FACTORS INFLUENCING NUTRITIONAL STATUS OF INFANTS IN INFORMAL SETTLEMENT OF OBUNGA KISUMU CITY, KENYA

BY

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DECLARATION

Declaration by the Candidate

This thesis is my original work and has not been presented for a Master's Degree in any other institution. No part of this report may be reproduced without the prior permission of the author and/ or Maseno University.

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DEDICATION

This work is dedicated to all the children living in difficult conditions in informal settlements that are a characteristic of many developing countries.

ABSTRACT

Undernutrition is common in children under five years of age globally, especially infants, due to their high nutrient needs for growth and development, which increases their susceptibility to infectious and chronic diseases. Informal urban settlements are characterized by high levels of poverty, making them high-risk areas for infant undernutrition. They tend to bear a high burden of undernutrition with varied context-based risk factors. The main objective of this study was to identify factors influencing the nutritional status of infants in the informal urban settlement of Obunga, Kisumu County. The specific objectives were to: explore the community perception of factors influencing the nutritional status of infants; assess the nutritional status of infants; and assess the relationship between socio-demographic, economic, and health-related factors and the nutritional status of infants in the informal urban settlement of Obunga. A cross-sectional mixed-methods study design was used. Purposive sampling was used to select participants for three focus group discussions, each with between 12 and 14 participants, for a total of 40. Infants 0–12 months (n = 124) were randomly selected from a list of 186 infants in Obunga. Data on perceptions of undernutrition and potential localized influencing factors was collected using a focus group discussion guide and analyzed using thematic analysis. A consolidated, structured questionnaire was used to collect quantitative data. Descriptive statistics were used to establish the prevalence of undernutrition, and regression analysis was used to identify factors associated with undernutrition. Results showed that undernutrition was perceived to be due to exclusive breastfeeding, giving too little food, a lack of a varied diet, intestinal worms, low income, carelessness of caregivers, diseases, and giving birth too soon. Stunting was perceived to be due to cold weather or eating cold foods. Prevalence of stunting, wasting, and underweight, were 27.9%, 15.7% and 19.7%, respectively. The prevalence of multiple anthropometric deficits was stunted-wasted 7.4%, stunted-underweight 13.1%, wasted-underweight 14%, and underweight-wasted and stunted 7.4%. Risk of stunting increased with age of infant (AOR=1.16*; 95% CI: 1.01-1.34). Diet diversity and minimum meal frequency was low but did not influence nutritional status. Risk of wasting was associated with diarrhoea (3.57*; 95% C.I:1.05-12.12). Risk of underweight was influenced by age of infant (AOR=1.27*; 95% CI: 1.03-1.57), mother's age (AOR= 0.83**; 95% CI: 0.73-0.94) and caregiver being employed (AOR= 6.07*; 95% C.I:1.54-23.93). Risk of being stunted-underweight increased by not handwashing after visiting the toilet (AOR= 0.18*; 95% C.I:0.03-0.86) and having grandmother as caregiver (AOR= 6.15*; 95% C.I:1.09-34.73). Risk of underweight-wasted decreased with increasing mother's age (AOR= 0.82*; 95% C.I:0.71-0.95) and increased with caregiver being employed (AOR=5.22**; 95% C.I:1.16-23.53). Risk of stunted-wasted (AOR=9.07**; 95% C.I:1.73-47.51) and stunted-underweight-wasted (AOR= 9.07*; 95% C.I:1.73-47.51) was associated with diarrhoea. Community perceptions, mother's age, handwashing after visiting the toilet, caregiver being employed, having grandmother as caregiver and diarrhoea are significantly associated with undernutrition in Obunga and should be addressed when designing community based nutrition interventions in this and similar populations.

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LIST OF ABBREVIATIONS

AOR	Adjusted Odds Ratio
CHV	Community Health Volunteer
COR	Crude Odds Ratio
FANTA	Food and Nutrition Technical Assistance Project
IMR	Infant Mortality Rate
KNBS	Kenya National Bureau of Statistics
MAD	Minimum Acceptable Diet
MADs	Multiple Anthropometric Deficits
MOH	Ministry of Health
NDHS	Nigeria Demographic Health Survey
SDGs	Sustainable Development Goals
UNICEF	United Nations Children's Fund
WHO	World Health Organization

OPERATIONAL DEFINITION OF TERMS

Caregiver: Is the person in a household responsible of taking care of a child 0 to 12 months and has knowledge and information about the child in question during the period of research. This included father, mother, grandmother and siblings who are of consent age, house help or any person with parental obligation to the child.

Exclusive breastfeeding: This is giving infant 0-5 months breast milk alone including water or any other food apart from droplets of medicine.

Factors influencing nutritional status: These are demographic, socio-economic, health related issues and community perceptions that influence nutritional status of infants

Infant: This is a child from 0 to12 months of age with 0 months starting at birth to end of 1st month of birth.

Informal Urban Settlements: These are urban areas with increased density of human created structures in comparison to the areas surrounding with population of 2,000 and above.

Minimum Dietary Diversity: This is giving infants 6-12 months food from 4 or more of the 7 food groups (World Health Organization , 2010).

Minimum Meal Frequency: This is giving breastfed and non-breastfed children 6-12 months, solid, semi-solid, or soft food (but also including milk feeds for non-breastfed children) the minimum number of times or more. For breastfed children: 2 times if 6-8months and 3 times for 9-23 months. For non-breastfed 4 times for children 6-23 months (W HO 2010).

Mixed feeding: This is giving a child less than six months other foods in addition to milk or breast milk.

Nutritional Status: This is the current body status of an individual or a population group in relation to their state of nourishment and classified as underweight, wasting, stunting, underweight-wasted, underweight-stunted, wasted-stunted, and underweight-wasted-stunted

Perceptions: These are beliefs held by an individual that will determine how they feed an infant.

Sanitation: This is the provision of facilities and services for the safe disposal of human urine and faeces (WHO).

Undernutrition: This refers to a condition that result from eating a diet that does not provide adequate nutrients for growth and maintenance.

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CHAPTER ONE
INTRODUCTION

1.1 Background of the Study

Nutritional status (measured by anthropometry) denotes how well nutrients from food consumed by an individual or group meet body requirements **(**Kirch, 2008). The outcome is either malnutrition or optimal nutrition. Malnutrition occurs in the form of undernutrition or overnutrition. The indicators of undernutrition are underweight, wasting, and stunting. These measurements can be computed for multiple anthropometric deficits. Malnutrition has lifelong consequences for individual health and the economies of nations, and virtually all countries are affected (United Nations Children's Fund (UNICEF) *et al.*, 2021). Global reports attribute 11% of disease burden and 45% of mortality among children under five years of age to undernutrition (UNICEF/WHO/World Bank Group, 2021).

The Sustainable Development Goal (SDG) 2.1 aims at ending hunger and ensuring food access among the poor and infants by the year 2030 (United Nations, 2022). Infancy, 0–12 months, is a time of rapid growth and development, which increases their vulnerability to undernutrition (Wardlaw, Hampl, & Disilvestro, 2004). It is at this point that a child's brain (Cao, Huang, & He, 2017) and body grow and develop rapidly (Black *et al.*, 2017), since the child is expected to double their birth weight at 6 months and triplicate it by one year of age. These processes require adequate food intake to prevent undernutrition. During infancy, undernutrition is attributed to suboptimal breastfeeding and complementary feeding practices (Fekadu, Mesfin, Haile, & Stoecker, 2015), especially in developing countries. Undernutrition in infancy leads to increased morbidity and mortality in the short term (Bartomiej *et al.*, 2017; Cusick & Georgeiff, 2016) and an increased risk of nutrition-related chronic diseases in the long term (Demilew & Abie, 2017). Infancy is therefore a critical time for undernutrition.

Globally, by the year 2050, approximately 70% of the world's population will be living in urban areas. Currently, 6 out of 10 urban dwellers live in informal settlements in Africa (UNICEF, 2012). Generally, residents of informal settlements are nutritionally vulnerable (Drimie, Faber, Vearey, & Nunez, 2013), as a result of high population density, household food insecurity, poverty, overcrowding, poor housing conditions, inadequate water and sanitation facilities, and deficient health facilities (Siddiqui, Salam, Lassi, & Das, 2020; Black *et al.*, 2017; Demilew & Abie, 2017; Ahsan, Arifeen, Al-Mamun, Khan, & Chakraborty, 2017; Bentley *et al.*, 2015; Fakir

& Khan, 2015; Mutisya, Kandala, Ngware, & Kabiru, 2015) and recurrent infections in children (Fet *al.*, 2015).

It is envisaged that by the year 2025, stunting will be reduced by 40% and wasting to less than 5% globally (World Health Organization, 2014). The prevalence of stunting and wasting has decreased over the past decade; however, the progress is not sufficient in developing countries and remains a serious concern (UNICEF/WHO/World Bank Group, 2021). There are still 150 million (22.2%) children under five who are stunted and 50.5 million (7.5%) who are wasted (Development Initiatives, 2021). Most of these children reside in developing and middle-income countries, mainly sub-Saharan Africa and Southeast Asia. In Africa, East Africa, compared to North Africa, has a higher percentage of stunting at 35.6% compared to 17.3% (UNICEF *et al.*, 2018; Black *et al.*, 2017). East Africa is thus a risky place for undernutrition.

Kenya, which is in Eastern Africa, has experienced a deterioration in the nutritional status of children under five years of age between the years 2015 and 2018. Within this period, urban undernutrition rates among children under the age of five increased as follows: Stunting increased from 19.8% to 24.5%, underweight from 7.5 to 9.8%, and wasting from 3.4% to 6.3%. There was an increase in stunting among infants from 12.5% to 14.6%, wasting from 5.2% to 8.3%, and underweight from 6.3% to 8.5%. (KNBS, 2018; Kenya KNBS, 2015), which is a worrying trend. Studies carried out in informal urban settlements have reported high levels of stunting, wasting, and underweight at 26.3%, 6.3%, and 13.16%, respectively, among infants (Vita *et al.*, 2019). In another study, stunting was at 49% (Mutisya *et al.*, 2015). Compared to the national data on undernutrition, urban undernutrition suggests that informal urban settlements in Kenya bear a large share. However, national data on urban undernutrition has not been disaggregated into formal and informal settlements to quantify the problem, especially among infants.

Stunting and wasting levels are the highest in the former Nyanza region (KNBS, 2015). This is in comparison to all other regions in Kenya. Kisumu County, which is in Nyanza Region, has high and medium levels of undernutrition among children under five years of age, with stunting at 23.9%, underweight at 5.2%, and wasting at 5.5% (KNBS, 2018). In contrast to other counties in this region, Kisumu County is home to several informal urban settlements that hold approximately three-quarters of its total population. There are several informal settlements in

Kisumu. Obunga, being one of them, uniquely comprises natives and immigrants who moved in to seek employment from the industries situated around the area (UN-HABITAT, 2005). It has the highest density of housing structures, mostly mud-walled. Periodic surveys on wasting amongst children under five years in Obunga informal settlements showed rates of 7.8% in April 2011 and 7.2% in August 2011 (Concern Worldwide, 2011). However, there is scarce information on the nutritional status of infants in Obunga.

Factors causing undernutrition are complex and range from socio-economic to demographic and health-related. Different studies have shown that several factors relate to infant and child undernutrition, including food insecurity (Mutisya *et al.*, 2015), illnesses (Demilew & Abie, 2017), and the child's age (KNBS, 2015). Others are sex, mother's age (Faye *et al.*, 2018; Myatt *et al.*, 2018; Chirande *et al.*, 2015), birth intervals of less than 2 years, low wealth quintile (KNBS and UNICEF, 2017; KNBS, 2015), low income in this setting (Omondi & Kirabira, 2016), and low maternal education level (Li, Kim, Vollmer, & Subramanian, 2020; Adnan & Khan, 2015; Chirande *et al.*, 2015). Health-related factors such as household sanitation and the use of unsafe drinking water are associated with undernutrition (Chirande *et al.*, 2015; Bantamen *et al.*, 2014). Diseases such as diarrhea, malaria, and HIV have also been cited as risk factors for undernutrition in several studies (KNBS, March 2018; Kinyoki, Berkley, Moloney, & Noor, 2015). Lack of immunization (Faye *et al.*, 2018), low levels of exclusive breastfeeding, and poor complementary foods have also been associated with undernutrition in young children (Chege *et al.*, 2001; Bentley *et al.*, 2015). Due to the many factors that affect undernutrition, it is important to explore the specific factors that influence the nutritional status of infants in the Obunga informal settlement.

Sociocultural perceptions of a community have an impact on the nutritional status of children (Khattak, Iqbal, & Ghazanfar, 2017), since they influence feeding decisions. They include social circumstances, cultural beliefs (Chakona, 2020), and food taboos (Otele, Bunu, & Edoni, 2019). The community's perceptions influence breastfeeding practices (Horwood *et al.*, 2020) and decisions on infant care and feeding practices even with knowledge (Karnawat *et al.*, 2015; Katepa *et al.*, 2015). This is because knowledge may not always translate to good practice.

Of the many factors that affect nutritional status, some are contextual in nature. Therefore, context-specific factors, together with community perceptions, that influence infants' nutritional status should be identified.

1.2 Statement of the Problem

Nutritional status is a vital proxy indicator of good health, especially during infancy, which is a critical time of childhood growth and development, as the impact of undernutrition at this age negatively affects later life. Undernutrition is an underlying cause of childhood morbidity and accounts for almost half of all deaths globally; however, there is slow progress towards its reduction, especially stunting. Developing and middle-income countries in Africa and Southeast Asia are the highest contributors to undernutrition among children under the age of five. Informal settlements in these countries have recorded high levels of undernutrition in comparison with other areas. In Africa, Eastern Africa has a high prevalence of undernutrition, especially stunting. In Kenya, there are no national aggregates for undernutrition in formal and informal settlements, yet informal settlements are attributed to the high rates of undernutrition seen. The former Nyanza province has high infant mortality rates, making it a risky region for infant survival, with Kisumu being home to the largest informal settlements in the region. Obunga informal settlement in Kisumu has high rates of undernutrition according to previous studies, which are higher than national levels. Published studies do not combine community perceptions with other determinants of undernutrition, yet the nutritional status of infants and factors affecting it in this area have not been sufficiently highlighted in the several studies in Obunga. This study therefore sought to determine factors influencing infant nutrition, taking into account community perceptions, to contribute to the prioritization of appropriate interventions for infants in the Obunga informal settlement.

1.3 Main Objective

To establish factors influencing nutritional status of infants (0-12months) within the informal urban settlement of Obunga in Kisumu City of Kenya.

1.4 Specific Objectives

The specific objectives of this study were:

i. To assess the nutritional status of infants (0-12 months) in Obunga informal urban settlement, Kisumu County, Kenya

ii. To determine socio-demographic, economic and health related factors influencing nutritional status of infants (0-12 months) in Obunga informal urban settlement, Kisumu County, Kenya.

iii. To explore community perception of factors relating to infants'(0-12months) nutrition in Obunga informal urban settlement, Kisumu County, Kenya.

1.5 Research Questions

i. What is the community perception on infant's (0-12 months) nutrition in Obunga informal settlements, Kisumu County Kenya?

ii. What is the nutritional status of infants (0-12 months) in Obunga informal settlements, Kisumu County, Kenya?

iii. Which socio-demographic, economic and health related factors influence nutritional status of infants (0-12 months) in Obunga informal settlements, Kisumu County, Kenya?

1.6 Significance of the Study

Undernutrition is an underlying cause of morbidity and mortality in children under the age of five. There are higher rates of undernutrition among infants and more so among those living in informal settlements, yet context-specific factors attributed to undernutrition at this age have not been fully determined. The determination of factors that contribute to undernutrition in this age group can contribute to addressing causes of undernutrition, enhancing child survival, and attaining the Kenya Vision 2030. The study can be referenced by other researchers; the study can be referenced when designing social protection programs for informal urban settlements since the right to proper nutrition is part of the human rights in the Kenyan Constitution of 2010. Ministries like Gender and Agriculture can use the information as a reference tool to develop interventions for improving the health and welfare of infants. This research can be used as a source of reference by the health sector to guide on baseline information for infant feeding practices and other factors influencing nutritional status while designing nutrition programs in this setting.

1.7 Scope of the study

i. The study focussed only on socio-demographic, economic and health related factors influencing nutritional status of infants 0-12 months

ii. Due to potential contextual differences in informal settlements, caution should be applied when generalizing from this finding to other informal settlements.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This section discusses literature related to the study. Areas that other scholars have addressed are highlighted and gaps that they did not address are identified.

2.2 Community Perceptions of Causes of Undernutrition

This section discusses literature related to community perceptions of causes of undernutrition. Community perceptions are a systematic translation of occurrences by people to understand their surroundings. They can be derived from socio-cultural conditions, past experiences, present circumstances, education, and preconceived notions (Robbins & Judge, 2013). This, however, may be real or imaginary. Community perceptions significantly influence the nutritional status of children as they determine decisions on infant feeding practices (Khattak *et al.*, 2017). Therefore, understanding them helps to know the root causes of undernutrition as well as the basis of community practices.

Studies have shown that communities have diverse perceptions of the causes of undernutrition. In a study in India, the community perceived undernutrition in children to be caused by a vulture flying over the mother when she was pregnant, a child eating adult food too early, insufficient food intake, not taking breast milk, and being looked at with an evil eye' (Burtscher & Burza, 2015). Some of these perceptions in this Indian community correctly identify the real causes of undernutrition, while others do not, as they are beliefs that are not precise.

In a study in Pakistan, the community perceived colostrum to be dirty, not beneficial, and would make the child feel hot; mangoes, eggs, and curry were not given to children in hot seasons as they were perceived to increase heat; Bananas, milk, oranges, and yoghurt were not given to children during cold seasons as they were perceived to increase sputum production and cause respiratory tract infections (Khattak *et al.*, 2017). In this Pakistani community, feeding children is guided by the seasons of the year that may affect their nutritional status.

In another study in Bangladesh, the community perceived that undernutrition was a result of bearing too many children, neglect of children, and poor sanitation that caused diseases (Goudet *et al.*, 2011). The causes of malnutrition as perceived by this Bangladeshi community accurately

identify causes of undernutrition among children that may be due to experience or community health education.

In a study in Ghana, the community perceived undernutrition to be due to offending a god, wrongly eating meat sacrificed to gods, eating prohibited food, and doing evil (Boatbil *et al.*, 2014). In this Ghanaian community, the perception of undernutrition is mostly related to traditional religious beliefs that may make it difficult to identify undernutrition.

In another study carried out in Nigeria, the community perceived undernutrition to be caused by ignorance about food to be given to children, a dirty environment, having a very large family, children eating forbidden foods like meat and eggs, improper breastfeeding, a mother not feeding well, poverty, and a mother being single or cohabiting **(**Otele *et al*., 2019). This Nigerian community generally understands the causes of undernutrition, although there are elements of tradition that are not accurate.

In a study carried out in an informal settlement in Kenya, the community perceived undernutrition as a result of alcoholism, poor sanitation, failed contraception, leaving a child under the care of a neighbor or daycare, poor maternal health and nutrition, worm infestation, the vicious cycle of unemployment, and consumption of street foods (Goudet *et al.*, 2016)**.** This community in Nairobi, Kenya, seems to understand the causes of undernutrition, which are due to poor social life and poverty in this setting.

These studies demonstrate that communities understand the existence of undernutrition in children. They, however, show that in as much as the communities understand that undernutrition exists, they have diverse perceptions of factors influencing undernutrition that range from socio-cultural beliefs, education on health, past experiences, and present circumstances. These perceptions determine the foods given to children. They also show that communities hold some perceptions that correctly depict causes of undernutrition, while others are misconceptions of causes of undernutrition. Due to the distinctiveness of communities, specific correct and incorrect community perceptions that influence nutritional status should be identified, especially in areas where undernutrition is high. In this light, the study intends to explore the unique community perceptions that influence the nutritional status of infants in the Obunga informal settlement.

2.3 Nutritional Status of Infants in Informal Settlements

This section discusses literature related to nutritional status of infants residing in informal settlements.

The Sustainable development sub-goal number 2.1 aims at ending hunger and ensuring access for all people, particularly poor people and those in vulnerable situations, including infants, by the year 2030 (United Nations, 2022). The specific nutrition targets in this goal to be achieved by 2025 include, but are not limited to, reducing stunting by 40% and reducing and maintaining childhood wasting to less than 5% (WHO, 2014). Global reports indicate that progress towards achieving these goals has remained low, mostly in developing countries (Development Initiatives, 2021).

Global reports indicate that, in a five-year period from 2015 to 2020, stunting in children under five years of age reduced from 156 million (22.2%) to 149.2 million (22%), though the progress is slow. Wasting also reduced from 50 million (7.5%) to 13.6 million (2%) which makes it on course towards achieving the set global target. Although there seems to be overall progress in achieving the set goals, Africa has lagged behind, as it was the only region where absolute numbers of stunting increased from 58.5 million to 61.4 million cases between 2015 and 2020 (Development Initiatives, 2021). This increase in absolute numbers in Africa may be a contributing factor to the overall smaller reduction of stunting observed worldwide. Wasting seems to be on course, as it decreased from 14.1 million (28%) to 3 million (1.5%) in Africa. During the same period, stunting in East Africa decreased from 37.5% to 32.6%, while wasting decreased from 5.6% to 1% (UNICEF, WHO, and World Bank Group, 2016).

Children 12-59 months of age living in low and middle-income countries have high levels of undernutrition of 38.8%, 27.5%, and 12.9% of stunting, underweight, and wasting, respectively (Li *et al.*, 2020). Residence in urban areas increases the risk of undernutrition among children (Gewa & Yandell, 2012). Studies from informal settlements show high rates of undernutrition in children. In a study in India, 45% and 16% of children 0–59 months of age were stunted and wasted, respectively, while in Bangladesh, 50% and 43% of children 0–59 months of age were stunted and underweight, respectively. Contrary to the global picture, in Kenya, within a 3-year period (2015–2018), there was an increase in urban undernutrition amongst children 0–59 months of age. Stunting levels increased from 19.8% to 24.5%, underweight increased from 7.5 to 9.8%, and wasting increased from 3.4% to 6.3% (KNBS, 2018; KNBS, 2015). There is no

disaggregated urban data to show the prevalence of undernutrition in formal and informal urban settlements; therefore, data on informal settlements can only be from individual studies. Due to poverty and other aggravating factors, informal urban settlements are attributable to the high undernutrition prevalence seen in urban areas (UNICEF *et al.*, 2018). Studies from urban informal settlements show high levels of undernutrition. A cross-sectional survey carried out in Nairobi, Kenya, among underfives revealed stunting, underweight, and wasting at 47%, 11.8%, and 2.6%, respectively (Olack *et al*., 2011). In addition, a longitudinal study carried out in Nairobi, Kenya, found that 49% of children aged 6–23 months were stunted (Mutisya *et al.*, 2015). Also, a study in two informal settlements in Nairobi, Kenya, among infants revealed that 26.3%, 13.2%, and 6.3% were stunted, underweight, and wasted, respectively (Vita *et al*., 2019).

The literature on trends in undernutrition indicates that undernutrition rates are decreasing worldwide. Wasting seems to be on course to meet the set goals, unlike stunting, which is reducing at a slower rate with absolute numbers increasing in Africa. Although these studies are observations from different age cohorts, the high levels of undernutrition among young children are attributable to informal urban settlements, where the majority of the poor dwell. The Kenyan studies demonstrated that there is limited information on disaggregated national data on the nutritional status of children dwelling in informal urban settlements to adequately quantify the problem. From these studies, it is notable that undernutrition occurs in the form of stunting, underweight, and wasting, with stunting being the most prevalent, followed by underweight, and then wasting. The undernutrition indicators used in the current study will comprise these indicators as used in several studies (Vita *et al*., 2019; KNBS, 2018; UNICEF *et al.*, 2018; KNBS, 2015; Olack *et al*., 2011; UNICEF, December 2007). Although multiple anthropometric deficits were not covered in the previous studies, this study will include them in order to demonstrate their existence and measure the burden of coexisting undernutrition in the Obunga informal settlement.

2.4 Socio Demographic, Economic and Nutritional status

This section discusses literature-related to socio demographic and economic factors influencing nutritional status.

Socio-demographic factors, which can be maternal or child-related, affect the ability of a mother to care for and provide for a child, especially in poor settings (Ahsan *et al.*, 2017). Several

studies among children under five years have demonstrated that high maternal age at first birth is a protective factor against undernutrition in children (Tesfaw & Fenta, 2021; Omondi & Kirabira, 2016; Gewa & Yandell, 2012; Kamiya, 2011). This is because motherhood at an early age is associated with undernutrition in mothers and children (Islam, Islam, Bharati, & Hossain, 2016). Delaying first pregnancies by women is therefore a way of reducing undernutrition in children as well as women.

Studies among children under the age of five have related birth intervals of less than 2 years to undernutrition (Tesfaw & Fenta, 2021; KNBS, 2015). It is therefore paramount that mothers have intervals of at least 2 years between pregnancies to reduce undernutrition in children. Several studies have associated low maternal education with undernutrition among children (Ahsan *et al.*, 2017; Ministry of Health *et al.*, 2016; EPHI and ICF, 2021; Omondi & Kirabira, 2016; KNBS, 2015). Therefore, efforts to keep girls in school remain critical to curbing undernutrition in children.

Studies have shown differing results on age as a risk factor for undernutrition. National data shows that wasting and stunting are prevalent after the age of 6 months, while being underweight is common in the first 6 months of life (KNBS, March 2015). A study done in Nairobi, Kenya, amongst infants found wasting to be common in the first 6 months of life, while stunting and underweight occurred after the age of 6 months (Vita *et al.*, 2019). Other studies in Nigeria and India revealed that wasting was highest in infants compared to older children (Akombi, Agho, Merom, & Renzaho, 2017; Bentley, Das, Alcock, More, & Osrin, 2015), yet underweight was common in older infants in studies in Nigeria and Bangladesh (Akombi *et al.*, 2017; Ahsan *et al.*, 2017). There are diverse findings on the type of undernutrition, though they generally agree that infants are at risk of undernutrition (Fakir & Khan, 2015). The difference in the type of undernutrition may be due to differences in the study population (some studies included children 0–59 months), study methodologies, and study settings.

There is a comparable difference in linear growth between boys and girls, with the latter having faster linear growth compared to the former (Faye, Fonn, Levin, & Kimani-Murage, 2018). Several studies have shown that boys compared to girls are at higher risk of undernutrition (Tesfaw & Fenta, 2021; Vita *et al.*, 2019; Chirande *et al.*, 2015; Kinyoki, Berkley, Moloney, & Noor, 2015; KNBS, 2015). These are contrary to the findings of a cross-sectional study on

children 0–59 months old in Bangladesh, where girls have higher levels of undernutrition than boys (Fakir & Khan, 2015). However, studies in Nairobi, Kenya, and India revealed little difference in nutritional status between the sexes (Vita *et al.*, 2019; KNBS, 2015; Bentley, Das, Alcock, More, & Osrin, 2015). In essence, boys are seemingly more prone to undernutrition than girls, and the difference seen may be due to socio-cultural practices where boys are favored over girls.

2.5 Economic Factors and Nutritional Status

This section discusses literature- related to economic factors influencing nutritional status of infants.

It is estimated that by 2030, 9 out of 10 children living in extreme poverty will be found in sub-Saharan Africa (UNICEF, 2016). Poverty has been associated with undernutrition and several disparities that affect young children (KNBS and UNICEF, 2017). National estimates from Nigeria and Kenya show stunting, wasting, and underweight among children 0–59 months to be risk factors among those in the low wealth quintile (Tesfaw & Fenta, 2021; KNBS, 2015). Similarly, stunting and underweight among children aged 6–59 months and 0–59 months are linked to low income and poor economic status in studies in low-income countries, such as Laos (Li, Kim, Vollmer, & Subramanian, 2020; Omondi & Kirabira, 2016; Kamiya, 2011). In Bangladesh, low socio-economic status is linked to underweight in children 0–59 months (Ahsan, Arifeen, Al-Mamun, Khan, & Chakraborty, 2017). Even among the poor, stunting levels are higher in poorer households (Mutisya *et al.*, 2015).

These studies indicate that nutritional status is influenced by socio-demographic factors that can be maternal or child-related. Maternal factors generally influence nutritional status; in addition, a child's age and sex are associated with different types of undernutrition. Low socio-economic status affects the ability of a caregiver to provide adequate nutrition, thus influencing nutritional status (Ahsan *et al*., 2017). This is due to the many challenges faced by these households in accessing healthy diets (Compte *et al.*, 2021). Therefore, using these factors, the study intends to find context-specific socio-demographic factors influencing infants in the Obunga informal settlement.

2.6 Health Related Factors and Nutritional Status

2.6.1 General Health Factors and Nutritional Status

Childhood illnesses rob the body of nutrients necessary for growth and development, thereby increasing the risk of undernutrition (Vita *et al.*, 2019). Studies from Nigeria, Ethiopia, and Kenya found diarrhea and cough to be risk factors for undernutrition (Tesfaw & Fenta, 2021; Bantamen, 2014; Gewa & Yandell, 2012). In addition, studies from Nigeria and Ethiopia found fever and malaria to be risk factors for wasting in children 0–59 months (Akombi, Agho, Merom, & Renzaho, 2017; Shikur, Deressa, & Lindtjrn, 2016). Several studies among children have associated diarrhea with stunting, underweight, or wasting (Vita *et al.*, 2019; Fekadu *et al.*, 2015; Kinyoki *et al.*, 2015; Kamiya, 2011). In another study, illnesses were found to be a risk factor for undernutrition (Demilew & Abie, 2017).

Low attendance at child welfare clinics has been associated with stunting in infants and children 0–59 months in Kenya and India (Vita et al., 2019; Faye *et al.*, 2018; Khan, 2015). Child welfare clinics provide services that promote the health and well-being of children, thereby preventing childhood diseases that affect their nutritional status.

Water and sanitation play a vital role in determining the nutritional status of children. (Gizaw & Worku, 2019). A study in Bangladesh associated poor sanitation with stunting in children 0–59 months (Ahsan, Arifeen, Al-Mamun, Khan, & Chakraborty, 2017). Studies have associated the non-availability of sanitation facilities with wasting in Ghana (Aheto, Keegan, Taylor, & Diggle, 2015), with stunting and wasting in Tanzania and Ethiopia (Chirande *et al.*, 2015; Yisak, Gobena, & Mesfin, 2015) in children under five years of age, and with underweight in children 5–24 months in Cameroon (Nagahori, Tchuani, & Yamauchi, 2015). However, in a study, the use of shared sanitation facilities was linked to diarrhea and helminths in young children (Heijnen, Cumming, Peletz, Chan, Brown, & Clasen, 2014). The use of water from unprotected sources is a risk factor for undernutrition (Bantamen & Belaynew, 2014). In addition, the use of untreated water has been linked to stunting in infants and children under five years of age (Vita *et al.*, 2019; Chirande *et al*., 2015). Lack of handwashing is a risk factor for underweight in children (Demilew & Abie, 2017).

2.6.2 Infants Feeding Practices and Nutritional Status

Exclusive Breastfeeding is a recommended practice for the first six months of life, and its continuation for at least two years reduces the risk of gastrointestinal infection and improves cardiorespiratory fitness in children (Labayen *et al*., 2012). Many women residing in rural areas do not know the importance of breastfeeding (Kuzma, 2013), but urban women have knowledge on infant feeding practices (Karnawat, Karnawat, Joshi, & Kohli, 2015), but the majority do not put this knowledge into practice (Bwalya, Mukonka, Kankasa, Masaninga, Babaniyi, & Siziya, 2015; Fekadu *et al.*, 2015). Studies indicate that suboptimal feeding practices, which include low levels of exclusive breastfeeding and poor complementary foods, are associated with undernutrition and diarrhea in young children (Chege *et al.*, 2016; 201; Bentley *et al.*, 2015; Bwalya *et al.*, 2015). On the other hand, early introduction of complementary feeds is associated with underweight and respiratory infections in children 0–24 months (Bwalya *et al.*, 2015). In addition, studies from low- and middle-income countries link low dietary diversity with wasting (Li, Kim, Vollmer, & Subramanian, 2020).

Based on the literature reviewed, health-related factors, which can be general or related to infant feeding practices, affect the nutritional status of children. Using these concepts, this study will look at their influence on the nutritional status of infants in the Obunga informal settlement to obtain baseline information on breastfeeding and complementary feeding practices.

2.7 Summary of Gaps in Literature

The literature has shown that factors influencing the nutritional status of children are many, and some may differ from one context to another. Community perceptions have been shown to influence decisions on feeding children. Studies reviewed have mostly focused on children under the age of five years, leaving a gap in caregivers' perceptions of factors that may influence the nutritional status of infants. These studies have further shown that perceptions differ from one setting to another depending on social, cultural, and religious beliefs and therefore may not be generalized. The studies reviewed have shown an increase in the prevalence of undernutrition in urban areas of Kenya among children under the age of five in the recent past. This increase is attributable to the informal settlements, which carry the bulk of the urban population. Since the country does not have disaggregated urban data on the nutritional status of children, including infants, it would be useful to establish the prevalence of undernutrition in infants in this setting. Studies reviewed on socio-economic, demographic, and health-related factors affecting the

nutritional status of children have mostly concentrated on older children and have provided valuable information on factors affecting undernutrition. However, there is a gap in context-specific factors influencing the nutritional status of infants in the Obunga Informal settlement, which this study intends to address.

2.8 Conceptual Framework

The Conceptual Framework based on the UNICEF conceptual framework developed in 1990 and revised in 1992 as part of the nutrition strategy. This framework categorizes influencers of nutritional status as immediate, underlying, and basic. Immediate causes are dietary intake and health status; underlying causes are household food security, care for women and children, health services, and a healthy environment; and basic causes are ecological, technical, social, political, and ideological. The key concepts were modified from the literature reviewed, from which potential risk factors for undernutrition were classified into three categories: Socio-demographic and Economic, health-related, and Community Perceptions (Figure 1.1).

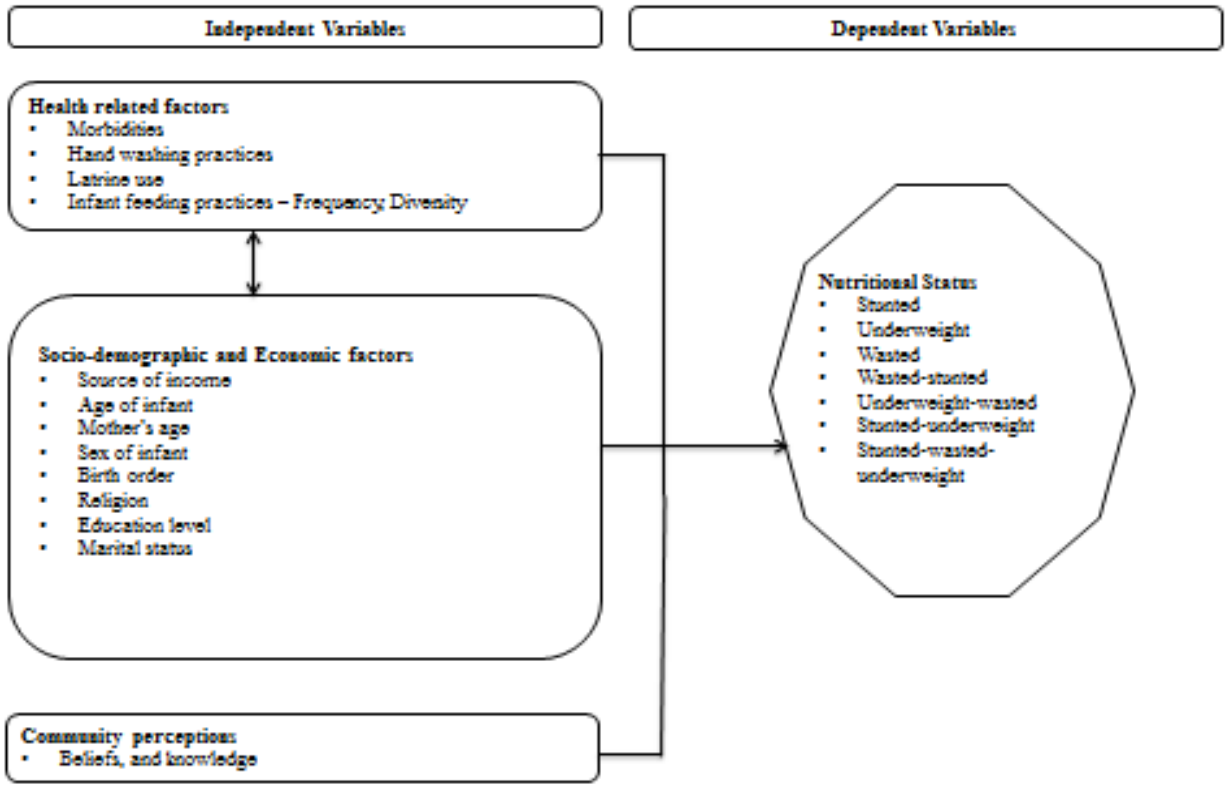

Figure1.1: Conceptual, Framework: Relationship between Factors Influencing Nutritional Status of Infants

CHAPTER THREE
METHODOLOGY

3.1 Introduction

This section consists of methods applied in this research to accomplish the study objectives. It includes; study area, study design, study population, sample size and sampling procedures, research instruments, data collection procedures, measurements of variables, data analysis, study, and ethical consideration.

3.2 Study Area

This study was carried out in Obunga informal settlement, which is located in Kisumu Central Sub County, East Kisumu Location, and Kanyakwar Sub Location it is situated approximately 5 kilometers from Kisumu City Center (See Appendix 1). The area developed as a way of providing affordable housing for those who were seeking employment in the nearby industries and the city. For this reason, it has the highest density of housing structures, with over 80% of the houses built of mud walls and old, re-used iron sheets. The main sources of income in this area are employment in the nearby industries, the informal sector, and small-scale businesses (UN-HABITAT, 2005).

Weather reports on Kisumu shows mean annual rainfall varies with altitude and proximity to the highlands of the Nandi Escarpment. The rainfall ranges between 1,000mm and 1,630mm with a mean annual rainfall of 1,280mm. Although there is entirely no dry month, there are two rain peaks. The long rains peak generally falls between March and May, with a secondary short rain peak falling in September to November. During the short rains, the average annual rainfall ranges between 450mm and 600mm. (World Weather Online, 2023).

The main sources of income in this area are employment by the informal sector, small scale business and very little of small-scale farming. The population in Kanyakwar Sub Location is estimated at 18,421 people the area is 8.6 square kilometres with an estimated population density of 2,133 persons per square kilometre (KNBS, 2019).In this study three villages that make up Obunga namely; Obunga Central, Kasarani, and Segasega were used.

3.3 Study Design

This study adopted a cross-sectional study design, specifically a mixed method that comprises two phases, which are qualitative and quantitative. The qualitative phase preceded the

quantitative since information specifically on diseases and complementary foods given to infants from the qualitative phase informed the development of the household questionnaire.

3.4 Study Population

The study population is the whole group of individuals with whom a researcher is interested in generalizing the findings of the study and has apparent similar characteristics (Mugenda & Mugenda, 2003).

Qualitative Phase

This comprised Obunga community members comprising of men and women who were included in the focus group discussion.

Quantitative Phase

They consisted of infants (0-12 months) residing in Obunga informal settlement.

3.5 Inclusion Criteria

Qualitative Phase

- The men and women who reside Obunga Community and gave informed consent
- Men and women in Obunga who currently or have once been caregivers therefore have knowledge on infant care practices in the community

Quantitative Phase

- All infants 0-12 months and caregivers of infants aged 0-12 months from households in Obunga informal settlements during the period of data collection and who gave informed consent.
- All infants with a regular caregiver (parent or grandparent) pair from Obunga for the period of study.

3.6 Exclusion Criteria

Qualitative Phase

- Community members with health issues that could compromise study outcome like mental illnesses

Quantitative Phase

- Pre- term neonates and infants with congenital defects as such infants would have special needs compared to other infants.
- Caregivers with health issues that could compromise study outcome like mental illnesses

- Those who did not meet the inclusion criteria were replaced through random selection from the sampling frame to reduce on bias.

3.7 Sample Size Determination

Sampling was done as follows:

Qualitative Phase

Focus groups consist of 6–12 people who share certain characteristics like age, sex, and knowledge (Kombo & Tromp, 2006), in this case knowledge on infant care practices. Eliot (2005) notes that three or four groups can be used to produce valid results for the same set of questions. A total of 40 people, consisting of 12 men, 14 mothers, and 14 grandmothers, participated in the study as segregated groups.

Quantitative Phase

To determine the sample size for the number of infants to include in the study, the following formula was used, and a 10% additional sample was used to cater for non-response (Magnani, 1997). In this study (Cochran 1977), this formula is used for large populations to yield a representative sample for proportions. It assumes that a simple random sample will be the sampling design. Wasting prevalence amongst children under the age of five from a 2011 survey by Concern Worldwide was 7.2% in the informal settlement of Obunga. Since infants make up approximately 20% of children under the age of 5 and the population of infants was not readily available, wasting rather than stunting was used to determine the samples required to ensure the number does not exceed the actual number on the ground. The confidence interval used was 95%, and the standard error was 5%. Therefore, the required sample size was:

$$n_o = \frac{Z^2 pq}{e^2}$$

Where:

n_o= the required sample size

Z = the abscissa of the normal curve

p = estimated proportion of the attribute that is present in the population

q= 1-p

e = desired level of confidence

Therefore, the sample size was:

$$\frac{(1.96)^2(0.072)\ (0.928)}{}$$

$(0.05)^2$

= 103 infants + 10% to compensate for non-response

= 113 infants

Due to the lack of population at sub location and village levels from the national census report, a mini-census was conducted, and a list of all infants totaling 186 was developed to form the sampling frame. To cater for 50% of the characteristics of the population and non-response, 124 infants were eventually selected for the study.

3.8 Sampling Procedures

Sampling is taking any portion of a population as a representative of that population. Sampling is done since it may not be necessary to include all subjects of a population in a research study (Mugenda & Mugenda, 2003), as long as the subjects are an accurate representative of the total population (Kothari, 2004).

3.8.1 Qualitative Phase

Purposive sampling method was used to pick individuals to attend the three focus group discussions for this study from the Obunga community. A community health worker assigned by the Ministry of Interior (Assistant Chief) was asked to select participants for the focus group. They needed to be men and women residing in the Obunga community, knowledgeable on infant care practices, who have been or are currently caregivers.

3.8.2 Quantitative Phase

Simple simple random sampling method was used to select infants from the sampling frame using a table of random numbers. In households with two (2) infants, replacement was done through random sampling from the sampling frame.

3.9 Data Collection Tools

3.9.1 Qualitative Phase

A focus group discussion guide was used to gather information on the perception of the community about the factors that influence the nutritional status of infants in the informal settlement of Obunga. The questions in the FGD guide were developed around knowledge and practices on infant feeding, undernutrition, and other health-related factors (see Appendix 3). The food list, who feeds the child, feeding methods, reasons for early introduction of

complementary feeds, and various diseases in the area provided additional information to be included in the semi-structured questionnaire.

3.9.2 Quantitative Phase

The household questionnaire was developed after analysis of the qualitative data; the list of diseases, feeding practices, and types of food given to infants contained in it was populated using information from the focus groups. Additional information from literature was used to complete the household questionnaire; it contained demographic information, anthropometric data, socio-economic factors, food intake, morbidity, health-related factors, household factors, and household sanitation (see Appendix 4).

3.10 Validity of Instruments

Content validity was determined to determine if the instruments satisfactorily covered the topic under study. This was done by sending the questionnaires to three (3) different qualified persons (Kothari, 2004), who gave their input, and the questionnaire was revised as per recommendations. Pre-testing of the questionnaire was also done.

3.11 Pretesting of Questionnaires

Many authors have used 10% of a similar population for pretesting the questionnaire (Mugenda & Mugenda, 2003). Participants consisted of caregivers of 12 infants from a similar population in the nearby Kamakowa settlement, which has a similar socio-demographic profile as the study area. Pretesting was done to: establish the validity and reliability of the tool; assess whether or not the wording was clear; check if the respondents could interpret all the questions in the same way; and determine if there was any research bias (Kombo and Tromp, 2006). The necessary adjustments were made thereafter.

3.11.1 Reliability of Instruments

Training on questionnaires was done for the research assistants to ensure all the questions would be interpreted and responded to in the same way. The author used information from literature to develop the tool. Clearly marked salter scales were used for taking weight, and they were calibrated using known measures. The weighing scales were calibrated using known measures. The height and length of infants were taken using uniforms and clearly marked wooden height boards. The height board uses known lengths. The weight and height measurements were taken

in duplicate, and an average was done. Where there was a discrepancy, a third measure was taken.

3.12 Data Collection Procedures

Data was collected in two phases: Qualitative and quantitative phases.

3.12.1 Qualitative Phase

- The identified community members were gathered at a central meeting venue organised by the link Community Health Volunteer (CHV) for a face-to-face interview.
- During the interview researcher (moderator) introduced the note taker and the purpose of the meeting. Then sought for permission from the participants to record and proceed with the discussion.
- The women group were divided into two since they are the primary caregivers and it gave the young mothers a levelled playing field to freely express their opinion
- During the discussions, the caregivers then introduced themselves
- Probe questions were used in both Dholuo and Kiswahili languages to elicit responses from the respondents and a note taker who took notes verbatim
- The topics were explored to the point of saturation. That is, it stopped when new information was no longer being generated.
- Questions on causes of undernutrition was asked in Dholuo and Kiswahili using pictures in of children who had marasmus (explained as too thin) and stunting (explained as a child shorter than those of the same age).
- Large groups that are above eight may not encourage active participation (Ritchie & JaneLewis, 2010), so the researcher gave every participant a chance to contribute and ensured all community views were recorded.
- Each interview took approximately 2 ½ hours to complete.

3.12.2 Quantitative Phase

The researcher and trained research assistants administered the questionnaire face-to-face at household level. The community health volunteers (CHV) acted as guides to the households; once in the household, the CHV introduced the researcher and explained the purpose of the visit to the caregiver, where face-to-face interviews were done. The researcher then greeted the caregiver, made introductions, and sought permission to conduct the interview, which was given

by the caregiver after signing the consent form (see Appendix 2). Weight and height measurements were taken first, followed by a face-to-face interview. The interview was face-to-face in both Dholuo and Swahili for clarity and took approximately 20 minutes. The consent forms were checked to confirm the participant's signature or thumbprint. The filled-out questionnaires were checked and coded at the end of each day and stored in a safe place under lock and key awaiting data entry. Of the one hundred and twenty-four (124) sampled infants, one hundred and twenty-two (122) female caregivers were interviewed, with two declining, giving a non-response rate of 1.6%.

3.13 Measurement of Variables

Anthropometric measurements (weight and height/length) were taken for all infants by the research team. Measurements were taken using procedures outlined in the measurement guide for the Food and Nutrition Technical Assistance (FANTA) project (Cogill, 2003). Community perception was measured manually. The mother's education level was measured as none or educated. The mother's age was estimated by using the reported year of birth. Marital status was measured as married or not married. Religious affiliation was measured as Christian or other. The source of income was measured as not employed or employed. The age of the infant was measured as completed months from the date of birth. The sex of the infant was measured as male or female. Meal frequency and diversity were measured by the *24-hour recall* method. Exclusive breastfeeding was measured as those who reported having given no food or water except for medicine in the preceding 24 hours. Minimum dietary diversity is measured as the number of infants 6–12 months old who received food from 4 or more of the 7 food groups according to the WHO food groups. Minimum meal frequency was measured as infants 6–12 months, breastfed and non-breastfed, who received solid, semi-solid, or soft food (but also including milk feeds for non-breastfed children) the minimum number of times or more. For breastfed children: 2 times if 6–8 months and 3 times if 9–12 months. For non-breastfed children 6–12 months. The minimum acceptable diet was measured as the proportion of infants 6–12 months who received a minimum acceptable diet (excluding breast milk). Sanitation facilities were measured as either available or not available. Handwashing practices that were measured as handwashing after visiting the toilet, before preparing the baby's food, before feeding the baby, and after changing the baby's nappies Each of these was considered a subcategory of handwashing. Diseases were measured as those that occurred in the 2 weeks preceding the study.

Those who feed children (caregivers) were classified as mothers, fathers, grandmothers, and others. Table 3.1 outlines the measurements of all the variables used.

Table 3.3: Summary of Measurement of Variables

Variables	Type of Scale	Measurement(codes)
Dependent variable		
Weight for age (underweight)	Nominal	Underweight Yes(1) or No(0)
Height for age(stunting)	Nominal	Stunted Yes(1) or No(0)
Weight for height (wasting)	Nominal	Stunted Yes(1) or No(0)
Multiple anthropometric deficits (MADs)	Nominal	MADs Yes(1) or No(0) as per the various sub categories
Independent Variable		
Community perception	Manually done	Thematic content analysis
Mothers education level	Nominal	None(0), Educated (1)
Mothers age	Scale	Age (years) using reported year of birth
Marital status	Nominal	Married No(0) or Yes(1)
Religion	Nominal	Christian No (0) or Yes (1)
Source of income(employment)	Nominal	Employed No (0) or Yes (1)
Age of infant	Scale	In completed months
Sex	Nominal	Female(0) and Male(1)
Exclusive breastfeeding (EBF)	Nominal	EBF Yes(1) or No(0)
Minimum dietary diversity (MDD)	Nominal	MDD Yes(1) or No(0)
Minimum meal frequency (MMF)	Nominal	MMF Yes(1) or No(0)
Minimum Acceptable Diet (MAD)	Nominal	MAD Yes(1) or No(0)
Hand washing practices(HW)	Nominal	HW Yes(1) or No(0) for each of the sub categories
Availability of sanitation facilities	Nominal	Yes(1) or No(0)
Child sick in preceding 2 weeks?	Nominal	Yes(1) or No(0)
Person who feeds infant (caregiver)	Nominal	Caregiver Yes (1) or No (0) based on provided subcategories

3.14 Data Analysis Plan

The research data were analysed according to the objectives of the study at two levels, which were qualitative and quantitative.

3.14.1 Qualitative Data Phase

Qualitative data was analysed manually by use of thematic content analysis and data represented under the various themes that emerged from the focus group discussion.

3.14.2 Quantitative Phase

The dependent variables were measured using anthropometric measures of height, length, and weight. The anthropometric data was standardized for age by using WHO *anthro* software version 3.2.2.1, which is based on the WHO's 2006 growth standards for children. Data analysis was done using SPSS version 20. Univariate analysis (binary logistic regression) was carried out

between the independent and dependent variables. Using significant variables at a p value of 0.05 from the binary logistic regression, multivariate analysis was then done to identify the independent predictors of nutritional status (measured as stunting, underweight, wasting, stunted-wasted, wasted-underweight, stunted-underweight, and underweight-wasted-stunted). The strength of the association was measured by an odds ratio with 95% confidence intervals. Both the crude odds ratios (COR) and adjusted odds ratios (AOR) are reported. Variables from the AOR with a p value of 0.05 were considered significant factors. Frequencies were used to analyze the background characteristics of respondents, diseases in the preceding two weeks of the study, and feeding practices for infants. The data analysis plan is summarized in Table 3.2.

Table 3.4: Summary of Data Analysis Plan

Objective	Variables	Data Analysis Methods and Tools
Objective 1 To identify community perception of factors influencing nutritional status of infants in the informal urban settlement of Obunga	Practice and perceptions	Thematic content analysis
Objective 2 To assess the nutritional status of infants (0-12months) in the informal urban settlement of Obunga	<u>Dependent variable</u> • Weight-for-age • Height-for-age • Weight-for-Height • Multiple anthropometric deficits <u>Independent variables</u>	Descriptive statistics mainly z-score index, frequencies, standard deviation and mean
Objective 3 To determine the relationship between factors influencing nutritional status of infants and nutritional status of infants in the informal urban settlement of Obunga	• Age • Sex • Income • Household sanitation • Diseases • Handwashing practices • Infant feeding practices <u>Dependent Variable</u> • Weight-for-age • Height-for-age • Weight-for-Height • Multiple anthropometric deficits	Binary logistic regression to generate OR and 95% CI Multivariate logistic regression to generate AOR and 95% CI

3.15 Ethical Consideration

The Maseno University Ethics Review Committee reference number MSU/DRPC/MUERC/00046/13 approved the study for implementation see appendix 8. Permission was also sought from the provincial administration at the office of the Sub Chief after presentation of introductory letter from Maseno University see appendix 7. The participation in the research was voluntary therefore, informed consent was obtained for Focus Group Discussion and the caregivers signed the questionnaires before proceeding with the interview at household level. Confidentiality was maintained by ensuring names of participants were not captured in the questionnaires rather codes were used to identify them. The filled questionnaires and list of infants were kept in safe custody by the researcher.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction

This chapter presents study findings that have been analysed and reported as per study objectives.

4.2 Community Perception of Factors Influencing Nutritional Status of Infants in the Informal Urban Settlement of Obunga

This information was collected from men and women (groups consisting of men, mothers, and grandmothers) in Obunga who currently or have once been caregivers therefore have knowledge on infant care practices in the community. The community members provided information on infant feeding practices, causes undernutrition, common childhood illnesses in the community.

To assess the community perception of undernutrition the members were shown photos of children who were stunted and another wasted (marasmus) and kwashiorkor.

4.2.1 Factors Relating to Overnutrition

The factor relating to over nutrition as depicted by the community was force-feeding. In this community, infants who were difficult to feed are force fed to ensure that they eat 'enough' food. This factor was mentioned in FGD 2 and 3 as indicated by the following responses:

> *"The stubborn infants or those who refuse to eat are force fed to avoid wasting my time and you know with this feeding method the infant can take up to one litre of porridge". [FGD 2: a mother]*

> *"The children who are stubborn are force fed "sigaglo" as it makes the child stay satisfied for a long time and they are able to take more food". [FGD 3: an old man]*

4.2.2 Factors Relating to Undernutrition

Undernutrition in this community were associated with: Exclusive breastfeeding, giving infant too little food, lack of consumption of variety of foods, worm infestations, low income, giving birth too soon, carelessness of care givers and diseases. These factors were mentioned in FGD 1, 2 and 3 as indicated by the following responses:

Exclusive breastfeeding was common in all groups as indicated in the following responses:

"When an infant is exclusively breastfed for six months they do not get sufficient amount of food that they need for growth. This is because the modern infants are hungrier than usual therefore requiring food very early". [FGD 3: an old man]

"There are some infants who require additional food earlier even as early as 3 months since the mother may not be producing sufficient amount of breast milk alone". [FGD 1: a grandmother]

"Because I am always busy and the baby is crying too much I do not have enough time to breast feed exclusively so my milk becomes too little to satisfy the infant I introduce cow's milk as 2 weeks, 3months, or even 5 months". [FGD 2: a mother]

Giving infant too little food was mentioned in FGD 1 and 2 as indicated by the following responses:

"When an infant is given too little food they are not able to grow well and so end up with undernutrition" [FGD 2: a mother]
"If you give an infant little food they do not grow properly" [FGD 1: a grandmother]

Lack of consumption of variety of food was mentioned in all the groups as indicated by the following responses:

"*When you give an infant only one type of food everyday they do not grow well as they lack the other foods to make them grow properly" [FGD 3: an old man]*

"By giving only one type of food it makes the infant not to grow well". [FGD 2: a mother]
"A child requires many types of food if you give only one type they don't grow well" [FGD 1: a grandmother]

Worm infestation was mentioned in all the groups as indicated by the following response:

"When an infant has worms they cannot grow well since they will not get sufficient nutrients from the food they are taking" [FGD 1: a grandmother]

"You know when a child has worms they do not grow well as the worms compete with the child for food" [FGD 2: a mother]

"Lack of proper care would make an infant to eat soil thereby getting worms and becomes malnourished". [FGD 3: young man]

Low income was mentioned as contributing to under nutrition in all the groups as indicated by the following responses:

"When you do not have sufficient amount of money to buy food the infant does not get enough food to eat, so when they cry too much because of hunger you put them on the breast as a way of making them calm down" [FGD 2: a mother]

"When you do not have sufficient money, the infant may become under nourished because you are unable to buy variety of foods that the infant requires". [FGD 3: a young man]
"Infants do not understand that one can lack money when they are hungry they can drive you crazy so you only give them the little available to pacify them". [FGD 1: a grandmother]

Giving birth too soon was mentioned in all the groups as indicated by the following responses:

"If a mother gets pregnant too soon and the pregnancy does not go well with the infant, the child may develop "ledho" (a type of sickness that makes the child not gain weight)". [FGD 1: a grandmother]

"When a mother gets pregnant too soon they are forced to withdraw the infant from breast milk and the child may end up stressed and become malnourished as they feel they are neglected". [FGD 2: a mother]

"If a woman gets pregnant too soon the child will not grow well because the child will not be breastfed, will feel neglected and develop "ledho" [FGD 3: an old man]

'Carelessness of caregivers' was mentioned in FGD 3 as indicated by the following responses:

"A mother who is careless does not have time to look after the infant well and does not care to feed the child and therefore leading to under nutrition" [FGD 3: a young man]

"A woman who has marital insecurity will not bother to look after and feed an infant as she will be busy following the man to know whom he talked to and why and this leads to under nutrition as the child will be eating cold foods" [FGD 3: an old man]

Diseases were mentioned in all the groups as indicated by the following responses:

"When an infant has diseases such as diarrhoea, vomiting, malaria, coughing, wounds on the tongue and allergies they do not eat much food therefore leading to under nutrition". [FGD 1: a grandmother]

"Diseases such as coughing, malaria, diarrhoea, "orianyancha" (rotavirus) are common in infants and these can cause under nutrition" (FGD 3: a young man).

"These diseases do not seem to have an end you treat one disease another one comes up, it is a series of never ending diseases!" [FGD 2: a mother]

Cold or cold food

Cold weather and cold foods were perceived to cause stunting in infants:

"That child is short due to an attack of cold (koyo), just the same way if you plant maize in the Rift Valley which is cold it grows slower compared to Nyanza which is warm where maize grows faster" (FGD 3: an old man)

"When you give a child cold food they don't grow tall" (FGD 2: a mother, FGD 1: a grandmother)

Causes of under nutrition as perceived by the community were insufficient income, giving very little food, lack of variety, diseases, worm infestations, cold, eating cold food and giving birth too soon which was associated with wasting disease.

4.2.3 Factors Relating to Optimal Nutrition

Optimal nutrition was related to feeding of the child with jute plant and early introduction of other feeds. This factor was mentioned in the various FGD groups as indicated by the following responses:

Feeding of the child with jute plant was mentioned in FGD 1 and 2 as indicated by the following responses:

"Feeding an infant with jute plant makes the child gain more weight" [FGD 2: a mother]
"Jute plant is especially good for infants as it makes them healthy" [FGD 1: a grandmother]

Early introduction of other feeds was mentioned in FGD 1 and 2 as indicated by the following responses:

"When you introduce other foods before six months the infant grows faster and is much stronger. The government needs to be petitioned to recommend other foods as from 3 to 4 months". [FGD 3: an old man]

"Since breast milk is hardly adequate and the mother sometimes feels dizzy after breastfeeding we usually opt to start other feeds before 6 months depending on the baby's appetite". [FGD 2: a mother]

"Most of these mothers are not able to produce enough milk to cater for the baby's needs, or the mother is too sick to breast feed, or the mother has gone to work it's good to introduce the infant other feeds". [FGD 1: a grandmother]

The community associated good nutrition with giving foods such as jute plant as well as early introduction of complementary feeds.

4.3 Demographic and Socio Economic Characteristics Caregivers

Table 4.1 outlines the demographic and socio economic characteristics pertaining to caregivers in the quantitative phase of the study.

Table 4.1: Demographic and Socio Economic Characteristics Caregivers

Characteristics	n (%)
Marital Status	
Married	100 (82%)
Single	19 (15%)
Widowed	2 (2%)
Divorced	1(1%)
Mothers Age	
15-19 years	24 (19.7%)
20-24 years	44(36.1%)
25-29 years	35(28.7%)
Over 30 years	18(14.8%)
Missing	1(0.8%)
Mother's Education Level	
None	1(1%)
Primary level	79 (65%)
Secondary level	36(29%)
Post- secondary level	6 (5%)
Religion	
Christians	114(93.4%)
Muslims	5(4.1%)
Others not specified	3(2.5%)
Source of Income	
Employed	5 (4.1%)
Casual workers	13 (10.7%)
Self employed	45 (36.9%)
Not employed	58(47.5%)
Missing	1(0.8%)

Majority of the caregivers 100 (82%) were married; the majority age ranged between 20-29 years but the bulk were between 20-24years 44 (36.1%); Most are educated but majority had primary level of education. This is majorly a Christian community 114 (93.4%). Among the employed majority are self- employed (small-scale business) 45 (36.9%), those not employed accounted for 58 (47.5%).

4.4 Nutritional Status of Infants (0-12months) in the Informal Urban Settlement of Obunga

In this study population the proportion of infants classified as normal (had no undernutrition) were 78 (63.9%), and 44 (36.1%) were undernourished according to the three anthropometric

indices of nutritional status: underweight, stunting and wasting. Of those who were undernourished (15.6%) had one indicator of undernutrition, 15 (34.9%) had two indicators of undernutrition and 9 (7.4%) had 3 indictors of undernutrition. 1 (0.8%) indicator was missing. Table 4.2 summarises the nutritional status of infants by indices in Obunga.

Table 4.2: Nutritional Status of Infants in by Indices, age group and Sex in Obunga

Factor	N	Stunting n (%)	Underweight n (%)	Wasting n (%)
Total	**122**	34(27.8%)	24 (19.7%)	19 (15.7%)
Sex				
Male	56	14 (25%)	13 (23.2%)	9 (16.1%)
Female	66	20 (30.3%))	11 (16.7%	10 (15.2%)
Age groups				
0-5 months	58	9 (15.5%)	7 (12.1%)	7 (12.1%)
6-12 months	64	25 (39.1%)	17 (26.6%)	12 (18.8%)
Prevalence of Multiple Anthropometric Deficits(n=122)				
Frequency				
Stunted and Wasted				9 (7.4%)
Stunted and Underweight				16 (13.1%)
Wasted and Underweight				17 (13.9%)
Underweight, Wasted and Stunted				9 (7.4%)
Undernourished Children (n=43)				
Single anthropometric deficit				19(44.2%)
Two anthropometric deficits				15(34.2%)
Three anthropometric deficits				9(20.9%)

The findings show that stunting has the highest prevalence 34(27.8%). The prevalence of underweight was higher in boys compared to girls while the prevalence of stunting is higher in girls compared to boys. Children 6-12 months had the highest rates of underweight, wasting and stunting compared to those who are 0-5months of age. Multiple anthropometric deficits were also present in infants in this population with the most prevalent being wasted-underweight at (13.9%) followed by stunted - underweight at (13.1%).

In this population 56% of infants who are undernourished had more than one form of undernutrition with majority 15(34.9%) having two anthropometric deficits.

4.5 Infant Feeding practices and health related indices

Exclusive breastfeeding for the first six months and timely introduction of complementary foods are the recommended feeding practices for infants. Table 4.3 shows the infant feeding indicators that were assessed in this study.

Table 4.3: Infant Feeding Indices

Indicator	Proportion
Currently breastfeeding	115(94.3%)
Exclusive breastfeeding under six months (n=58)	38 (65.5%)
Minimum dietary diversity (n=64)	22 (34.4%)
Minimum meal frequency (n=64)	28 (43.7%)
Minimum acceptable diet – Breastfed (n=59)	23(38.9%)
-Non breastfed (n=5)	2 (40%)

Ninety four percent 115 (94%) of the children breast milk in the preceding 24 hours, sixty-six 38 (66%) percent of children 0-5months were breastfed exclusively. Thirty-four 34.4% received a diet that met the minimum dietary diversity. Forty-three 43.7% were fed the minimum number of times appropriate for their age. Thirty-nine 38.9% of the breastfed and forty 40% of the non-breastfed children 6-12 months were fed a minimum acceptable diet (MAD).

Table 4.4 highlights the complementary foods given to infants in Obunga community. The number included all infants 6-12 months and those who were 0-5months and were not exclusively breastfed.

Provision of adequate complementary feeding at 6 completed months of age is imperative to ensure the infant achieves optimal growth and development. Table 4.4 outlines the various complementary foods given to infants in Obunga area.

Table 4.4: Common Complementary Foods

Food	Food group for diversity	Frequency(n=84)
Porridge	Grains, roots and tubers	75(89%)
Cow's milk	Milk and milk products	42(50%)
Soup and ugali	Grains, roots and tubers	40(48%)
Orange juice	Other fruits and vegetables	32(38%)
Avocado	Other fruits and vegetables	31(37%)
Tea with milk	Milk and milk products	28(33%)
Apoth(jute)	Vitamin A rich fruits and vegetables	20(24%)
Irish potatoes/chips	Grains, roots and tubers	21(25%)
Pawpaw	Vitamin A rich fruits and vegetables	10(12%)
Strong tea	None	9(11%)
Rice	Grains, roots and tubers	7(8%)
Beans	Legumes and nuts	4(5%)
Fish	Fleshy foods	3(4%)
Cooked bananas	Grains, roots and tubers	3(4%)
Green vegetables, pumpkin, mango	Vitamin A rich fruits and vegetables	3(4%)
Cerelac	Grains, roots and tubers	1(1%)
	Eggs	0

Most commonly fed food is porridge 75(89%) followed by cow's milk 42 (50%) and soup with ugali40 (48%). Very few children received food from the protein group (fleshy foods and legumes and nuts) with none receiving from the eggs group.

Household sanitation is key in the prevention of communicable diseases, which have been linked to undernutrition. Table 4.5 outlines availability of sanitation facilities, handwashing practices and morbidity amongst infants in the preceding 2 weeks.

Table 4.5: Availability of sanitation facilities, handwashing practices and diseases prevalence

Indicator	Proportion
Had latrines	116(95.1%)
Had no latrines	6(4.9%)
Washed hands after visiting toilet	108(88.5%)
Washed hands before feeding baby	101(82.8%)
Washed hands before preparing baby food	67(54.9%)
Washed hands after changing nappies	56(45.9%)
Morbidity in infants	
Running nose	26(21.3%)
Coughing	25(20.5%)
Hotness of the body (fever)	23(18.9%)
Diarrhoea	18(14.8%)
Malaria	11(9%)
Vomiting	11(9%)
Rotavirus	9(7.4%)
Skin conditions	8(6.6%)
Others(witchcraft, ear infection, long epiglottis)	3(2.5%)

Ninety five percent (95%) of primary caregivers' households had latrines. Handwashing was common after visiting the toilet and before feeding the child as opposed to before preparing food and after changing nappies. The most common morbidities amongst infants were running nose 21.3%, coughing 20.5% and fever 23(18.9%).

4.6 Socio-economic, Demographic and Health Related Factors influencing Nutritional Status

Regression analysis was used to determine the relationship between nutritional status and factors influencing it. Crude odds ratio were generated using binary logistic regression and adjusted odds ratios generated using multiple logistic regression in a model that included all factors found to be associated with the outcome variable in the binary logistic regression. The results are herein summarised accordingly.

4.6.1 Factors Influencing Stunting

Using binary logistic regression, 37 factors were analysed and 4 factors, which were age of infant, father feeds, diarrhoea, and spacing, were found to be associated with stunting. These 4 factors were then subjected to multiple logistic regression. Results are summarized in Table 4.6.

Table 4.6: Factors Influencing Stunting

Factor	Crude OR		Adjusted OR	
	OR	**95% CI**	**OR**	**95% CI**
Age of infant	1.21**	(1.06-1.37)	1.16*	(1.01-1.34)
Father caregiver	3.0*	(0.96-9.33)	2.23	(0.67-1.32)
Diarrhoea	3.16*	(1.13-8.83)	1.84	(0.58-5.89)
Spacing	0.89*	(0.64-1.25)	0.93	(0.65-1.32)

*Key: $p < 0.05$ *; $p < 0.01$ ***

An analysis of the relationship between age of infant and stunting revealed a significant effect at both crude and adjusted level. At crude, with each unit increase in age of infant the odds of an infant being stunted increased by 1.21 times (Crude odd=1.21; 95% CI: 1.06-1.37; p<0.01); while at adjusted level, with each unit increase in age the odds of an infant being stunted increased by 1.16 times (AOR=1.16; 95% CI: 1.01-1.34; p<0.05)

An analysis of the relationship between fathers as caregiver, diarrhoea, spacing and stunting revealed a significant relationships only at crude level. At crude level, with father being the care giver the odds of an infant being stunted increased by 3.0 times (Crude odds= 3.0; 95% CI: 0.96-9.33; p<0.05). At crude level, with each unit increase in diarrhoea the odds of an infant being stunted increased by 3.16 times (Crude odds= 3.16; 95% CI: 1.13-8.83; p<0.05). At crude level, with each unit increase in spacing the odds of an infant being stunted decreased 0.89 times (Crude odds= 0.89; 95% CI: 0.64-1.25; p<0.05); at adjusted level fathers as caregiver, diarrhoea and spacing were not significant indicating lack of support for the associations.

4.6.2 Factors Influencing Underweight

Using binary logistic regression, 37 factors were analysed against underweight. Of these factors, five (5) variables: age of infant, mother's age, and grandmother feeds infant, diarrhoea and source of income were found to influence underweight. These 5 variables were then subjected to multiple logistic regression to generate the adjusted odds ratio (AOR). Results of both analyses for these five factors are summarized in Table 4.7.

Table 4.7: Factors Influencing Underweight

Factor	Crude O.R		Adjusted O.R	
	O.R	**95% CI**	**O.R**	**95% CI**
Age of infant	1.23**	(1.06-1.42)	1.27*	(1.03-1.57)
Mother's age	0.88*	(0.79-0.99)	0.83**	(0.73-0.94)
Grandmo ther caregiver	8.33**	(1.83-37.86)	4.17	(0.72-24.05)
Diarrhoea	3.26*	(1.11-9.59)	2.78	(0.61-12.61)
Employment of caregiver	3.47*	(1.27-9.48)	6.07*	(1.54-23.93)

*Key: $p < 0.05$ *, $p < 0.01$ ***

An analysis of the relationship between infant's age, mother's age, employment of caregiver and underweight revealed a significant effect at both crude and adjusted levels. At crude level, with each unit increase in age the odds of an infant being underweight increased by 1.23 times (Crude odds= 1.23; 95% CI:1.06-1.42; p=<0.01) while at adjusted level, with each unit increase in age, the odds of an infant being underweight increased by 1.27 times (AOR=1.27; 95% CI:1.03-1.57; p=<0.05). At crude level, with each unit increase in mother's age the odds of an infant being underweight decreased by 0.88 times. (Crude odds= 0.88; 95% CI: 0.79-0.99; p=<0.05); while at adjusted level, with each unit increase of a mother's age the odds of an infant being underweight decreased by 0.83 times (AOR=0.83; 95% CI: 0.73-0.94; p=<0.01). At crude level, with caregiver being employed the odds of an infant being underweight increased by 3.47 times (Crude odds=3.47; 95% CI: 1.27-9.48; p=<0.05); while at adjusted level, with caregiver being employed the odds an infant being underweight increased by 6.07 times (AOR= 6.07; 95% CI: 1.54-23.93; p=<0.05).

An analysis of the relationship between grandmother being a caregiver, diarrhea and underweight revealed a significant effect only at crude level. At crude level, with grandmother being a caregiver the odds of an infant being underweight increased by 8.33 times (crude odd= 8.33; 95% CI: 1.83-37.86; p=<0.01). With each unit increase in diarrhoea the odds of an infant being underweight increased by 3.26 times (crude odd 3.26; 95% CI: 1.11-9.59; p=0.05). At adjusted level, both grandmother being a caregiver and diarrhoea were not significant indicating lack of support for the associations.

4.6.3 Factors Influencing Wasting

Using binary logistic regression, 37 factors were analysed and 3 factors that were grandmother feeds, diarrhoea and source of income were found to influence wasting. These 3 factors were then subjected to multiple logistic regression. Results are summarized in Table 4.8.

Table 4.8: Factors Influencing Wasting

Factor	Crude O.R		Adjusted O.R	
	OR	**95% CI**	**OR**	**95% CI**
Grandmother caregiver	6.53**	(1.47-28.95)	4.59	(0.94-22.52)
Diarrhoea	3.46*	(1.11-10.82)	3.57*	(1.05-12.12)
Employment of caregiver	2.97	(0.99-8.87)	2.65	(0.84-8.39)

*Key: $p < 0.05$ *; $p < 0.01$ ***

An analysis of the relationship between diarrhoea and wasting revealed a significant effect at both crude and adjusted levels. At crude level, with each unit increase in diarrhoea the odds of an infant being wasted increased by 3.46 times (Crude odds=3.46; 95% CI:1.11-10.82; p=<0.05); while at adjusted level, with each unit increase in diarrhoea the odds of an infant being wasted increased by 3.57 times (AOR=3.57; 95% CI:1.05-12.12; p=<0.05).

An analysis of the relationship between grandmother as a caregiver, employment of a caregiver and wasting revealed a significant relationship only at crude level. At crude level, with grandmother being a caregiver the odds of an infant being wasted increased by 6.53 times (crude odds= 6.53; 95% CI 1.47-28.95; p=<0.01). With the employment of the caregiver the odds of an infant being wasted increased by 2.0 times (crude odds=2.0; 95% CI 1.15-3.49; p=<0.01). At adjusted level grandmother being a caregiver and employment of a caregiver were not significant indicating lack of support for the indicators.

4.6.4 Factors Influencing Stunted-Wasted

Using binary logistic regression, 37 factors were analysed and 3, which were age of infant, grandmother feeds and diarrhoea, were found to influence stunted-wasted. These 3 factors were thereby subjected to multiple logistic regression. Results of factors influencing stunted-wasted are summarized in table 4.9.

Table 4.9: Factors Influencing Stunted- Wasted

Factor	Crude OR		Adjusted OR	
	OR	**95% CI**	**OR**	**95% CI**
Age of infant	1.45*	(1.09-1.92)	1.28	(0.92-1.79)
Grandmother caregiver	9.85*	(1.42-68.36)	5.25	(0.70-39.31)
Diarrhoea	16.83***	(3.72-76.17)	9.07**	(1.73-47.51)

*Key: p < 0.05 *; p < 0.01 **; p < 0.001****

An analysis of the relationship between infant's age, grandmother being a caregiver and Stunted-Wasted revealed a significant relationship only at crude level. At crude level, with each unit increase in age the odds of an infant being Stunted-Wasted increased by 1.45 times (Crude odds= 1.45; 95% CI: 1.09-1.92; p<0.05). At crude level, care by grandmother the odds of an infant being Stunted-Wasted increased by 9.85 times (Crude odds= 9.85; 95% CI: 1.42-68.36; p<0.05). At adjusted level, age of infant and grandmother being a caregiver were not significant indicating lack of support for the associations.

An analysis of the relationship between diarrhoea and Stunted-Wasted revealed a significant relationship at both crude and adjusted levels. At crude level, with every unit increase in diarrhoea the odds of an infant being Stunted-Wasted increased by 16.83 times (Crude odds=16.83; 95% CI: 3.72-76.17; p<0.001); while at adjusted level, with every unit increase in diarrhoea the odds of an infant being Stunted-Wasted increased by 9.07 times (Adjusted odd=9.07; 95% CI: 1.73-47.51; p<0.05).

4.6.5 Factors Influencing Stunted-Underweight

Using binary logistic regression, 37 factors were analysed and 5, which were age of infant, diarrhoea, handwashing after changing nappies, handwashing after visiting the toilet and grandmother feeds were found to be associated with underweight. These 5 factors were further subjected to multiple logistic regression. Results are summarized in table 4.10.

Table 4.10: Factors Influencing Stunted- Underweight

Factor	Crude OR		Adjusted OR	
	OR	**95% CI**	**OR**	**95% CI**
Age of infant	1.40***	(1.14-1.73)	1.24	(0.98-1.58)
Diarrhoea	6.72***	(2.09-21.61)	4.08	(0.98-16.90)
Hand washing after changings nappies	0.23*	(0.06-0.86)	0.54	(0.12-2.51)
Hand washing after visiting the toilet	0.20**	(0.06-0.72)	0.18*	(0.03-0.86)
Grandmother caregiver	4.66*	(0.99-21.82)	6.15*	(1.09-34.73)

*Key: $p < 0.05$ *; $p < 0.01$ **; $p < 0.001$****

An analysis of the relationship between age of infant, diarrhoea handwashing after changing nappies, and stunted-underweight revealed significant effects only at crude level. At crude level, with each unit increase in age the odds of an infant being stunted-underweight increased by 1.40 times (Crude odds=1.40; 95% CI: 1.14-1.73; p<0.001). At crude level, with each unit increase in diarrhoea the odds of an infant being stunted-wasted increased by 6.72 times (Crude odds=6.72; 95% CI: 2.09-21.61; p<0.001); At crude level, with each unit increase in hand-washing after changing nappies the odds of an infant being stunted-wasted decreased by 0.23 times (Crude odds=0.23; 95% CI:0.06-0.86; p<0.05). At adjusted level they were not significant indicating lack of support for the associations.

An analysis of the relationship between hand washing after visiting the toilet, grandmother being caregiver and stunted-wasted revealed a significant effect at both crude and adjusted levels. At crude level, with each unit increase in hand washing after visiting the toilet the odds of an infant being stunted-wasted decreased by 0.20 times (Crude odd=0.20; 95% CI: 0.06-0.72; p<0.01); while at adjusted level, with each unit increase in hand washing the odds of an infant being stunted-underweight decreased by 0.18 times (AOR=0.18; 95% CI: 0.03-0.86; p<0.05). At crude level, care by grandmother the odds of an infant being stunted-underweight increased by 4.66 times (Crude odds=4.66; 95% CI: 0.99-21.82; p<0.05); while at adjusted level, care by grandmother the odds of an infant being stunted-underweight increased by 6.15 times (AOR=6.15; 95% CI: 1.09-34.73; p<0.05).

4.6.6 Factors Influencing Underweight-Wasted

Using binary logistic regression, 37 factors were analysed and 6 that were age of infant, mothers age, grandmother feeds, diarrhoea, source of income and fever were established to influence underweight-wasted. These 6 factors were further subjected to multiple logistic regression. Results are summarized in Table 4.11.

Table 4.11: Factors Influencing Underweight- Wasted

Factor	Crude OR		Adjusted OR	
	OR	95% CI	OR	95% CI
Age of infant	1.18*	(1.00-1.38)	1.09	(0.87-1.37)
Mothers age	0.83*	(0.72-0.96)	0.82*	(0.71-0.95)
Grandmother caregiver	7.77**	(1.73-34.87)	3.74	(0.56-24.83)
Diarrhoea	4.23*	(1.32-13.52)	4.85	(0.89-26.28)
Employment of caregiver	3.51*	(1.07-7.81)	5.22**	(1.16-23.53)
Hotness of the body(fever)	3.03*	(0.98-9.37)	2.02	(0.52-7.81)

Key: $p < 0.05$ *; $p < 0.01$ **

An analysis of the relationship between the age of infant, grandmother as caregiver, diarrhoea, fever and underweight-wasted revealed significant effects only at crude level. At crude level, with each unit increase in age the odds of an infant being underweight-wasted increased by 1.18 times (Crude odds=1.18; 95% CI: 1.00-1.38; p<0.05). At crude level, care by grandmother the odds of underweight-wasted increased by 7.77 times (Crude odds=7.77; 95% CI: 1.73-34.87, p<0.01). At crude level, with each unit increase in diarrhoea the odds of an infant being underweight-wasted increased by 4.23 times (Crude odd=4.23; 95% CI: 1.32-13.52; p<0.05). At crude level, with each unit increase in hotness of the body (fever) the odds of an infant being underweight-wasted increased by 3.03 times (Crude odds=3.03; 95% CI=0.98-9.37; p<0.05). At adjusted level these factors were not significant indicating lack of support for the associations.

An analysis of the relationship between mothers age, employment of caregiver and underweight-stunted revealed a significant effect at both crude and adjusted levels. At crude level, with each unit increase in mother's age the odds of an infant being underweight-wasted decreased by 0.83 times (Crude odds=0.83; 95% CI:0.72-0.96; p<0.05); while at adjusted level, with each unit increase in mother's age the odds of an infant being underweight decreased by 0.85 times (AOR=0.85; 95% CI:0.72-0.99; p<0.05). At crude level, with the caregiver being employed the odds of an infant being underweight-wasted increased by 1.86 times (Crude odds=1.86; 95% CI:

1.05-3.30; p<0.05); at adjusted level, the caregiver being employed the odds of an infant being underweight-wasted increased by 3.2 times (AOR=3.20; 95% CI: 1.43-7.19; p<0.01).

4.6.7 Factors Influencing Stunted-Underweight-Wasted

Using binary logistic regression, 37 factors were analysed and 3 that were age of infants, grandmother feeds and diarrhoea were found to influence stunted-wasted-underweight. These 3 factors were then subjected to multiple logistic regression. Results of factors influencing stunted-wasted-underweight are summarized in Table 4.12.

Table 4.12: Factors Influencing Stunted- Underweight-Wasted

Factor	Crude OR		Adjusted OR	
	OR	**95% C.I**	**OR**	**95% C.I**
Age of infant	1.45**	(1.09-1.92)	1.28	(0.92-1.79)
Grandmother caregiver	9.85*	(1.42-68.36)	5.28	(0.70-39.31)
Diarrhoea	16.83***	(3.72-76.17)	9.07*	(1.73-47.51)

Key: p < 0.05 *; p < 0.01 **; p < 0.001***

An analysis of the relationship between the age of an infant, grandmother as a caregiver and stunted-underweight-wasted revealed significant effects only at crude level. At crude level, with each unit increase in age the odds of an infant being stunted-underweight-wasted increased by 1.45 times (Crude odds=1.45; 95% CI: 1.09-1.92; p<0.01). At crude level, care by grandmother the odds of an infant being stunted-underweight-wasted increased by 9.85 times (Crude odds=9.85; 95% CI: 1.42-68.36; p<0.01). At adjusted level they were not significant indicating lack of support for the associations.

An analysis of the relationship between diarrhoea and stunted-underweight-wasted revealed a significant effect at both crude and adjusted levels. At crude level, with each unit increase in diarrhoea the odds of an infant being stunted-underweight-wasted increased by 16.83 times (Crude odds=16.83; 95% CI: 3.72-76.17; p<0.001); while at adjusted level, with each unit increase in diarrhoea the odds of an infant being stunted-underweight-wasted increased by 9.07 times (Adjusted odd=9.07; 95% CI: 1.73-47.51; p<0.05.

CHAPTER FIVE
DISCUSSION

5.1 Introduction

This section consists of the discussion of the study findings presented according to the study objectives.

5.2 Community Perception of Factors Influencing Nutritional Status of Infants

The first objective aimed to explore the perception of the community about factors influencing the nutritional status of children. This community perceives undernutrition to be caused by: giving too little food to a child; worm infestation; diseases; low income; 'carelessness' of caregivers; and a lack of consumption of a variety of foods, which is in agreement with known causes of undernutrition. On the other hand, they erroneously perceive exclusive breastfeeding, cold weather, and eating cold food as causing undernutrition. It associates giving birth too soon with thinness. This thinness is viewed as a disease, not a form of undernutrition.

Giving too little food is associated with undernutrition, which is correct since the infant does not get sufficient nutrients to support growth and development. Diseases and worm infestations are perceived to cause undernutrition, which is correct since childhood illnesses are risks to undernutrition (Vita *et al.,* 2019). Low income is perceived to cause undernutrition, which is correct because it is a determinant of household purchasing power and nutritional status (Li *et al.,* 2020; Omondi & Kirabira, 2016). 'Carelessness' of the caregiver is perceived to cause undernutrition as the caregiver, mostly the mother, was deemed to have insufficient time to feed the baby. Lack of variety in foods is also perceived to cause undernutrition, which is correct since dietary diversity is associated with reduced probabilities of undernutrition (Li *et al.,* 2020; Fekadu *et al.,* 2015).

An issue observed in Obunga is the perception that exclusive breastfeeding causes undernutrition. This is linked to the perception that: it does not satisfy the modern child; it is insufficient for a growing child; it causes dizziness to mothers after breastfeeding; and the amount produced reduces once a mother resumes work. Perceived insufficient milk production is a concern raised by many mothers in several studies (Moraes, Moreira, Drugowick, Bonanato, Imparato, & Reis, 2016; Karall *et al*., 2015; Robert, Coppieters, Swennen, & Dramaix, 2014). This could reduce the potential benefit of exclusive breastfeeding in this community.

In the Obunga community, early introduction of complementary feeds is associated with optimal nutritional status, yet it is associated with underweight and stunting, according to several studies (Demilew & Abie, 2017; Khan & Islam, 2017; Fekadu *et al*., 2015). Uniquely, in the Obunga community, there are two perceptions that, although not linked to undernutrition by the community, are perceived to contribute to poor health and poor growth. Giving birth too soon is perceived to cause a disease known as '*ledho',* which is not undernutrition but rather unexplained thinness. This is treated with traditional herbs, yet it is unrecognized as wasting. They believe that when a mother gives birth too soon, the older child gets inadequate love and care and so grows thin. This is in contrast with findings that a closely spaced reproductive cycle is associated with undernutrition (Tesfaw & Fenta, 2021; KNBS and UNICEF, 2017). Eating cold food or exposure to cold weather is associated with stunting (understood by the community as shortness), as cold is deemed to make a child grow slower, hence not linked to the quality of the food or other causes of stunting. This is contrary to the known causes of stunting from several studies (Tesfaw & Fenta, 2021; Vita *et al*., 2019; Faye *et al*., 2019; Omondi & Kirabira, 2016; Labayen *et al*., 2012).

These findings show that the community understands some known causes of undernutrition in children, which may be the result of health education or experiences. On the contrary, there are misconceptions about exclusive breastfeeding and causes of wasting and stunting in children, which threaten the identification of undernutrition and eventually the achievement of good nutritional and health status.

5.3 Characteristics of Primary Caregivers

The next objective is drawn from caregivers in households in Obunga. In this study, the majority of the respondents are Christians, married, and mainly between 19 and 24 years old. The majority have primary-level education and are not employed. This depicts a young population with a basic level of education and a high dependency ratio. This confirms the high female dependency ratio in the former Nyanza Province in persons aged 15–64 years (KNBS, 2012) and the national statistics, which indicate that the majority of Kenyans have primary level education at 50.6% (KNBS, December 2019). However, in the Obunga informal settlement, the proportion of respondents with basic education (65%) was higher than the national average.

5.4 Nutritional Status of Infants (0-12months)

The second objective of this study was to establish the nutritional status of infants in Obunga. The prevalence of stunting, underweight, and wasting in Obunga is higher than in Kisumu County (KNBS, 2015) and the national rates given in KNBS (2018), indicating that Obunga contributes significantly to overall undernutrition in the county and country. This corroborates findings by others that informal settlements are major drivers of undernutrition (Vita *et al*., 2019; Ahsan *et al*., 2017; Bentley *et al.*, 2015). The study additionally shows that a notable proportion of undernourished children in Obunga have combined forms of undernutrition, which in themselves are problems of public health concern. This information has not previously been reported.

Stunting rates in this study are high according to WHO classification (see Appendix 6) and are therefore of public health concern. This high rate is comparable to those reported in informal settlements in Nairobi, Kenya (Vita *et al*., 2019), Bangladesh (Ahsan *et al*., 2017), and Somalia (Kinyoki, Berkley, Moloney, & Noor, 2015). Unlike other studies where stunting is higher in boys (Tesfaw & Fenta, 2021; Vita *et al.*, 2019; Chirande *et al*., 2015; Kinyoki, Berkley, Moloney, & Noor, 2015), the prevalence of stunting in Obunga is higher in girls compared to boys. The observed higher levels of stunting in older children compared to the younger ones are similar to those in other studies (Vita *et al*., 2019; KNBS, March 2015).

Underweight prevalence in Obunga can be considered high, although there is no classification for it. These rates are similar to those reported in Ethiopia (Fekadu *et al.*, 2015), but higher than those observed in studies from informal settlements in Nairobi (Vita *et al*., 2019; Olack *et al*., 2011) and Kiambu (Chege, Ndungu, & Gitonga, 2016). This may be due to differences in infant feeding practices in these places. In Obunga, underweight occurs more in boys than in girls, which is similar to findings from several studies (Vita *et al*., 2019; Akombi, Agho, Merom, & Renzaho, 2017; KNBS, 2015).

According to the WHO classification, wasting prevalence in Obunga is very high. Studies in Ethiopia (Fekadu *et al.*, 2015), Tanzania (MOH *et al.*, 2016), an informal settlement in Kiambu, Kenya (Chege, Ndungu, & Gitonga, 2016), and Nigeria (Akombi *et al.*, 2017) have shown similar high rates of wasting. Unlike stunting and underweight, wasting in Obunga is similar in girls and boys, concurring with findings by Bentley *et al. (*2015 in India.

Children with multiple anthropometric deficits are found in Obunga, and the prevalence of MADs can be classified as low (stunted-wasted-underweight), medium (stunted-underweight), and high (wasted-underweight) levels. A meta-analysis by Myatt *et al.* (2018) and McDonald *et al*. (2013) indicates that multiple anthropometric deficits are associated with increased risks of child mortality.

5.5 Socio-Economic and Demographic and Health Related Factors Influencing Nutritional Status of Infants

The third objective aimed at identifying factors influencing the nutritional status of infants in Obunga. Several factors influence underweight, wasting, stunting, and multiple anthropometric deficits in this setting.

In Obunga, infant feeding indicators are not associated with any form of undernutrition. The rates of exclusive breastfeeding in this study are comparable to those from India and national estimates (Bentley *et al.*, 2015; KNBS, 2015). The perception found in the first objective of associating exclusive breastfeeding with poor nutrition status and the early introduction of complementary feeds with optimal nutrition may be a threat to improving the rates of exclusive breastfeeding in this community.

Dietary diversity scores and meal frequencies are low in Obunga, meaning that children receive a diet of poor quality that could be insufficient to meet their needs for growth. However, the community does not link meal frequency with undernutrition. Several studies have linked low dietary diversity scores (Fekadu et al., 2015), poor quality diets (Chakona, 2020; Bwalya et al., 2015), inadequate quantity, and monotonous diets (Mkhize & Sibanda, 2020) consisting mostly of foods from the grains group (Chakona, 2020; Bentley et al., 2015; Bwalya *et al*., 2015; KNBS, 2015) with stunting, wasting, and underweight. This suggests that in Obunga, low diet diversity and meal frequency occur across households whether or not children are malnourished, and understanding the relationship further requires data beyond that obtained in the current study. The community reports insufficient money to purchase adequate food (FGD 1 and 2) and insufficient money to buy a variety of food, as reported in FGD 3. This may imply that income poses a challenge to obtaining a diverse and adequate diet for many households and may be the factor with which an association is likely to be observed.

Undernutrition in Obunga is associated with the age of the infant, the mother's age, the employment of the caregiver, diarrhea, not handwashing after visiting the toilet, and having a grandmother as a caregiver. Infants age is associated with underweight and stunting but not wasting in Obunga. The older a child is, the more likely they are to be stunted or underweight. Wasting, on the other hand, occurs across age groups. Other studies have similarly observed underweight in older children (Vita *et al*., 2019; Akombi et al., 2017; Ahsan et al., 2017; KNBS, 2015). This observation may be due to challenges in acquiring and providing complementary feeds for a growing child. Although stunting in children in Obunga was linked to income in a previous study (Omondi & Kirabira, 2016), this association was not observed in the current study, which only identified age as an influencing factor.

In Obunga, mothers ages as well as caregivers employment are associated with underweight and underweight-wasting in infants. Older mothers are less likely to have infants with these indicators, as the risk decreases with the mother's age. This indicates that older mothers are less likely to have an underweight or underweight-wasted infant. On the other hand, the risk of the indicators increased with employment status, indicating that infants of employed mothers were more likely to manifest the indicators. Tesfaw & Fenta (2021) also found the mother's age to be associated with being underweight. Siddiqi *et al*. (2011) found that a mother's age was linked to underweight and wasting. None of the studies assessed combined malnutrition indicators. Ahsan *et al*. (2017) found that caregivers working outside the home were linked to underweight in children. The link between underweight and underweight-wasting with employment observed in Obunga may be due to financial obligations necessitating a mother to report to work before 6 months and starting mixed feeding, as reflected in FGD 1. Income in Obunga was identified as a protective factor against underweight in a previous study (Omondi & Kirabira, 2016); this association was not observed in the current study, which may imply that apart from food, these infants require extra care that may be lacking from a working mother. However, Influences on this difference should be explored in suitable studies.

Diarrhoea is linked to wasting and stunted-wasted-underweight in Obunga. Several studies have linked diarrhea to wasting in children (Tesfaw & Fenta, 2021; Vita *et al.*, 2019; Fekadu *et al.*, 2015; Kinyoki *et al*., 2015). Similarly, stunting (Kinyoki *et al*., 2015), wasting, and underweight (Tesfaw & Fenta, 2021; Demilew & Abie, 2017) are associated with diarrhea. Illnesses in children in this community are also linked to undernutrition (FGD 1, 2, and 3). Handwashing

after visiting the toilet was found to be a protective factor against stunting and underweight in Obunga, possibly because informal settlements share sanitation facilities that have been linked to diarrhea and helminths in children (Heijnen *et al*., 2014).

Having a grandmother as a caregiver is associated with being stunted or underweight in Obunga. Stunting is an indicator of chronic food insecurity; hence, this may imply that households with grandmothers as caregivers have food and nutrition insecurity. This may be because grandmothers in settings characterized by poverty play multiple roles of provider and caretaker (Alderete, Sonderegger, & Pérez-Stable, 2018), and the addition of an extra mouth to feed may lead to the provision of low-quality complementary feeds. The interplay of these factors in Obunga should be assessed to better understand why grandmothers as caretakers contribute to infants being stunted and underweight.

The combination of key factors influencing the nutritional status of infants in Obunga had similarities and differences with those observed in other studies. Overall, the study corroborates the position that factors known to influence nutrition status may or may not be key drivers of poor nutritional status depending on the context in which they are measured. Hence, factors associated with stunting, wasting, or underweight, as well as the occurrence of multiple indicators, may differ based on the context in which they are measured.

CHAPTER SIX

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This chapter presents summary of the study findings, which have been analysed, interpreted in chapter four and discussed in chapter five, conclusions, and recommendations.

6.1 Summary of Findings

6.1.1 Community Perception of Factors Influencing Nutritional Status of Infants

The study established that the community has correctly perceive: giving too little food, worm infestation, diseases, low income, 'carelessness' of caregiver and lack of consumption of variety of foods which are in agreement with known causes of undernutrition. On the other hand, they erroneously perceive exclusive breastfeeding, cold weather and eating cold food as causing undernutrition. Early introduction of complementary feeds is associated with optimal nutrition. Giving birth too soon is associated with thinness considered a disease and not a consequence of undernutrition.

6.1.2 Nutritional Status of Infants (0-12months)

In this study, the prevalence of undernutrition is higher than the national average. There are high stunting and underweight levels as well as very high wasting levels. MADs which are associated with increased mortality rate are: medium (stunted-wasted, stunted-underweight and stunted-wasted-underweight); and high (wasted-underweight) in infants.

6.1.3 Relationship between Socio-demographic and Economic Factors and Health related Factors and Nutritional Status of Infants

The findings of this study show that exclusive breastfeeding rates are similar to national levels and dietary diversity scores and minimum meal frequencies are low. Undernutrition in Obunga is associated with child's age, mother's age, having grandmother as a caregiver and caregiver being employed, diarrhoea, and not washing hands after using the toilet.

6.2 Conclusions

1. These findings show that the Obunga community has correct perceptions of some known immediate and underlying causes of undernutrition however, there are erroneous perceptions in the community on exclusive breastfeeding, early introduction of complementary feeds and imperceptions of wasting and stunting that could threaten

improvement of exclusive breastfeeding rate, identification and correction of wasting and stunting.

2. There are medium, high and very high levels of undernutrition in the form of underweight, wasting, stunting indicating that Obunga bears a large share of the undernutrition burden and risk of mortality and morbidity in Kisumu County and Kenya as a whole. Additionally, the presence of multiple anthropometric deficits in Obunga identifies infants at increased risk of mortality.
3. In this community, risk of stunting increases with a child's age; risk of wasting is associated with diarrhoea; risk of underweight increases with age of infants and the employment of a caregiver and decreases with increasing mother's age; stunted-wasted and stunted-underweight-wasted are associated with diarrhoea; stunted-underweight is associated with not handwashing after visiting the toilet and having grandmother as a caregiver; underweight –wasted decreases with increasing mother's age and increases with employment of the caregiver. These are all potential factors that influence nutritional status of infants in Obunga which if addressed would reduce undernutrition in this setting.

6.3 Recommendations

6.3.1 Recommendations for this Study

i. The government to provide nutrition education to Obunga residents that target the misconceptions on breastfeeding, complementary feeding and identification of wasting and stunting.
ii. There is need to refocus efforts of identifying and addressing undernutrition, e.g. "household MUAC" in order to reduce the high undernutrition prevalence.
iii. There is need to target the Obunga Community with health and nutrition education on hygiene to address diarrhoea, nurturing and care, as well as exclusive breastfeeding and complementary feeding which are low across households in as much as they were not associated with undernutrition in Obunga.
iv. To adequately address undernutrition, urban nutrition data should be disaggregated to the level informal settlements.

6.3.2 Recommendations for Further Research

i. There is need for a study to provide in-depth exploration of factors influencing nutritional status of infants of employed caregivers in Obunga

ii. There is need for an in-depth study on diet diversity and minimum meal frequency to understand its association with undernutrition in Obunga

iii. Explore reasons for discrepancies of stunting in girls and boys in Obunga

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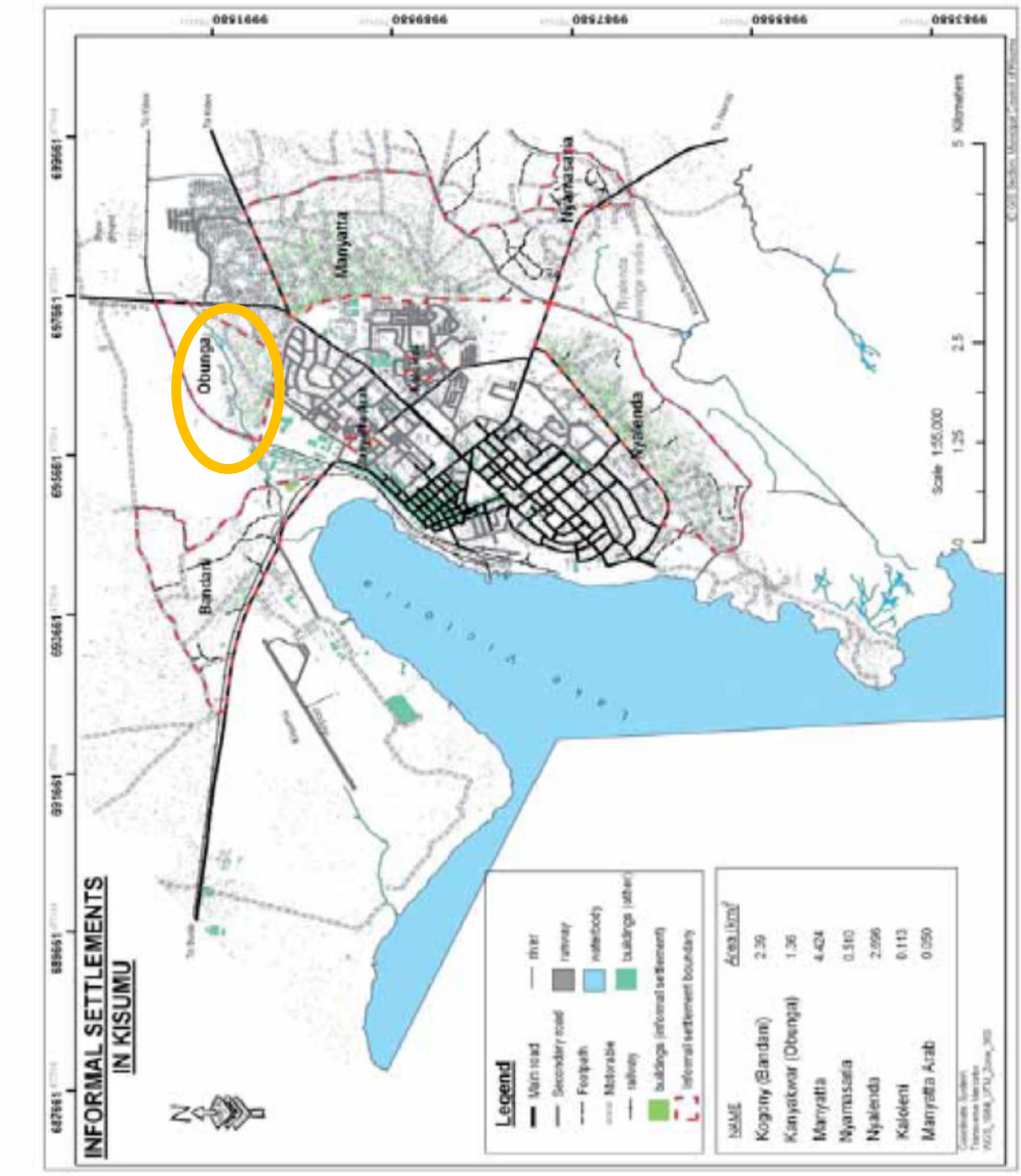
APPENDICES

Appendix 1: Map of Informal Settlements in Kisumu Showing Obunga Area



Appendix 2 : Consent Form

District ---------- Village ----------

Household Number ---------- Date of interview ----------

Name of Interviewer ----------

My name is Rosemary A. Otiende a student from Maseno University and my contact for any question is 0721-817-530. I am here to discuss with you about Factors That Influence Nutritional Status of Infants from Birth to One Year in Obunga Informal Settlement. The result of this phase of the study will enable the government to develop future interventions for children. The participation into this study is voluntary which means you can refuse or accept to be a participant. You can stop me for any clarification.

Do I proceed? **Y** **N**

Signature ----------

Appendix 3: Focus Group Discussion Guide

Caregiver

Name of the study setting	
Name of the district	
Facilitator/Moderator	
Note take/recorder	

As participants arrive, thank them warmly for coming, welcome them and put them at ease by friendly conversation. [When the group is complete] Introduce yourself and the note taker and state the use of the tape recorder. Reaffirm from the members that they have come voluntarily to participate in the discussion and that they can still withdraw from the group if they wished to. Seek this consent by a show of hands.

INTRODUCE TOPIC OF DISCUSSION:

The principal focus this study is to explore on caregiver rated factors that influence nutritional status of infants from birth to one year in Obunga informal settlement. The result of this phase of the study will enable us to develop a tool that will be used to establish the actual factors influencing nutritional status of infants for future interventions.

AGREE ON NORMS AND CONFIDENTIALITY

- Explain the session shall be in form of a discussion.
- Stress that there are no right or wrong answers.
- Ask participants to feel free to say what they think
- Ask the group to treat what others say as confidential
- Cell phone use and leaving the room while discussion is in progress etc.
- Tell the discussants how long the discussion will take.

Remind participants this is voluntary and they are free to leave at the start or any time during the discussion.

Questions

Infant Feeding Practices

1. How are children less than 12 months fed in this community by caregivers? (*Probe Why*)
2. When (age) do mothers begin to give other foods (including water) other than breast milk alone for their infants? (*probe why*)
3. How do you prepare the foods that you provide to children who are below 1 year? And why do you prepare the foods that way?
4. How many times do you feed children below one year?
5. What kind of foods do you provide?
6. Who feeds them?
7. How are men involved in feeding?
8. What are the sources of food for these children?
9. What challenges do you face in feeding your children less than one year? How do you respond to the challenges?

About Under-nutrition

10. Have you ever seen a child who looks like this (*show pictures of children with marasmus, kwashiorkor and stunting*). If yes. What do you think are the causes of the problem you have seen? (*probe*)
11. How do you handle a child who has symptoms or appearance like the one you have seen in the picture? *(probe on religious and cultural beliefs and mirth's in the community)*

Health Related Factors

12. What are some of the common illnesses that children below one year suffer from?
13. What do you do when your child is sick?
14. What challenges do you face when your child is sick? How do you respond to the challenges?

Appendix 4: Household Questionnaire

HOUSEHOLD QUESTIONNAIRE

1. Demographic factors

Child's date of birth: ____/____/____ Age in Completed Months _____ Sex ☐ M ☐ F

(*Tick Appropriately*)

Child's birth order ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ Mother's age _____ Years

Child Spacing: ☐ <2yrs 2-<5years ☐ 5-<10 years ☐ ≥ 10 years ☐

Marital Status: Single ☐ Married ☐ Widowed ☐ Divorced ☐

Nutritional Assessment

Length (cm) ☐☐☐.☐ Weight (kg) ☐☐.☐ Oedema ☐ Y ☐ N

2nd Length ☐☐☐.☐ ☐☐.☐

3rd Length ☐☐☐.☐ ☐☐.☐

---

2. Socio-economic Factors

Source of income: Salaried income ☐ Casual employment ☐ Self-employed ☐

Not employed ☐

Approximate Monthly Income in Ksh: < 5,000 ☐ < 10,000 ☐ >10,000 ☐

Religion: Catholic ☐ Protestant ☐ Muslim ☐ Legio Maria ☐ Roho's ☐

Others (*specify*) _____

Level of education: None ☐ Primary ☐ Secondary ☐ Post-secondary ☐

What do you think can cause a child to be like this? (*Show a picture of children with under-nutrition*)

Disease ☐

Giving birth too soon (*ledho, hero*) ☐

Do not know ☐

Lack of food ☐

Others (*specify*)……..

---

3. Feeding Practices

For all children

Who feeds the index child?

Mother ☐

Father ☐

Grandmother ☐

An older child ☐

A neighbour ☐

Other specify…….

How do you feed the index child when they refuse to eat?

Force feeding (*sigaglo*) ☐

Beat to eat ☐

Leave alone feeding ☐

Assisted feeding ☐

For children all infants birth to 12 months

In a day how often do you feed the infant?

Twice ☐

Three times ☐

Four times ☐

Five times ☐

On demand Indicate approximate number of times on average…….

4. Food intake

Which food including liquids does the index child normally eat and do you prepare it? *(24 hr recall)*

Consistency

Food		**Thick**	**Thin**	**Liquid**
Water	☐	☐	☐	☐
Soup and ugali	☐	☐	☐	☐
Cow's milk	☐	☐	☐	☐
Plain porridge	☐	☐	☐	☐
Porridge with milk	☐	☐	☐	☐
Composite porridge (*nyuka mosang*)	☐	☐	☐	☐
Breast milk	☐	☐	☐	☐
Exclusive breastfeeding (*tick only if mother has not given any food including water*)	☐	☐	☐	☐
Jute leaves (*apoth*) and Ugali	☐	☐	☐	☐
Milk tea	☐	☐	☐	☐
Strong tea	☐	☐	☐	☐
Avocado	☐	☐	☐	☐
Orange juice	☐	☐	☐	☐
Pawpaw	☐	☐	☐	☐
Commercial porridge	☐	☐	☐	☐

Others specify

…… ☐ ☐ ☐

…… ☐ ☐ ☐

…… ☐ ☐ ☐

For children less than six months

What were the reasons for early introduction of complementary foods?

Painful breasts ☐

Not enough milk ☐

Baby showed signs of wanting to eat ☐

Did not know baby is supposed to be breastfed for six months ☐

Family pressure to introduce other foods ☐

Others specify ……..

---

5. Morbidity

Has the index child been sick within the past 2 weeks? Y ☐ N ☐

If yes, what was the baby suffering from?

Diarrhoea ☐

Rotavirus (*orianyancha*) ☐

Vomiting ☐

Hotness of the body ☐

Running nose ☐

Coughing ☐

Skin conditions ☐

Malaria ☐

Others (*specify*) _____

6. Health Related Factors

In case the child (name) is sick where do you seek for treatment?

Public hospital ☐

Private hospital ☐

Pharmacy ☐

Herbal remedies ☐

Others specify ☐

Do you take your child for Child Welfare Clinic

(Growth monitoring and immunization)? Y ☐ N ☐

If No, What are the reasons?

Health facility too far. ☐

Not allowed within our practise (cultural, religious) ☐

Have never had time to visit the facility ☐

Others (specify)……

---

7. Household Factors

Which type of fuel do you use?

Kerosene ☐

Firewood ☐

Gas ☐

Charcoal ☐

Others *specify*……

How often do you buy it?

Everyday ☐

Once a week ☐

Twice a week ☐

Thrice a week ☐

Other *specify*……

Sanitation level

Source of water

Piped water ☐

Rainwater collection ☐

Protected well ☐

Protected spring ☐

River or pond ☐

Unprotected well ☐

Unprotected spring ☐

Vendor provided water ☐

Sanitation Facilities

Connection to a public sewer ☐

Connection to a septic tank ☐

Simple pit latrine ☐

Pour-flush latrine ☐

Ventilated improved pit latrine ☐

Public or shared latrine ☐

Open pit latrine ☐

Bucket latrine ☐

Open air ☐

How long does it take you to reach the water source?

0-5 Minutes ☐

5-10 Minutes ☐

10-15 Minutes ☐

>20 minutes ☐

How long does it take you to reach the latrine?

0-5 Minutes ☐

5-10 Minutes ☐

10-15Minutes ☐

>20 minutes ☐

Do you treat water for drinking? Y ☐ N ☐

If yes how?

Boiling ☐

Water treatment chemicals (e.g. water guard) ☐

Solar treatment ☐

At what times do you wash your hands? (*Tick all that apply*)

After visiting the toilet ☐

Before preparing baby's food ☐

Before feeding the baby ☐

After changing the baby nappies ☐

How do you wash your hands?

With water only ☐

With soap and water inside a basin ☐

With soap and running water ☐

With ash and water ☐

Is soap available in the house? Y ☐ N ☐

Household sanitation level (*observe*) Poor ☐ Good ☐

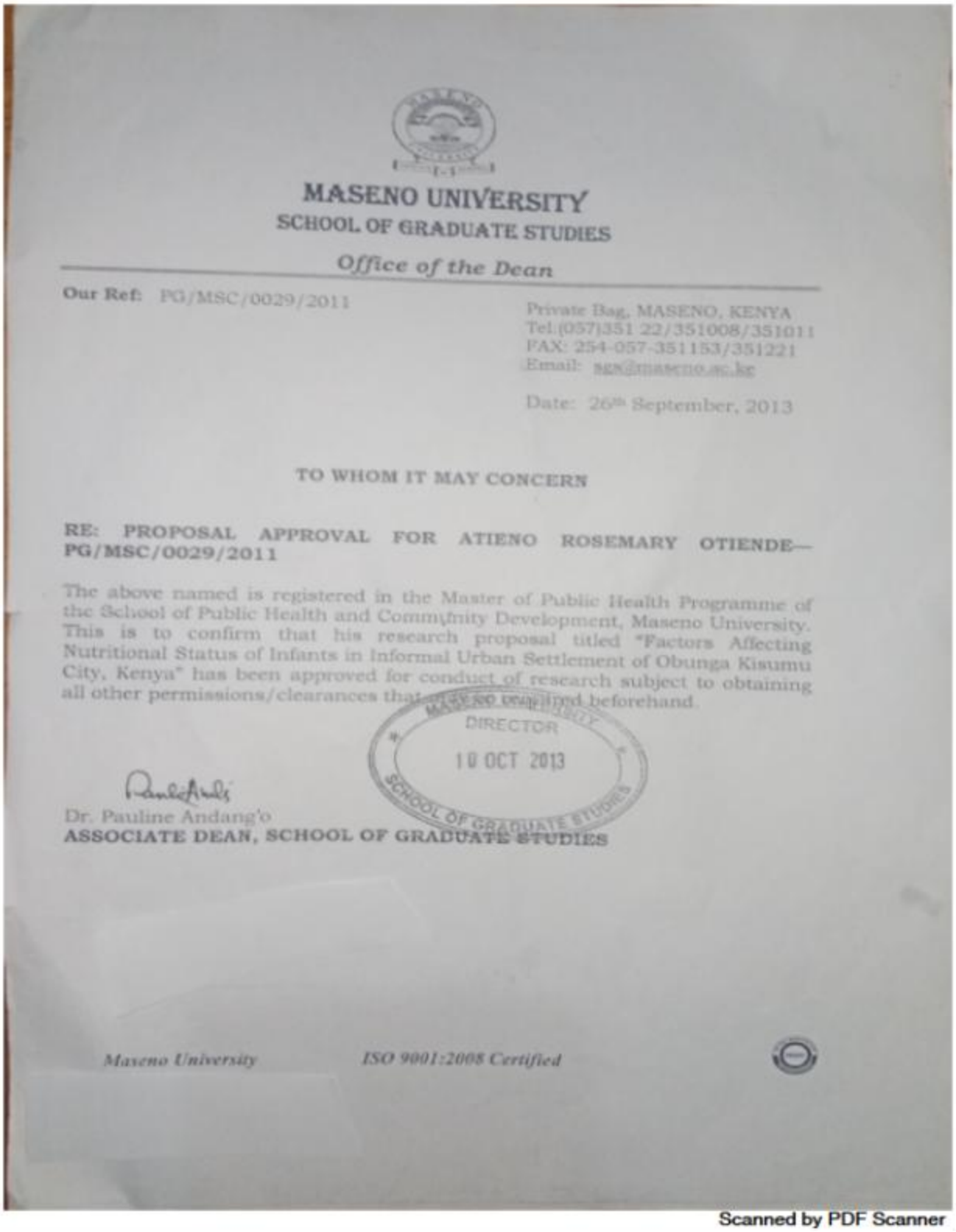
Appendix 5: WHO Recommended Food Groups for Children Under Five Years of Age

1	Grain, roots, tubers and plantains
2	Legumes and nuts
3	Dairy products
4	Fresh foods (meat, fish, poultry, live/organs)
5	Eggs
6	Vitamin A rich fruits and vegetables.
7	Other fruits and vegetables.

Appendix 6: WHO Classification for Assessing Severity of Undernutrition by Prevalence

Indicator	**Prevalence cut-off values for public health significance**
Stunting	<2.5%: very low 2.5 to <10%: low 10 to <20%: medium 20 to <30%: high ≥30%: very high
Wasting	<2.5%: very low 2.5 to <5%: low 5 to <10%: medium 10 to <15%: high ≥15%: very high
Overweight	<2.5%: very low 2.5 to <5%: low 5 to <10%: medium 10 to <15%: high ≥15%: very high

Appendix 7: Proposal Approval Letter



MASENO UNIVERSITY
SCHOOL OF GRADUATE STUDIES
Office of the Dean

Our Ref: PG/MSC/0029/2011

Private Bag, MASENO, KENYA
Tel:(057)351 22/351008/351011
FAX: 254-057-351153/351221
Email: sgs@maseno.ac.ke

Date: 26th September, 2013

TO WHOM IT MAY CONCERN

RE: PROPOSAL APPROVAL FOR ATIENO ROSEMARY OTIENDE— PG/MSC/0029/2011

The above named is registered in the Master of Public Health Programme of the School of Public Health and Community Development, Maseno University. This is to confirm that his research proposal titled "Factors Affecting Nutritional Status of Infants in Informal Urban Settlement of Obunga Kisumu City, Kenya" has been approved for conduct of research subject to obtaining all other permissions/clearances that are required beforehand.

MASENO UNIVERSITY
DIRECTOR
10 OCT 2013
SCHOOL OF GRADUATE STUDIES

Dr. Pauline Andang'o
ASSOCIATE DEAN, SCHOOL OF GRADUATE STUDIES

Maseno University *ISO 9001:2008 Certified*

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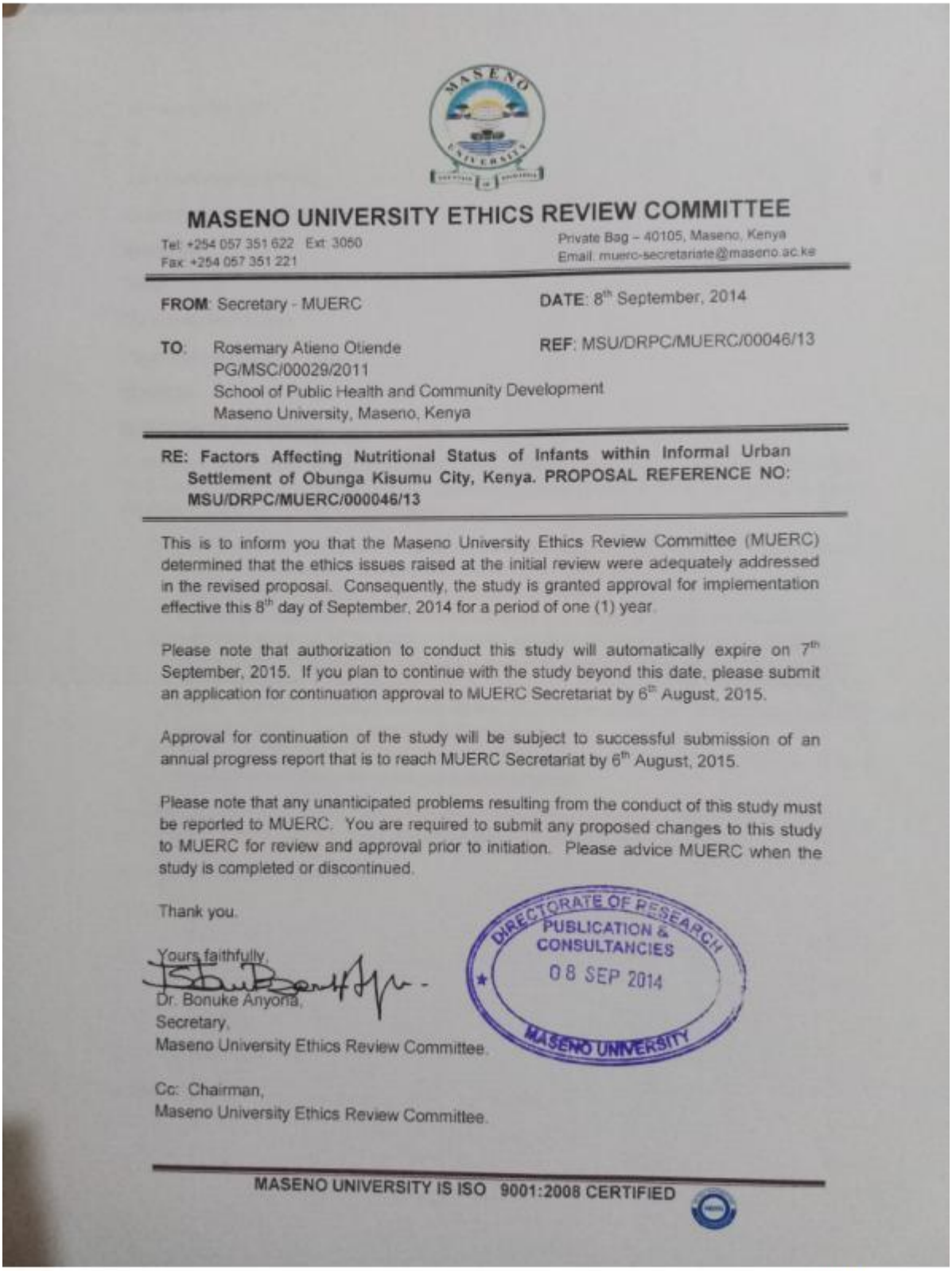
Appendix 8: Ethical Approval Letter



MASENO UNIVERSITY ETHICS REVIEW COMMITTEE

Tel: +254 057 351 622 Ext: 3060
Fax: +254 057 351 221

Private Bag – 40105, Maseno, Kenya
Email: muerc-secretariate@maseno.ac.ke

FROM: Secretary - MUERC

DATE: 8th September, 2014

TO: Rosemary Atieno Otiende
PG/MSC/00029/2011
School of Public Health and Community Development
Maseno University, Maseno, Kenya

REF: MSU/DRPC/MUERC/00046/13

RE: Factors Affecting Nutritional Status of Infants within Informal Urban Settlement of Obunga Kisumu City, Kenya. PROPOSAL REFERENCE NO: MSU/DRPC/MUERC/000046/13

This is to inform you that the Maseno University Ethics Review Committee (MUERC) determined that the ethics issues raised at the initial review were adequately addressed in the revised proposal. Consequently, the study is granted approval for implementation effective this 8th day of September, 2014 for a period of one (1) year.

Please note that authorization to conduct this study will automatically expire on 7th September, 2015. If you plan to continue with the study beyond this date, please submit an application for continuation approval to MUERC Secretariat by 6th August, 2015.

Approval for continuation of the study will be subject to successful submission of an annual progress report that is to reach MUERC Secretariat by 6th August, 2015.

Please note that any unanticipated problems resulting from the conduct of this study must be reported to MUERC. You are required to submit any proposed changes to this study to MUERC for review and approval prior to initiation. Please advice MUERC when the study is completed or discontinued.

Thank you.

Yours faithfully,

Dr. Bonuke Anyona,
Secretary,
Maseno University Ethics Review Committee.

DIRECTORATE OF RESEARCH PUBLICATION & CONSULTANCIES 08 SEP 2014 MASENO UNIVERSITY

Cc: Chairman,
Maseno University Ethics Review Committee.

MASENO UNIVERSITY IS ISO 9001:2008 CERTIFIED

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