say that your opinions are very important, there is no right or wrong answer and everyone is encouraged to participate. This session is expected to last for 45 minutes to 1 hour. We are going to try to keep time.

Note time discussion starts .....hr.....minutes

Step2: Purpose of FGD

Q1: What do you understand with the term children nutritional status and what does it involve?

Q2: What do we require to provide good nutrition to our children? (Try to identify factors that influence children nutritional status directly such as feeding practices, environmental factors, health care, economic status, cultural and traditional practices).

- Feeding practices (breastfeeding practices, types of complementary feeding, what are some introductory foods given to children)
- Health care (Management of childhood diseases, vaccination, food supplementation, de-worming).
- Environmental factors (food hygiene, waste disposal, household size, water sources).
- Socio economic (source of income for household, occupation, level of education)
- How does religious, cultural and traditional practices influence children nutritional status (food limitation, taboos)

Q3: When children nutritional status is inadequate, what can happen to the child? (Types of malnutrition, signs and symptoms, treatment of malnutrition)

Q4: What are the major challenges experienced children care givers in their bid to provide appropriate nutrition for the children. (Try to understand underlying and basic factors that influence nutrition).

Q5: How can we reduce malnutrition in children?

Step 3: Dismissing the participants.

Thank you for your participation and contribution to this discussion. The information you have given us will help us improve health service delivery

Appendix 111: Interview Guide Key Informants

KEY INFORMANT INTERVIEW SCHEDULE

TITLE: DETERMINANTS OF MALNUTRITION IN CHILDREN 6 TO 24 MONTHS AT MBAGATHI DISTRICT HOSPITAL, WELL BABY CLINIC.

Thank you for offering to participate in the in-depth interview. The interview will be tape-recorded. Information obtained during this interview is confidential and shall not be accessed to unauthorized persons and only used for the purpose of this study.

1. What is your job title and position in this clinic?

2. How long have you worked at the well-baby clinic at Mbagathi hospital

3. About how many children do you normally see on monthly basis?

4. Out of children seen monthly, what percentage is malnourished?

5. From your interaction with children care givers and your experience as a health worker in this clinic what are some of contributing factors to malnutrition among children 6 to 24 months?

Consider-

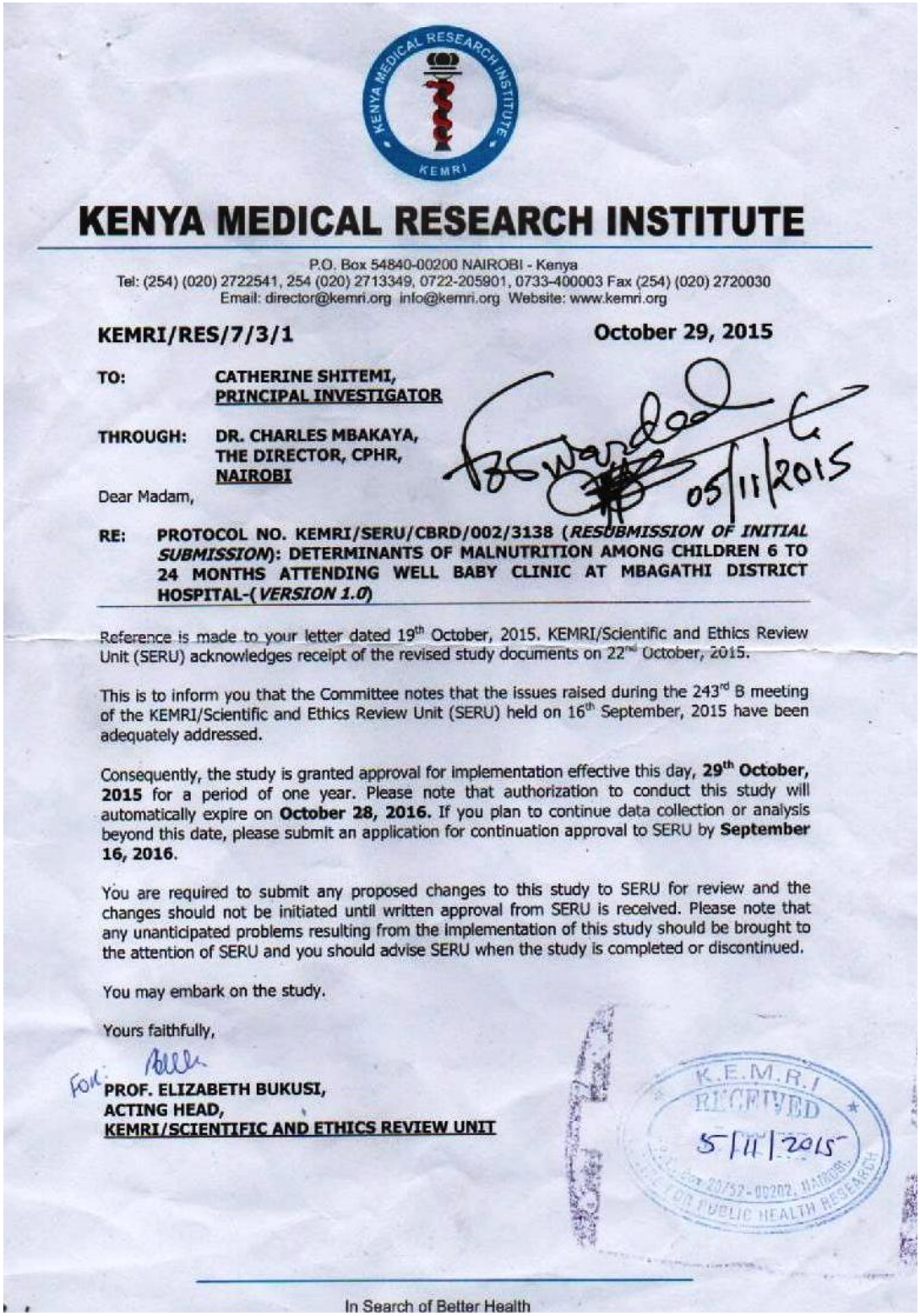
- Socio-demographic characteristics of care givers
- Morbidities
- Feeding practices
- Cultural practices, food taboos or religious beliefs

6. From your experience, what are some of possible interventions can you suggest that can reverse malnutrition among the children attending WBC?

Consider- At health facility, family setting, and community

-At policy level

Appendix IV: Ethical Approval from Seru



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KEMRI/RES/7/3/1 **October 29, 2015**

TO: **CATHERINE SHITEMI,**
PRINCIPAL INVESTIGATOR

THROUGH: **DR. CHARLES MBAKAYA,**
THE DIRECTOR, CPHR,
NAIROBI

05/11/2015

Dear Madam,

RE: PROTOCOL NO. KEMRI/SERU/CBRD/002/3138 (*RESUBMISSION OF INITIAL SUBMISSION*): DETERMINANTS OF MALNUTRITION AMONG CHILDREN 6 TO 24 MONTHS ATTENDING WELL BABY CLINIC AT MBAGATHI DISTRICT HOSPITAL-(*VERSION 1.0*)

Reference is made to your letter dated 19th October, 2015. KEMRI/Scientific and Ethics Review Unit (SERU) acknowledges receipt of the revised study documents on 22nd October, 2015.

This is to inform you that the Committee notes that the issues raised during the 243rd B meeting of the KEMRI/Scientific and Ethics Review Unit (SERU) held on 16th September, 2015 have been adequately addressed.

Consequently, the study is granted approval for implementation effective this day, **29th October, 2015** for a period of one year. Please note that authorization to conduct this study will automatically expire on **October 28, 2016.** If you plan to continue data collection or analysis beyond this date, please submit an application for continuation approval to SERU by **September 16, 2016.**

You are required to submit any proposed changes to this study to SERU for review and the changes should not be initiated until written approval from SERU is received. Please note that any unanticipated problems resulting from the implementation of this study should be brought to the attention of SERU and you should advise SERU when the study is completed or discontinued.

You may embark on the study.

Yours faithfully,

For

PROF. ELIZABETH BUKUSI,
ACTING HEAD,
KEMRI/SCIENTIFIC AND ETHICS REVIEW UNIT

K.E.M.R.I
RECEIVED
5/11/2015

In Search of Better Health

Appendix V: Manuscript 1

ORIGINAL RESEARCH

Prevalence and Contributing Factors to Malnutrition among Children Aged 6 to 24 Months Attending Well-Baby Clinic at Mbagathi District Hospital, Nairobi

Catherine Shitemi[1], Florence Kyallo[2], Yeri Kombe [3]

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ABSTRACT: Despite the generally observed declining levels of malnutrition globally, it remains a challenge in developing countries of Sub-Sahara Africa where estimated 45% of children below five years are stunted. In Kenya, levels of stunting have declined from 35% in 2009 to 26% in 2014 (GOK, 2014).This follows the implementation of multiple initiatives by the Kenya Government as envisaged in the Vison 2030, embedded in the Kenya constitution 2010 and spelled out in the National Nutrition Action Plan 2012-2017 adapted to scale up high impact nutrition initiatives and provides a framework for operationalization of feasible and cost effective interventions to curb malnutrition in children below five years. However, there still exist large disparity on the prevalence of malnutrition with less developed counties and most populace areas still positing high prevalence rates. Previous studies have shown increased rates of malnutrition in the informal settlements. Nairobi where the study is focused has over 60% of the population residing in the informal settlements with limited resources. Mbagathi Hospital draws most of the clientele from the neighboring informal settlement of Kibera, Dagoretti and Embakasi and therefore an ideal place to undertake the study to assess the prevalence of malnutrition, identify associated factors with an aim of expanding the understanding and recommend potential interventions. A total of 300 mother/guardian and child pairs were enrolled in the study. Height and weight measurements were taken for every child and socio-demographic data obtained from mothers/guardians using interviewer administered semi-structured questionnaires. Anthropometric data was analyzed using WHO Anthro2006 software and socio-demographic data using Statistical Package for Social Scientists (SPSS) version.20. The prevalence of wasting (WHZ <-2SD) was 15.3%, underweight (WAZ <-2SD) was 22.0% and stunting (HAZ <-2SD) was 14.3%. Prevalence of underweight was significantly higher among boys (28.1%) than girls (15.6%) (χ^2 *8.056,* p=0.018). Low birth weight, child illness two weeks to study and mothers' perception of child health status were significant predictors of malnutrition (p=<0.05). In addition, poor maternal education and family income ≤Ksh. 20,000 were strongly associated with high rates of malnutrition (p<0.000). Emphasis on maternal education and nutritional interventions targeting children attending Well- Baby Clinics would have significant impact on malnutrition among the study population.

Key words: Malnutrition, prevalence, wasting, underweight, stunting.

INTRODUCTION

Malnutrition poses heavy burden on global society and continues to be significant public health and development concern worldwide [1, 2, 3, 4]. As a result, malnutrition has been described both a consequence and a determinant of under development [4]. Nearly a billion people still suffer from malnutrition globally with approximately 98 % occurring in developing countries [5]. Ideal child growth demands sufficient energy and nutrients intake, absence of disease and appropriate care [6]. Evidence supports the increasing recognition of the importance of child development as a predictor of future human capital, social progress and health of future generations [7, 8]. For instance, consequences of stunting and underweight are delayed motor development and general effect on cognitive development [9]. This results in a lower intelligent quotient (IQ), greater degree of behavioral problems and deficient social skills; at school, the child portrays decreased attention, deficient learning and lower educational achievements [10]. As well, malnutrition is the underlying cause to global childhood disease burden among children below 5 years of age accounting for approximately one third of child death worldwide [11]. Among adults, malnutrition results in decreased work capacity and increased risk of morbidity predisposing to early death [12].

Developing countries bear the brunt of malnutrition with 80% of the world's malnourished children living mostly in Southern Asia, Sub-Saharan Africa, western Pacific and the Middle East [13]. In Sub- Sahara Africa, 42% of all children are stunted [14]. Stunting in children is regarded as best proxy measurement of child well-being, as it captures multiple dimensions reflecting child health, development and the environment where they live [15].

In Kenya, the prevalence of malnutrition remains relatively high [16]. The Kenya Demographic and Health Survey 2014 estimates that 26% of children are stunted, 4% are wasted while 11% are underweight [17]. However, despite the relative reduction from the previous surveys following the implementation of multiple initiatives by the Kenya Government which are spelled out in the National Nutrition Action Plan 2012-2017, there still exists large disparity on the prevalence of malnutrition with less developed counties and most populace areas positing high prevalence rates [17]. The high prevalence of malnutrition calls for action to identify factors that are related to malnutrition that would enable more specific and contextual interventions [17].

Nairobi, where the study is focused is rapidly growing and it is estimated that more than 60% of the population resides in the informal settlements [18]. This fast growth constraints available resources increasing vulnerability including malnutrition [19]. The study conducted at Mbagathi Hospital sought to establish prevalence and contributing factors of malnutrition among children aged 6 to 24 months attending the Well-Baby Clinic (WBC) and provide context specific evidence for targeted interventions and decision making. The age between 6 to 24 months is recognized as most vulnerable because it is a period of rapid growth associated with increased nutrients demand, it coincides with introduction of complementary feeding and the child is at risk of infection due to changes in feeding practices [20]. It is also recognized that any deviation occurring at this age has more adverse impact on growth and development [21].

MATERIALS AND METHODS

An institution based cross-sectional study was conducted to assess the prevalence and contributing factors of malnutrition among children aged 6 to 24 months attending WBC at Mbagathi Hospital in Nairobi County, Kenya. Sample size for the study (300 children) was calculated based on Fisher's formula, Kenya national prevalence of stunting (26%) as the expected prevalence, 5% desired precision and 95% confidence interval [17, 22, 23]. The study started on 23rd November 2015 and ended 26th January 2016. A systematic random sampling was employed to identify and recruit the 300 children. Based on monthly clinic attendance of approximately 300 children per month (calculated from averaging the data from past six months), a sampling interval of every second child was established. Every morning from Monday to Thursday, the research team picked one child randomly from the queue to act as child number 1 and thereafter every alternative child who met the criteria was enrolled and included in the survey. The child's mother/guardian provided the socio-demographic information.

Ethical clearance to undertake the study was obtained from Scientific and Ethics Review Unit (SERU) at Kenya Medical Research Institute (KEMRI). An informed written consent to participate was obtained from every study participants prior to commencing the investigation. The hospital administration gave permission to undertake the study.

Anthropometric measurement of weight and height of study children were taken using standard procedures. Infant electronic weighing scale model RCS-20 designed to take baby weight of up to 20 kilograms was used to measure weight of the children. Length/height were taken using measuring board. Weight and length/height were recorded to the nearest 0.1kilogram and 0.1cm respectively [24]. Interviewer administered semi- structured questionnaires were used to collect socio- demographic data. The respondents were the children's mothers/guardians.

Data Analysis

Anthropometric data was analyzed using WHO Anthro 2006 recommended for children below 59 months and Statistical Package for Social Scientists (SPSS) version 20 software for numerical and categorical data [25, 26]. The anthropometric indices were expressed in terms of Z-scores (Height for Age, Weight for Height and Weight for Age) and reflected as well-nourished, stunted, wasted or underweight in comparison to the WHO reference population [25]. After questionnaires were counter checked for completeness and legibility, double entry of all data into SPSS computer program and database for all variables established. Descriptive statistics for all study variables were conducted and presented in forms of means, standard deviations and percentages. Pearson chi-square test of independence was used to determine nutrition outcomes in relation to study children characteristics, mothers' socio-demography and household characteristics. Statistical significance were preset at 95% confidence interval and p-value < 0.05.

RESULTS

Characteristics of study children

Of the 300 study children, 51% were boys and 49% were girls (table 1). The mean age in months was 11.85 (±4.561) with a minimum of 6 and maximum of 24 months. Approximately half of the children (56%) were below one year of age. The lowest birth weight was 1.0kg and the highest 4.5kg with a mean of 2.97kg (±0.495). Majority of children (82.2%), breastfeeding was initiated with 1 hour of birth (n=298), two children (0.7%) were never breastfed at birth. Most of children (80.5%) were still breastfeeding at the time of study. Mothers' being pregnant (34.5%) and lack of enough breastmilk (24.1%) were the most common reasons given for stopping to breastfeed a child (n=58).

Table 1. Characteristics of study children

Variable	Frequency	Percentage%	Mean
Gender of study children (n=300)			
Male	153	51.0	
Female	147	49.0	
Age in months (n=300)			
6-11	168	56.0	11.85((±4.561)
12-18	99	33.0	
19-24	33	11.0	
Child birthweight in kilograms (n=300)			
<2500	56	18.7	2.97((±0.495)
≥2500	244	81.3	
Breast feeding practices			
First initiation of breastfeeding after birth (n=298)			
≤1 hour	245	82.2	
>1 hour	45	15.1	
≥1 day	8	2.7	
Breastfeeding status of child (n=298)			
Currently breastfeeding	240	80.5	
Not breastfeeding	58	19.5	
Reason child stopped breastfeeding (n=58)			
Child old enough	8	13.8	
Child refused breastmilk	9	15.5	
Mother did not have enough breastmilk	14	24.1	
Mother pregnant	20	34.5	
Prevention of mother to child transmission of HIV	7	12.1	

Demographic characteristics of the respondents

A total of 300 mothers provided socio-demography data (table 2). The maternal age in years ranged from 17 to 49 years with a mean of 26.99(± 5.21). The age between 24 and 29 years had the majority of women (36%), 8% of mothers were aged above 35 years and 7.3% were below 20 years of age. More than half (59%) of the respondents resided in Kibera, Embakasi and Dagoretti. Majority (81.7%) were married in a monogamous marriage, a third (39%) had primary level of education and below and number of births per woman ranged from 1 to 6 with a mean of 1.94(±1.047). The mean monthly income per family was Ksh. 27, 760 (±25,668). Over a half of respondents (54.3%) had family income ≤Kshs.20, 000 per month.

Table 2. Demographic characteristics of study respondents

Variable	Frequency	Percentage %	Mean
Mothers age in years (n=300)			
<20	22	7.3	26.99(±5.21)
20-24	85	28.3	
25-29	108	36.0	
30-34	61	20.3	
≥35	24	8.0	
Residence of respondents (n=300)			
Kibera	100	33.3	
Embakasi	46	15.3	
Dagoretti	33	11.0	
High-Rise	33	11.0	
Rongai	18	6.0	
Others	70	23.3	
Marital status of respondents (n=300)			
Married	245	81.7	
Unmarried	55	18.3	
Level of education of the respondents (n=300)			

Primary and below	117	39.0	
Secondary and above	183	61.0	
Number of children per woman (n=300)			
≤2	219	73.0	1.94 (±1.047)
>2	81	27.0	
Family income in Kenya shillings (n=293)			
≤20,000	159	54.3	27,760(±25,668)
>20,000	134	45.7	

Nutrition outcomes of study children

Prevalence of malnutrition was calculated based on WHO reference population [25] and presented in table 3. The prevalence of wasting (<-2SD) was 15.3%, underweight (<-2SD) was 22.0%, while stunting (<-2SD) was 14.3%. Prevalence of malnutrition by gender indicated that 18.3% of boys and 12.2% of girls were wasted, 28.1% of boys and 15.6 of girls were underweight while 17.6% of boys and 10.8% of girls were stunted. Generally, boys had higher percentage than girls in all three forms of malnutrition. When prevalence of malnutrition was assessed based on children's age in months 13.7%, 18.2% and 15.2% of children aged 6-11, 22-18 and 19-24 had low weight for height (WHZ), 20.2%, 26.3% and 18.2% of children aged 6-11, 12-18 and 19-24 had low weight for age (WAZ) and 9.5%, 23.3% and 12.2% children aged 6-11, 12-18 and 19-24 had low height for age (HAZ) respectively. The age between 12-18 months had the highest percentage of children with malnutrition.

Table 3. Nutritional outcomes of the study children

Variable	**<-2SD**		**≥-2SD**	
Nutritional status of study children (prevalence of wasting, underweight, stunting)				
	N	%	n	%
Weight for height z-scores (n=300)	46	15.3	254	84.7
Weight for age z-scores (n=300)	66	22.0	234	78.0
Height for age z-scores (n=300)	43	14.3	257	85.7
Nutritional status of study children by gender				
Weight for age z-scores				
Male (n=153)	28	18.3	125	81.7
Female (n=147)	18	12.2	129	87.8
Weight for age z-scores				
Male (n=153)	43	28.1	110	71.9
Female (n=147)	23	15.6	124	84.4
Height for age z-scores				
Male (n=153)	27	17.6	126	82.4
Female (n=147)	16	10.8	131	89.1
Nutritional status of study children by age in months				
Weight for height z-scores				
6-11 (n=168)	23	13.7	145	86.3
12-18 (n=99)	18	18.2	81	81.8
19-24 (n=33)	6	15.2	28	84.8
Weight for age z-scores				
6-11 (n=168)	34	20.2	134	79.8
12-18 (n=99)	26	26.3	73	73.7
19-24 (n=33)	6	18.2	27	81.8
Height for age z-scores				
6-11 (n=168)	16	9.5	152	90.5
12-18 (n=99)	23	23.2	76	76.8

19-24 (n=33)	4	12.1	29	87.9

Nutritional outcomes in relation to children characteristics

Although the study revealed a higher prevalence of malnutrition among boys than among girls in all three forms of malnutrition (table 4), low weight for age (underweight) was statistically significant among boys 28.1% than among girls 15.6%, (χ^2 *8.056*, p=0.018). In addition, low birth weight (<2500 grams) was a significant predictor of malnutrition. Of all the children with malnutrition more than a quarter (28.5%) were wasted ($\chi^2$10.631, p= 0.001), about a half (47.8%) were underweight (χ^2 13.489, p=0.000) and 17.3% were stunted (χ^2 10.062, p=0.002). These figures almost double the national prevalence of malnutrition according to Kenya Demographic and Health surveys 2014 (4%, 11% and 26%) for wasting, underweight and stunting respectively [17]. Children who were reported sick two weeks prior to study were more likely to be wasted ($\chi^2$7.240, p=0.027) and underweight ($\chi^2$17.324, p=0.008) when compared to children who reported no illness over the same period. Childhood morbidity two weeks to study did not have a significant effect on low height for age ($\chi^2$0.349 p=0.555). Stunting is the chronic form of malnutrition and this would account for the observed difference on the effect of morbidity two weeks to study on height for age z-scores. Maternal perception of child health status was used to gauge how well care givers are able to interpret children nutrition status in relation to whether a child is healthy or unhealthy. Of all the children who were described as unhealthy (n=42), 54.8% ($\chi^2$58.482, p=0.000) were wasted 52.4% ($\chi^2$26.269, p=0.000) were underweight and 28.6% ($\chi^2$8.0062, p=0.005) were stunted. However, maternal observation and interpretation should be taken with caution because the study also noted that among children described as healthy (n=258), 8.9% had low weight for height, 17.1% had low weight for age and 12.0% had low height for age raising doubt on the appropriateness of mothers' interpretation of child health status.

Table 4. Nutritional status in relation to study children characteristics

Variable	**<-2SD**		**≥-2SD**		**χ^2**	**P-value**
	N	%	n	%		
Gender of study children						
Weight for age z-scores						
Male (n=153)	28	18.3	125	81.7	2.23	0.327
Female (n=147)	18	12.2	129	87.8		
Weight for age z-scores						
Male (n=153)	43	28.1	110	71.9	8.056	0.018
Female (n=147)	23	15.6	124	84.4		
Height for age z-scores						
Male (n=153)	27	17.4	126	88.9	2.157	0.142
Female (n=147)	16	8.9	131	89.1		
Weight for height z-scores						
<2500 (n=46)	13	28.2	33	77.8	10.631	0.001
≥2500 (n=254)	30	11.8	224	88.2		
Weight for age z-scores						
<2500 (n=46)	22	47.8	24	52.2	13.489	0.000
≥2500 (n=254)	44	17.3	200	82.7		
Height for age z-scores						
<2500 (n=46)	15	32.6	31	67.4	10.062	0.002
≥2500 (n=254)	28	11.0	226	89.0		
Weight for height z-scores						
Sick (n=141)	30	21.3	111	78.7	7.240	0.027
Well (n=159)	16	10.1	143	89.9		
Weight for age z-scores						
Sick (n=141)	38	27.0	103	73.0	17.324	0.008
Well (n=159)	28	17.6	131	82.4		
Height for age z-scores						

Sick (n=141)	22	15.6	119	84.4	0.349	0.555
Well (n=159)	21	13.2	128	86.8		
Weight for height z-scores						
Unhealthy (n=42)	23	54.8	19	45.2	58.482	0.000
Healthy (n=159)	23	8.9	235	91.1		
Weight for age z-scores						
Unhealthy (n=42)	22	52.4	20	47.6	26.269	0.000
Healthy (n=258)	44	17.1	214	82.9		
Height for age z-scores						
Unhealthy (n=42)	12	28.6	30	71.4	8.0062	0.005
Healthy (n=258)	31	12.0	227	88.0		

Nutrition status of study children in relation to demographic characteristics of respondents

An analysis of children nutrition outcome in relation to demographic characteristics of study children (table 5) demonstrates that though maternal age less < 20 years portrayed a high percentage of children with malnutrition when compared to other age brackets (27.3%, 45.4% and 22.7%) for wasting, underweight and stunting, it was however not statistically significant (p>0.05).There was an inverse relationship between children nutrition outcomes and maternal level of education with children of mothers with poor level of education (primary and below) at high risk of malnutrition when compared to children whose mothers had secondary school level and above. Almost a quarter (24.8 %,) of children whose mothers had primary or lower level of education (n=117) had low weight for height ($\chi^2$13.202, p=0.000), a third (32.5 %,) had low weight for age ($\chi^2$12.273, p=0.000) and 22.2% had low height for age (χ^2 9.721, p=0.002). In addition, malnutrition was found more prevalent among the low-income population with a monthly income (≤ Kshs. 20,000, n=117). A fifth (22.0%), had low weight for height ($\chi^2$10.135, p<006), a third (32.7%), had low weight for age ($\chi^2$6.701, p=0.035), and 19.5% had low height for age ($\chi^2$5.756, p=0.016). Likewise, even though the relationship between mothers' occupation and malnutrition rates of study children was inconsequential, the study observed a higher prevalence of under nutrition among children whose mothers were not in formal employment (n=133). At least 17.3% of children had low weight for height ($\chi^2$0.707, p=0.4), 25.6% had low weight for age ($\chi^2$1.768, p=0.184) and 16.5% had low height for age ($\chi^2$0.949, p=0.33).

Table 5. Children nutrition status in relation to mothers' demographic characteristics

Variable	**<-2SD**		**≥-2SD**		**χ^2**	**P-v**
	N	%	n	%		
Weight for height z-scores						
<20 (n=22)	6	27.3	16	72.7	4.239	0.375
20-24 (n=85)	9	10.6	76	89.4		
25-29 (n=108)	18	16.7	90	83.4		
30-34 (n=61)	10	16.4	51	83.6		
>35 (n=24)	3	12.5	21	87.5		
weight for age z-scores						
<20 (n=22)	10	45.4	12	54.6	8.092	0.088
20-24 (n=85)	17	20.0	68	80.0		
25-29 (n=108)	21	19.4	87	80.6		
30-34 (n=61)	14	23.0	47	77.0		
>35 (n=24)	4	16.7	20	83.3		
Height for age z-scores						
<20 (n=22)	5	22.7	17	77.3	5.998	0.199
20-24 (n=85)	13	15.3	72	84.7		
25-29 (n=108)	26	20.1	95	87.9		
30-34 (n=61)	7	11.5	54	88.5		
>35 (n=24)	5	20.8	19	79.2		
Weight for height z-scores						
Primary and below (n=117)	29	24.8	88	75.2	13.202	0.000
Secondary and above (n=183)	17	9.3	166	90.7		
Weight for age z-scores						

Primary and below (n=117)	38	32.5	79	67.5	12.273	0.000
Secondary and above (n=183)	28	15.3	155	84.7		
Height for age z-scores						
Primary and below (n=117)	26	22.2	91	77.8	9.721	0.002
Secondary and above (n=183)	17	9.3	166	90.7		
Weight for height z-scores						
Unemployed (n=133)	23	17.3	110	82.7	0.707	0.4
Employed (n=167)	23	13.8	144	86.2		
Weight for age z-scores						
Unemployed (n=133)	34	25.6	99	74.4	1.768	0.184
Employed (n=167)	32	19.2	135	80.8		
Height for age z-scores						
Unemployed (n=133)	22	16.5	111	83.5	0.949	0.33
Employed (n=159)	21	12.6	146	87.4		
Weight for height z-scores						
≤20,000 (n=134)	39	22.0	124	78.0	142.043	0.001
>20,000 (n=159)	9	6.7	124	93.3		
Weight for age z-scores						
≤20,000 (n=134)	52	32.7	115	72.3	92.232	0.523
>20,000 (n=159)	19	14.2	115	85.8		
Height for age z-scores						
≤20,000 (n=134)	31	19.5	128	80.5	275.964	0.000
>20,000 (n=159)	12	9.0	122	91.0		

Nutritional status of study children in relation to household characteristics

The results of chi-square tabulation of children nutrition status and household characteristics (water sources and toilet facilities), as presented in table 6 illustrates that three quarters (75%) of the study population drew water from public water taps, 21% had water inside the house, 2.3% purchased from vendors and 1.7% drew water from borehole/wells. Out of 225 respondents who drew water from public taps, 17.8% were wasted ($\chi^2$4.142, p= 0.042), 25.5% were underweight ($\chi^2$7.485, p= 0.006) while 14.4% ($\chi^2$3.267, p=0.071) were stunted. In addition, out of 216 families using public toilet facilities, 19.0% were wasted ($\chi^2$7.908, p=0.001) and 26.4% were underweight ($\chi^2$8.659, p=0.003). Though 16.7% of study children were stunted it had no statistical significance ($\chi^2$3.421, p=0.064).

The Kenyan Government through the Ministry of health has adapted high impact and cost effective nutritional interventions Infants and Young Child Feeding practices, which are geared towards reducing prevalence of malnutrition, however, this study points to the existence of other underlying factors responsible for increased vulnerability to malnutrition.

Table 6. Children nutritional status in relation to household characteristics of respondents

Variable		<-2SD	≥-2SD		χ^2	P-value
	N	%	n	%		
Weight for height z-scores						
Public water tap (n=225)	40	17.8	185	82.2	4.142	0.042
Private water tap (n=75)	6	8.0	69	92.0		
Weight for age z-scores						
Public water tap (n=225)	58	25.5	167	74.2	7.485	0.006
Private water tap(n=75)	8	10.7	67	89.3		
Height for age z-scores						
Public water tap (=225)	37	14.4	188	83.6	3.267	0.071
Private water tap (n=75)	6	8.0	69	92.0		
Weight for height z-scores						
Public toilets (n=216)	41	19.0	175	81.0	7.908	0.001
Private toilets (n=84)	5	6.0	94.0			
Weight for age z-scores						
Public toilets	57	26.4	159	73.6	8.659	0.003
Private toilets (n=84)	9	10.7	75	89.3		
Height for age z-scores						
Public toilets (n=216)	36	16.7	180	83.3	3.421	0.064
Private toilets (n=84)	7	8.3	77	91.7		

DISCUSSION

The main goal of the study at Mbagathi Hospital WBC was to evaluate the prevalence of malnutrition (wasting, underweight and stunting) and assess contributing factors among children aged 6 to 24 months. Prevalence of wasting was estimated at 15.3%, the proportion of children who were underweight was 22. 0%, and 14.3%, of children were stunted. Considering that the Well-Baby Clinic caters for healthy children, the prevalence of malnutrition reported in this study is high, especially when compared to the findings of the most recent Kenya Demographic and Health Survey [17] for Nairobi County (2.5% wasting, 3.8% underweight and 17.2% stunting). Such high rates of malnutrition not only have health implications but also social and economic consequences [27]. In the short term, malnutrition lowers the immune system, increases burden of disease and risk of death among children below five years [28]. It is estimated that malnutrition is responsible for over 35% of child death annually, causes 11% of Disability Adjusted Life Years (DALYs) compromising physical and cognitive development [29]. Consequently, malnutrition lowers productivity and perpetuates poverty condemning generations into vicious cycle [30]. Therefore, interventions targeting malnourished children would have best benefits to the society.

Conversely, high prevalence of malnutrition can differ from national rates because national studies are conducted across the country muffling such high prevalence of wasting and underweight observed in this study. A program analyst with United National Development Programme, cautions that the aggregate reduction in child malnutrition level across the country should not conceal the fact that not all segments of population benefit from improvement with same magnitude [31].

Equally, the high prevalence rates of underweight and wasting found in this study can be attributed to study setting. Hospital based studies are likely to post high prevalence of

malnutrition possibly due to availability of screen systems that identify children even in early phases of malnutrition. Barker et al. hospital based cross-sectional study in the rural parts of India among the pre-school children found a relatively high prevalence of malnutrition. Of the 516 children sampled 394 were malnourished with 53.86% underweight, 43.22% stunted and 60.67% wasted [32].

Similarly, children residing in the informal settlements are more likely to be malnourished when compared to other populations [33]. This can be attributed to conditions that are prevalent in the slums; overcrowding, poor health infrastructure, inadequate water supply, poor drainage and high rates of unemployment impacting on household food security [34]. These findings are consistent with a study by Kimani-Murage et al. in two slums in Nairobi (Korogocho and Viwandani). The study found overwhelmingly evidence of under nutrition particularly stunting (46%) emphasizing the existence of high rates of malnutrition in the informal settlements [35]. Across the global, Dhone et al community based cross-sectional study in urban fields of Medical College in Pune, India, found a significantly high prevalence of malnutrition. Of the 319 children enrolled in the study 208 were under nourished representing a 65.2% [36].

Child gender, low birth weight, childhood illnesses and maternal perception of child health status were strong predictors of malnutrition among the study children. The high prevalence of underweight ($p<0.05$) found among boys than girls in the study is commensurate with other studies conducted worldwide. Halemarian's community based cross-sectional study in the rural community of Western Ethiopia to assess prevalence of underweight in children below 2 years found a high rate of underweight among boys (9.7%) than in girls (8.2%) [37]. These trends were also observed by Duwarah et al.in a cross sectional study to assess the nutritional status of under five children attending a pediatric outpatient department in a Tertiary Care-Hospital of Northeastern India. [38]. Low birth weight remains an important public health concern especially in most developing countries of Sub-Sahara Africa (13%) and South Asia (28%) and Latin America (9%) [39]. Abu-Saad and Fraser recommend efforts to improve maternal nutrition as the most critical intervention [40].

The strong relationship between maternal perception of child health status and nutrition outcomes in this study, calls for further studies to assess how this capacity can be enhanced and used for early detection of malnutrition [41]. Other important findings identified as drivers of malnutrition were poor maternal education (below primary levels), low family income and poor sanitation. Makoka et al., analysis of three African countries based on Demography and Health Surveys found an inverse correlation of maternal education and children nutritional status. The surveys concluded that higher levels of maternal education were protective of children against malnutrition and called for expansion of free primary education to secondary education for it to have impact on malnutrition [42].

CONCLUSION

In this study, malnutrition remains a significant public health concern especially among poor urban populations, especially those living in slums. Low birth weight and maternal education that is below primary level were identified as predictors of malnutrition in this study.

RECOMMENDATION

The authors recommend additional nutrition education targeting mothers in poor urban areas, especially those with low birth weight babies and those with low formal education. This would contribute to lowering the burden of under nutrition among under-fives. Further research may explore the specific factors that are responsible for gender disparity in the prevalence of malnutrition among the study population.

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Appendix VI: Manuscript II

Complementary feeding practices and nutritional status of children 6 to 24 months: A cross-sectional descriptive study

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ABSTRACT

Background: Complementary feeding refers to a process of introducing the infant to additional sources of nutrition other than the breast milk, usually at the age of six months. Infant and Young Child Feeding guidelines provided by United Nations Children's Fund/ World Health Organization require that children are exclusively breastfed from birth to six months of age when addition foods is introduced to meet the increasing nutritional requirements of the growing child. Proper initiation of the complementary feeding is critical as any deviation may lead to inadequate energy and nutrient intake, leading to sub-optimal growth and development.

Objective: The study aimed to assess complementary feeding practices in relation to nutritional status of children aged 6 to 24 months at the Well baby Clinic at Mbagathi Hospital, Nairobi County.

Material and Methods: A cross-sectional study involving 300 children aged 6 to 24 months was conducted at the Well Baby Clinic at Mbagathi Hospital. Anthropometric measurements were taken using standard procedures and interviewer administered questionnaire was administered to mothers to gather data on complementary feeding practices of study children. Anthropometric data was analyzed using WHO anthro2005 software and descriptive statistics analyzed using SPSS version 20. Results were presented in tables.

Results: Majority (81.7%) of children were first initiated complementary feeding at the recommended age of six months with a mean age of 5.71(±1.033). Almost a quarter (24.3%) of the children were given ≤ 3 meals per day with a mean of 4.35 (±1.210) meals per day. 15.3% of the children were wasted (W/H z-score <-2SD), 22% underweight (W/A z-score <-2SD) and 14.3% stunted (H/A z-score <-2SD. Most complementary foods were Carbohydrates (starchy) based from locally available cereals with limited combination from other food classifications.

Conclusion and recommendation: Despite the impressive rates of compliance with the recommended age of introduction of complementary feeding, malnutrition was high among the children attending the Well Baby clinic at Mbagathi District Hospital. There is need for health care providers to proactively address gaps in complementary feeding practices especially on food diversity, food composition and frequency of meals.

Key words: Complementary feeding practices, malnutrition, food quality, complementary food diversity.

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