PREVALENCE OF MALNUTRITION AND ASSOCIATED FACTORS AMONG CHILDREN LESS THAN FIVE YEARS OF AGE ATTENDING MULAGO NATIONAL REFERRAL HOSPITAL NUTRITION UNIT , KAMPALA UGANDA

BY

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FEBRUARY 2024

DECLARATION

I EEOI JACOB LOKAMATEI hereby declare that this dissertation is my original composition and has never been submitted in any form to any other academic institution of higher learning for the award of any academic qualification.

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LIST OF ABBREVIATIONS AND ACRONYMS.

ACC:	Administrative Committee on Coordination
AIDS:	Acquired Immunodeficiency Syndrome.
AMREF:	African Medical and Research Foundation
ANC:	Antenatal Care
BMI:	Body Mass Index
CI:	Confidence interval
DHO:	District Health Officer
FAO:	Food and Agriculture Organization
GDP:	Gross Domestic Product
IPD:	Inpatient Department.
LRA:	Lord's Resistance Army
MCH:	Maternal and Child Health
MoH:	Ministry of Health
MUAC:	Mid Upper Arm Circumference
OR:	Odds ratio
PEM:	Protein Energy Malnutrition
PHC:	Primary Health Care
SPSS:	Statistical package for social sciences
UBOS:	Uganda Bureau of Statistics
UDHS:	Uganda Demographic and Health Survey
UKAID:	Development United Kingdom Agency for International
UNAP:	Uganda National Action Plan
UNICEF:	United Nations International Children's Emergency Fund

OPERATIONAL DEFINITIONS

Children under-fives years: are children from birth to fifty nine months.

Factors: will be defined as elements that influence the occurrence of malnutrition among children under five years and they will include socio-demographic, medical and behavioral style factors (Birungi, 2013).

Malnutrition: refers to deficiencies or excesses in nutrient intake, imbalance of essential nutrients or impaired nutrient utilization (WHO, 2017)

Prevalence: will be defined as the proportion of children under five years that will be found to be having malnutrition and will be expressed in percentage (Birungi, 2013).

ABSTRACT

Background: Malnutrition is one of the leading causes of morbidity and mortality among children below five years globally and is estimated that 45% of deaths in children under 5 years of age is due to undernutrition. In uganda, mortality of children under 5 years due to malnutrition or indirect malnutrition causes is approximated at 45.0%. the purpose of this study was to determine the prevalence of malnutrition and associated factors among children under five years at Mulago Hospital nutrition unit . **Methodology:** This was a cross sectional study involving a sample size of 147 participants attending Mulago Hospital . Respondents were recruited using simple random sampling technique and data was collected using a self generated questionnaire and analyzed using SPSS V 23.0.

Results: In this study, more than a half 88(59.9%) of the participants were females and majority 74(50.3%) of them were aged 12-36 months. The prevalence of malnutrition among children below five years was 56(37.2%). Multivariate analysis revealed that child's age <12 months ($p<0.001$, OR=0.07) and 12-36 months ($p<0.001$, OR=0.14) decreased chances of having malnutrition compared to age 37-59 months . Child's regular deworming ($p<0.001$, OR=0.02) and washing hands before eating ($p<0.001$, OR=0.09) decreased chances of having malnutrition. Birth interval of ≤2 months ($p=0.005$, OR=18.54) increased chances of having malnutrition compared to birth interval of 3-4. Maternal factors included; maternal age <20 years ($p=0.002$, OR=13.46) which increased chances of having malnutrition compared to age 30-39 years. Primary level of education ($p<0.001$, OR=49.37) increased chances of having malnutrition compared to tertiary level of education. Being married ($p<0.001$, OR=0.1) reduced chances of having malnutrition compared to being single. Regarding maternal occupation, being a business woman ($p=0.001$, OR=0.03) and civil servant ($p=0.003$, OR=0.04) reduced chances of suffering from malnutrition compared to other types occupation. Similarly, nutrition education ($p<0.001$, OR=0.01) reduced suffering from malnutrition.

Conclusion and recommedation: We concluded although the prevalence of malnutrition obtained in our study was lower than the previous findings in western Uganda, it was still higher than the general national and global estimation. Both child and maternal related factors are associated with malnutrition in under five children. The child related factors include child's age, regular deworming and washing of hands before eating. The maternal related factors include maternal age, marital status, education level occupation and nutrition education. we recommended community nutrition and health education.

CHAPTER ONE

1.0 Introdution

1.1 Background

Malnutrition is a medical condition which refers to deficiencies, excesses or imbalances in a person's intake of energy and or nutrients (WHO; 2016). There are two broad categories of malnutrition namely over nutrition commonly as overweight which is more prevalent in the developed countries and under nutrition which commonly manifests as wasting, underweight, growth retardation especially in children, low immunity, and grade one edema (Webb, 2014). Globally, 155 million of children under five years are stunted whereas 52 million are wasted (Hawks et al., 2017). It has been estimated that 170 million (30%) of children under the age of five in the world are moderately or severely stunted, and 110 million (19%) are moderately or severely underweight (WHO, 2017).

According to WHO, among children below five years, 10% are wasted, 39%are stunted, and 25%are underweight from the Sub-Saharan (WHO, 2017).

The pooled prevalence of chronic undernutrition among under five children in East Africa was 33.3%, ranging from 21.9% in Kenya to 53% in Burundi (Tesema et al., 2021)

In Uganda, 29% of the children below five years are stunted while 9% are severely stunted, 4% are wasted and 1% are severely wasted whereas 11% are underweight and 2% are severely underweight thus Uganda registering one of the highest global figures and in sub Saharan Africa, among the age group (UDHS, 2016). Regional wise, the prevalence of acute malnutrition (wasting) in Uganda among children below 5 years of age is 10% for West Nile sub-region a refugee humanitarian setting and highest (26%) in Karamoja for the reasons namely, war zone which can affect food circulation, transportation, and cultivation and nomadic lifestyle in the region could also be a possible contributory factor (UBOS, 2022). The

condition varied with different regions, highest in the western region particularly Tooro sub-region with 41% and lowest in the Teso sub-regionwith 14% (Kikafunda et al., 2014).

Malnutrition tends to always compromise a child's immune system and hence such children always easily succumb to diseases which in turn increases mortality and morbidity rates, diminishes the cognitive abilities of children and lowers their educational attainment, reduces labor productivity and reduces the quality of life of all affected (Wekesa *et al;* 2016).

Statistics have shown that about 40% of cases of mortality among children under the age of 5 years in Uganda is attributed to malnutrition (UBOS, 2017).

The above prevalences are far above the target identified by the World Health Assembly which adopted the goal of reducing and maintaining the prevalence of wasting in children to under 5% by 2025 (WHO, 2016) and therefore forms the basis of my research to identify the prevalence and risk factors to malnutrition among the below 5 years age group children at Mulago Hospital nutrition unit . Much as malnutrition as a health problem has been clearly described, analysis of its causes still continues to remain obscure (Mugarura et al., 2021).

The contributing factors in childhood malnutrition are low birth weight, inadequate breast feeding and exclusive breastfeeding, inappropriate complementary feeding, maternal education, lack of proper knowledge of nutrition, micronutrient intake, parity, birth spacing, household socioeconomic status, food insecurity, poor sanitation and infectious diseases (Wolf et al., 2014; Engell et al., 2013).

In Uganda, malnutrition has been associated with immediate, basic and underlying factors as well as food prices, poverty and unemployment (Ickes et al., 2012). Children whose parents engage in agriculture and manual work, peasant farmers or parents employed by non-family members, as well as age of the mother, and age and sex of the child; are at higher risk of

stunting and underweight compared to the children from pastoralists' families Habaasa et al., 2015; Nankiga et al., 2019).

1.2 Statement of the problem.

Malnutrition is one of the leading causes of morbidity and mortality among children below five years globally and is estimated that 45% of deaths in children under 5 years of age is due to undernutrition (WHO, 2017). Towards the end of the millennium development goals (MDGs) era, the global prevalence of underweight children was reported to have dropped from 25%in 1990 to 15% in 2015 (WHO, 2016). Unfortunately, this decline was not evenly distributed because 90% of the underweight children were found in Africa particularly the Sub-Saharan region (Akambi et al., 2017). Infact, the number of stunted children in Sub-Saharan Africa had rather increased to almost one-third between 1990 and 2013 (Akombi et al., 2017).

In uganda, mortality of children under 5 years due to malnutrition or indirect malnutrition causes is approximated at 45.0% (Black et al., 2010). Moreover the prevalence of stunting among this age group in Kampala District was found to be 89.3%, a figure which was much higher than the general global and national prevalence (Mugarura et al., 2021).

The latest National Development Plan (MOF, 2020) and in the Nutrition Action Plan for multi-sectoral support (MOF, 2012); have set national targets that are a crucial part of the national strategy for becoming a middle-income country by 2040 (MOF, 2015) such targets include achieving the WHA goal, and ending all forms of malnutrition by 2030. As a result, the Uganda Multi-sectoral Food Security and Nutrition Project (UMFSNP) has established programs such delivery of multi-sectoral nutrition services at primary schools and community levels, community sensitization , establishment of community based institutions, agriculture support for school-based nutrition service and strengthening nutrition services as to benefit pregnant and lactating women and children under five years (DHS, 2016).

Despite the interventions, the prevalence of malnutrition in Kampala district among children under five years has remained one of the leading causes of OPD visits and IPD admission (Mugarura et al., 2021). This prompted for investigation of the actual prevalence and factors that are associated with under-five malnutrion .

1.3 Study objectives

1.3.1 General objective

To determine the prevalence and factors associated with malnutrition among children below 5 years at Mulago National Referral Hospital nutrition unit , Kampala Uganda

1.3.2 Specific objectives

i. To determine the prevalence of malnutrition among children below 5 years at Mulago Hospital nutrition unit , Kampala Uganda
ii. To find out the child related factors associated with malnutrition among children below 5 years at Mulago Hospital nutrition unit , Kampala Uganda
iii. To determine the maternal related factors associated with malnutrition among children below 5 years at Mulago Hospital nutrition unit , Kampala Uganda

1.4 Research Questions

i. What was the prevalence of malnutrition among children below 5 years at Mulago Hospital nutrition unit ?
ii. What were the child related factors associated with malnutrition in children below 5 years at Mulago Hospital nutrition unit ?
iii. What were the maternal related factors associated with malnutrition among children below 5 years at Mulago Hospital nutrition unit ?

1.5 Justification of the study

According to UDHS report 2016, nutrition indicators for young children and their mothers have not improved much over the past 15 years all over the country (UDHS, 2016). The World Food Program(WFP) report of 2013 also indicated that Uganda loses about 899 million US dollars annually due to the effects of hunger and malnutrition accounting for about 5% of the country's GDP (WFP, 2013). This comes at a time when the government and its outside partners such as USAID, UKAID & EU have put aside a lot of resources to address child malnutrition in Uganda.

While the description of the malnutrition burden is clear, specific analysis of the causes is scanty; besides, the demographic and health survey data does not cater for the analysis of causes of malnutrition and yet they are many, complex and multi-factorial (Kikafunda et al., 2014). There was need, therefore, to clearly build a holistic picture of the factors responsible for these high levels of childhood malnutrition so as to guide the design of effective policies and nutrition interventions. The study would also provide data to the stakeholders of the hospitals in the region as well as the leaders on setting up strategies to bring down malnutrition.

1.6 Study scope

1.6.1 Geographical scope

The study was conducted at Mulago National Referral Hospital which is the main specialized and referral hospital in Uganda

The hospital is located in Central Uganda , Kampala district

1.6.2 Content scope.

This study focused on causes of malnutrition among the children below 5 years at Mulago Hospital nutrition unit . Responses were drawn from parents and or caregivers of children who visit the health facility for OPD and IPD services. The major two independent variables were child factors which include sex of the child, age of the child, birth order and birth interval and

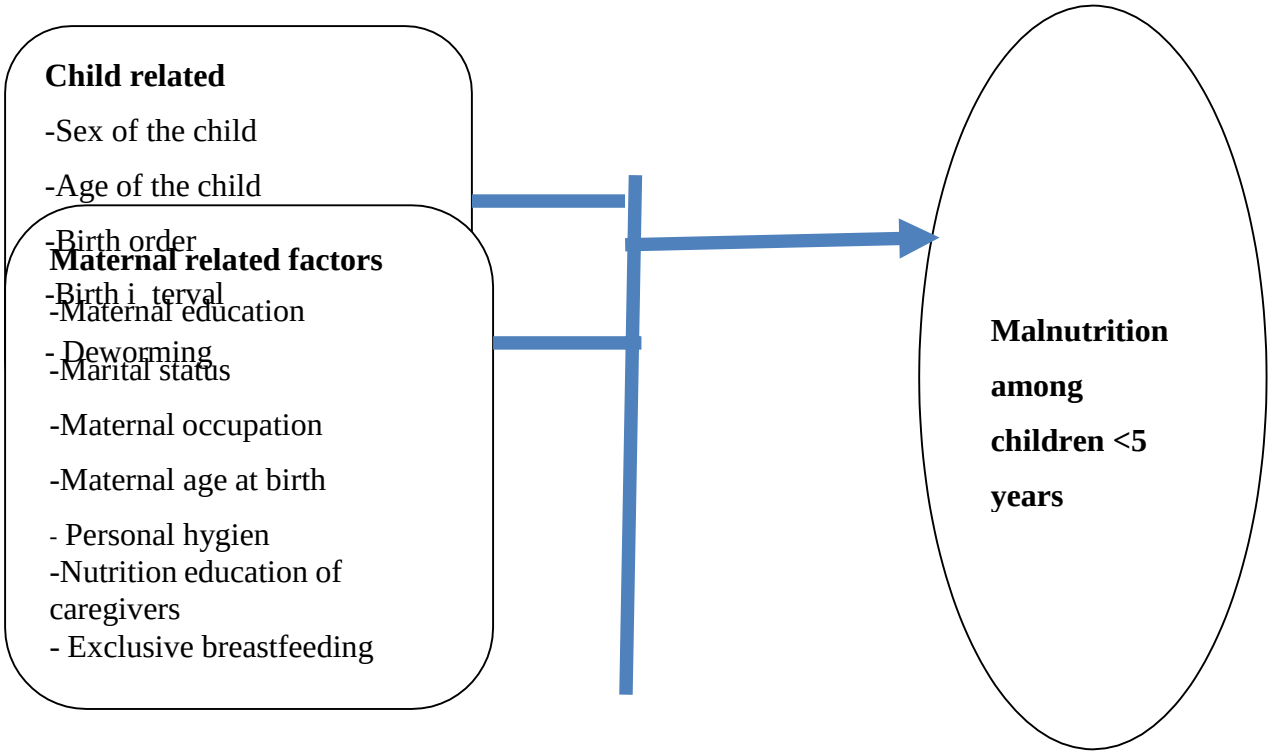
maternal factors which include age of the mother at birth, maternal education, marital status and maternal occupation.

1.6.3 Time scope.

The study took a period of approximately 2 months

1.8 Conceptual framework

Independent variable **Dependent variable**



CHAPTER TWO

2.0 Literature Review

2.1 Prevalence of malnutrition

The prevalence of malnutrition among under five years children vary with type, time and geographical distribution (Hawks et., 2017).

Towards the end of the millennium development goals (MDGs) era, the global prevalence of underweight children was reported to have dropped from 25% in 1990 to 15% in 2015 (WHO, 2016). Unfortunately, this decline was not evenly distributed because 90% of the underweight children were found in Africa particularly the Sub-Saharan region (Akombi et al., 2017). Infact, the number of stunted children in Sub-Saharan Africa had rather increased to almost one-third between 1990 and 2013 (Akombi et al., 2017). The 2015 MDG report stated that 10% wasted, 39% stunted, and 25% underweight children were from the Sub-Saharan Africa region (WHO, 2016). Sub-Saharan Africa contributes to one-third of the global undernourished children (Hawks et al., 2017). With nearly 41 million children being overweight, there is a simultaneous increase of both overweight and obesity conditions in the low- and middle-income regions of the world (WHO, 2017). The threat of the double burden is global with no exception and it is estimated that every country is affected with at least 1 form of malnutrition as there are various forms of malnutrition whereby currently, 88% of the countries are suffering from either 2 or 3 conditions of malnutrition (Hawks et al., 2017).

Uganda's national estimates, which the prevalence is heterogeneous across thecountry, indicate that 3.6% of children suffer from moderate acute malnutrition, while 1.3% have severe acute malnutrition (UBOS, 2017). However, all forms of malnutrition still remain largely hidden in Uganda because regular assessment is difficult in these children (UNICEF, 2018). The prevalence of acute malnutrition (wasting) in Uganda among children below 5 years is 4% and 10% for West Nile sub-region, refugee humanitarian settings, where refugees from South

Sudan and Congo are harbored (UBOS, 2017). The condition varied with different regions, highest in the western region particularly Tooro sub-region with 41% and lowest in the Teso sub-region with 14% (USAID, 2018). This is higher than the World HealthAssembly's target to reduce and maintain the prevalence ofwasting in children to less than 5% by 2025 (Hawks et al., 2017).

The commonest form of under nutrition in Uganda today among children is PEM which presents clinically as; stunting, underweight with syndromes such as marasmus, marasmic kwashiorkor and Kwashiorkor with features such as scanty hair and edema especially of the feet as coupled with low immunity of which these forms account for between 10%-30% of all cases of malnutrition in Uganda (Bhan et al., 2013).

Other forms of malnutrition are due to inadequate intake of micronutrients such as vitamins, sodium, calcium, potassium, iron and magnesium. Iron deficiency is of major concern as it contributes to about 40% of the cases of anemia in infants and children (UNICEF, 2013).
The deficiency of vitamin A and iron deficiency has become a point of concern among children below 5 years of age (Brenda et al., 2011). Children suffering from malnutrition are often screened using methods such as measurement of BMI, MUAC, waist circumference as well as screening for any form of co morbidities (Stanfield, 2017).

2.2 Child related factors of malnutrition of children under-five years.

Previous studies on malnutrition of under-five children revealed that the causes of stunting are multifactorial (Tiwari et al., 2014). Commonly reported child related factors of stunting among under-five children include sex of the child, age, birth order and birth interval (Torlesse et al., 2016).

Sex of child

From the reviewed literature, there seems to be a consensus that malnutrition among children below five years is greater among boys as compared to the girls (Torlesse et al., 2016). The cause of this discrepancy is not well established in the literature though it is believed that boys are more influenced by environmental stress than the girls (Sarmistha, 2019).

According to a study done in Kwara state Nigeria, there was a significant relationship between sex of a child and malnutrition whereby male children were more likely to be malnourished than their female counterparts (Babatunde, 2011).

Another study done in Botswana revealed that stunting, wasting and underweight were also significantly more prevalent among boys than girls (Salah, 2016).

A study on the factors associated with malnutrition in internally displaced persons' camps of Northern Uganda indicated that a male child was nearly two times more likely to suffer from acute malnutrition compared to a female child (Olwedo et al.,2018).

Age of child

Recent studies have found out that younger children are less likely to be malnourished than the older children (Shrimpton, 2021).

It is important to note that specific ages, children's nutritional status is sensitive to feeding, weaning practices, care, and exposure to infection thus a cumulative indicator of growth retardation (height-for-age) in children is positively associated with age(Yimer, 2020).

A study conducted by Nguyen and Kam in Vietnam found out that the risk of malnutrition increases with age of a child whereby children in the youngest age group 0-11 months had significantly lower risk of being stunted, underweight and wasted than children in the older age groups (Nguyen, 2018).Similar findings have been reported in different countries for instance in Kwara state of Nigeria (Babatunde, 2011) and rural India (Sarmistha, 2019).

The findings are plausible considering that many of the younger children are still being breastfed and chronic malnutrition sets in only after weaning (Babatunde, 2012).

According to (UBOS, 2017), malnutrition increases with the age of the child through the first three years of life before declining in the fourth and fifth year.

Birth Order

Research findings indicate that malnutrition is rare among under-five children of birth order 2-3 and that higher birth order (5+) is positively associated with child malnutrition (Sommerfelt,2014 and Jeyaseelan, 2017). In a study carried out among 6939 children below five years in Bangladesh, the prevalence of stunting increased with birth order hence most of the children who were of birth order more than two had greater chances of stunting and wasting (Rayhan, 2016).

Worthy to note is that few studies according to the literature search have been conducted on the subject of child birth order and malnutrition among under-five children.

The Bangladesh Demographic Health Survey (BDHS) 2011 report showed that unwanted birth and child mortality increases with higher birth order.

Birth Interval

In another study conducted in Bangladesh, children within the first birth interval were 1.66 times more likely to be stunted and children whose preceding birth interval was less than two years were 1.32 times significantly more likely to be stunted as compared to children of a preceding birth interval 24 months or above. Similar results were observed for underweight children (Nure, 2012). Furthermore, Nure's study indicated that preceding birth intervals and child stunting were statistically significant whereby preceding birth intervals of 18-35 months had a marginally positive significance on stunting whereas the interval of more than 48 months shows a negative relationship on stunting.

A meta-analysis found out that both short birth intervals (6-17 months) and long birth intervals (59 months and above) were associated with significantly greater risk for adverse perinatal outcomes such as preterm birth, low birth weight, and small size for gestational age (Turyashemererwa et., 2019).

According to UBOS 2017, malnutrition is highest if the birth interval is less than 24 months (41 percent) since it is an important indicator of the nutritional status of children (UBOS, 2017).

Deworming of the child.

Helmithic infection deprive infants of their nutritients leading to stunted growth, wasting and underweight (Mascarini-Serra, 2011). However, a study done by (Mugarura et al., 2012) found that infestation with STH does not increase the chances of developing undernutrition. In contrast, some studies on preschool aged children found that nearly all infested children had significant stunted growth (Nwaneri & Omuemu, 2012).

Personal hygiene

Poor personal hygiene practices such as eating with unwashed hands, consumption of unclean fresh foods, walking barefoot, and consumption of unboiled water may contribute to stunting (De Onis et al., 2012). Mugarura et al., (2012) found that consumption of unboiled water is associated with stunting. Unboiled water could be a vehicle for transmitting both helminthes and other pathologic organisms that impair absorption and utilization of nutrients (Mascarini-Serra, 2011).

2.2 Maternal related factors of malnutrition of children under five years.

Maternal Education

Several studies have found out that mothers' education is associated with good nutrition practices and particularly child nutrition of children under five years. (Babatunde; 20101;Olwedo, 2018; Webb & Block, 2014; Shrimpton, 2014). In a similar study in Bangladesh, children of mothers with no education and primary education were 28% and 33% respectively more stunted than children of mothers with secondary or higher education.

Web & Block pointed out the fact that most women with low education spend more time in gardens and feed their children on less nutritious foods compared to educated mothers with adequate knowledge about the adequate intake of food for their children in terms of correct quantity, quality and frequency (Webb & Block, 2014). However, Sommerfelt found a negative association between the mother's education and malnutrition of children under- five years (Sommerfelt, 2014).

More to note is that mother's education is associated with more efficient management of limited household resources, greater utilization of available health care services, better health promoting behaviors, lower fertility as well as child centered caring practices and all this consequently results into a reduction in malnutrition among under-five children (Nguyen, 2018).

Marital Status

There's a growing awareness of the importance of both parents participating in child upbringing (Engebresten et al., 2010) and the involvement of men in the feeding of young children (UNICEF, 2011).

However, the area of child care and nutrition has been characterized by limited inclusion of men in the majority of African communities (Engebresten,2012). On the study about mothers' marital status and under-five child nutrition, findings in Ethiopia revealed that child's

malnutrition is significantly associated with marital status whereby under-five child malnutrition is higher among unmarried rural and divorced/separated women compared to married ones (Teller, 2020). Similarly, a study conducted in Volta region Ghana found that being a married mother was positively associated with good nutritional status among children below five years (Antwi, 2011).Contrary to the above, a study in Tanzania revealed that mothers who are married were more likely to have undernourished children unlike those that were unmarried perhaps because of the cost of maintaining families hence sometimes these families fail to produce nutritious supplements to the under-five children (Nyaruhucha, 2016).

Maternal Occupation

Mother's occupation is one of the indicators for access to adequate food supplies, use of health services, availability of improved water sources, and sanitation facilities which are prime determinants of child nutritional status (UNICEF, 2019).

According to a review of Demographic and Health Surveys in selected African countries, malnutrition was more prevalent among children whose mothers did not work for instance according to DHS 1986-89, Burundi had 48% of stunted growth among children from non-working mothers while Zimbabwe had 31.0% of her children stunted among nonworking mothers while 27.5% were among working mothers (Sommerfelt, 2014).

A study in Vietnam revealed that children from mothers who were laborers or farmers and had a greater prevalence of stunting, underweight and wasting than those from mothers who worked in office or were housewives (Nguyen, 2018). Rukundo reasoned it that working mothers rarely get time to take care of their children, thus leaving leaving their children at home with other siblings who may neglect feeding them following the right frequency and this sometimes worsens the problem of malnutrition(Rukundo, 2018).

In a study done in Botswana on the effect of maternal occupation on under-five malnutrition, it was found out that underweight occurred to a lesser extent among children whose mothers

worked in agriculture (7.5% in livestock and 28.6% for those working in crops) than among children (40.0%) whose mothers were involved in informal business (Salah,2016).

Maternal age at birth

Mothers' age at birth has been associated with malnutrition among children below five years (UNICEF, 2014). A case in point was found out in Bangladesh where children whose mothers were less than 20 years at the time of birth were 1.22 times more likely to be stunted, wasted and underweight compared to children whose mothers were 20 years and above at the time of birth (Nure *et al;* 2011).

Bachou in the Ugandan settings identified that severely malnourished infants were mostly from young mothers had low weight at birth with less access to breast feeding which is essential for the infants' protein intake (Bachou, 2020).

Contrary to the above however, it is important to note that children of the younger mothers are traditionally cared for by their grandmothers in Turkey and this was associated with low levels of malnutrition among children of younger mothers less than 24 years (Ergin et al., 2017).

Exclusive breastfeeding

According to the study done western Uganda by Mugarura et al., (2021) it was found that exclusive breastfeeding had significantinfluence on stunting compared with the other factors. However, a cross-sectional study done among Malawianinfants (below 6 months) showed that exclusive breastfeeding had prevented stunting (Kuchenbecker et al., 2015).

Nutrition education of caregivers

Having knowledge about proper ways of feeding children is important since they know what when to feed the child and this in turn reduces the risk of malnutrition (Kuchenbecker et al., 2015). A cross-sectional study done by Motebejan et al, nutrition education of caregivers was

significantly associated with reduced chances of malnutrition among children below five years of age (Motebejan et al., 2015).

2.4 Summary of the literature review

Whereas the literature reviewed indicated that there was a general decrease of malnutrition among children under five years globally, it had increase in the Sub –Saharan and Uganda in particular. The literature further indicated that western Uganda is one of the leading regions with high prevalence of malnutrion.

Malnutrition among children below five years wass influenced by both child and maternal factors. However there was a paucity of published data of Kampala district hence a need to conduct this study. This was part of the research gap that this study sought to examine.

CHAPTER THREE

3.0 Methodology

3.1 Study design.

This was a across sectional study design. The design was preferred because results were presented in numbers and percentage form, data collected was presented as collected from the field, and data was also collected at one point at a time. It was preferred because it was time saving.

3.2 Study setting

The study was carried out in Kampala district at Mulago National Referral Hospital. Kampala district is found in Central Uganda and houses the capital city of the country , Kampala City

3.3 Study population.

The research was done among all the children under five years of age attending Mulago National Referral Hospital nutrition unit

3.4 Selection criteria

3.4.1 Inclusion criteria.

The study included all children under five years of age attending Mulago National Referral Hospital nutrition unit whose parents consented to the study .

3.4.2 Exclusion criteria.

The study excluded all the children under 5 years whose parents or guardians refused to consent to the study.

3.5 Sample size determination.

Sample size was determined by using Cochran's formula:

$$S = \frac{Z2PQ}{d2}$$

Where:

S= sample size

Z= standard Deviation at required degree of accuracy which was estimated at 95%; which gave 1.96

P= already known prevalence from other studies (89.3% - Mugarura et al., 2021)

Q= 1-P (1-0.893)

d= degree of error we were able to accept (0.05)

$$s = \frac{(1.96)^2 * 0.893(1 - 0.893)}{0.05^2}$$

S= 146.83.

S≈147

So the sample size was 147.

3.6 Sampling Technique.

The study employed a simple random sampling where children <5 years were considered for the study. The caretakers answered the questions during the study. The technique gave each member of the target population an equal and independent chance of being selected for the study. This ensured that the selected sample was a good representation of the population.

3.7 Data Collection tools.

A structured questionnaire was used as the data collection tool. The questionnaire contained three parts namely part one (this consisted of the child related factors), part two (which consisted of maternal related factors) and part three (anthropometry measurements).

3.8 Data collection methods.

Questionnaires were used to collect data from those participants who consented to participate in the research by signing the consent forms. This was accompanied by interactive sessions with the participants to clarify those elements of the questionnaire that were not understood well.

Anthropometry, a method which uses body measurements of the human to draw conclusion about the nutritional status of individuals was used to assess malnutrition among children under five years.

Child variables including weight, height/length, sex and age were entered in excel software to calculate measurement indices of weight-for-age, height-for age and weight-for-height. The indices generated were compared with standard reference values for WHO Child Growth Standards and CDC 2007 to obtain the Z-scores. Three indices were used that included wasting, stunting and underweight among children. Wasting refered to a low weight-for-height and was a measure of acute malnutrition; it's an indicator of short term fluctuation in nutritional status. Children whose weight-for-height Z-scores were below -2 standard deviation were regarded as wasted. Stunting on the hand refered a low height-for-age which was a measure of chronic malnutrition. It's a good indicator of cumulative growth retardation. Children whose height-for-age Z-scores were below -2 standard deviation were regarded as stunted.

Underweight on the other hand denoted a low weight-for-age and it's a measure of chronic and acute malnutrition. Similarly all children whose weight-for-age Z-scores were less than -2 standard deviation were denoted as underweight.

3.9 Data quality control.

In order for efficient, effective and quality research results, the following measures under quality control were employed. Appropriate training and orientation of the interviewers before the survey was done. I used research assistants who were fluent in local language which ensured proper communication with the participants. Questionnaires were checked for completeness before they were collected and packed.

3.10 Data analysis and presentation.

Data from questionnaires was sorted, edited and recorded for accuracy and completeness. The data collected was statistically analyzed using SPSS V.23.0 i.e. descriptive analysis for the prevalence of malnutrition among children under 5 years attending Mulago Hospital nutrition unit and this was presented in form of frequencies and percentages in pie-chart. The associated factors were analyzed by univariate, bivariate and multivariate logistic regression to get the p-values, odds ratios and confidence interval which were put in tables. For bivariate analysis, a p-value less than 0.2 was considered significant whereas for multivariate analysis, we considered a significant p-value to be less than 0.05.

3.11 Ethical considerations.

Approval

The research was conducted after the approval of the research proposal from the School Of Medicine and Surgery and introductory letter was given to the researchers. Permission to collect data was obtained from the hospital administration.

The administrators were assured that the information obtained from their department was to handled with due confidentiality by only using it to achieve the objectives stated in the research study.

3.12 Limitations.

- Time constraint as I had to go satellite hospital for placements
- Limited funds to conduct the study

3.13 Dissemination of results

The results of the study in form of a research report were handed to King Ceasor University School of Health Sciences as requirement for award of a Bachelor in Medicine and Bachelor in Surgery .

CHAPTER FOUR

4.0 Results

This chapter presents findings from the study and they have been presented in line with specific objectives. The response rate was 100%.

4.1 Socio-demographic characteristics of the participants (n=147)

Table 1: Socio-demographic characteristics of the participants

(n=147)

Variable	Category	Frequency	Percentage
Sex of the child	Male	59	40.1
	Female	88	59.9
Age of the child	<12 months	43	29.3
	12-36 months	74	50.3
	37-59 months	30	20.4

In this study, more than a half 88(59.9%) of the participants were females and majority 74(50.3%) of them were aged 12-36 months as shown in table 1 above.

4.2 Prevalence of malnutrition

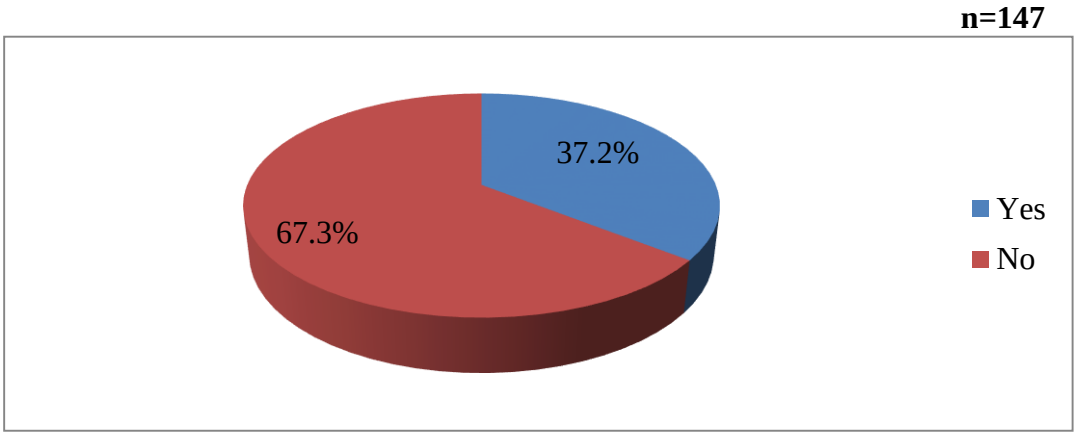


Figure 1: Prevalence of malnutrition

The prevalence of malnutrition among children below five years was 56(37.2%) as indicated in figure 2 above.

4.3 Child related factors

4.3.1 Univariate analysis child related factors (n=147)

Table 2: Univariate analysis child related factors

(n=147)

Variable	Category	Frequency	Percentage
Sex of the child	Male	59	40.1
	Female	88	59.9
Age of the child	<12 months	31	21.1
	12-36 months	74	50.3
	37-59 months	42	28.6
Birth order	1-2	43	29.3
	3-4	59	40.1
	5 and above	45	30.6
Birth interval	2 or less	118	80.3
	3-4	29	19.7
Regular deworming	Yes	88	59.9
	No	59	40.1
Type drinking water	Boiled	131	89.1
	Unboiled	16	10.9
Washing hands before eating	Yes	100	68.0
	No	47	32.0
Wearing shoes	Yes	134	91.2
	No	13	8.8

More than a half 88(59.9%) of the participants were females while majority 74(50.3%) of them were aged 12-36 months. Majority 59(40.1%) of the participants were of 3-4 birth order while more than three quarters 118(80.3%) had a birth interval of ≤2. More than a half 88(59.9%) of the participants had regular deworming and 131(89.1%) of them drink boiled water. Majority 100(68.0%) of the participants would wash their hands before eating and 134(91.2%) of them wore shoes especially in muddy environment as shown in table 2 above.

4.3.2 Bivariate analysis of child related factors

Table 3: Bivariate analysis of child related factors

(n=147)

Variable	Category	Malnutrition		OR	Df	P-value
		Yes	No			
Sex of the child	Male	17(28.8%)	42(71.2%)	0.67	1	0.414
	Female	31(35.2%)	57(64.8%)			
Age of the child	<12 months	4(12.9%)	27(87.1%)			
	12-36 months	16(22.2%)	58(77.8%)	31.14	2	**<0.001**
	37-59 months	28(66.7%)	14(33.3%)			
Birth order	1-2	15(34.9%)	28(65.1%)			
	3-4	15(25.4%)	44(74.6%)	2.63	2	0.269
	5 and above	18(40.0%)	27(60.0%)			
Birth interval	2 or less	47(39.8%)	71(60.2%)	18.35	1	**<0.001**
	3-4	1(3.4%)	28(90.6%)			
Regular deworming	Yes	4(4.5%)	84(95.5%)	86.28	1	**<0.001**
	No	44(74.6%)	15(25.4%)			
Type drinking water	Boiled	46(35.1%)	85(64.9%)	3.85	1	**0.050**
	Unboiled	2(12.5%)	14(87.5%)			
Washing hands	Yes	16(16.0%)	84(84.0%)	38.92	1	**<0.001**
before eating	No	32(68.1%)	15(31.9%)			
Wearing shoes	Yes	42(31.3%)	92(68.7%)	1.13	1	0.289
	No	6(46.2%)	7(53.8%)			

Bivariate analysis showed that age of the child (p<0.001, OR=31.14), birth interval (p<0.001, OR=18.35), regular deworming (p<0.001, OR=86.28), type of drinking water (p=0.050, OR=3.85), washing hands before eating (p<0.001, OR=38.92) were significantly associated with malnutrition.

4.3.3 Multivariate analysis of child related factors

Table 4: Multivariate analysis of child related factors

Variable	Category	Malnutrition		OR(95%CI)	P-value
		Yes	No		
Age of the child	<12 months	29(67.4%)	14(32.6%)	0.07(0.02-0.25)	**<0.001**
	12-36 months	16(21.6%)	58(78.4%)	0.14(0.06-0.32)	**<0.001**
	37-59 months	3(10.0%)	27(90.0%)	Ref	.
Birth interval	2 or less	47(39.8%)	71(60.2%)	18.54(2.44-140.91)	**0.005**
	3-4	1(3.4%)	28(90.6%)	Ref	.
Regular deworming	Yes	4(4.5%)	84(95.5%)	0.02(0.01-0.05)	**<0.001**
	No	44(74.6%)	15(25.4%)	Ref	.
Type drinking water	Boiled	46(35.1%)	85(64.9%)	3.79(0.83-17.40)	0.087
	Unboiled	2(12.5%)	14(87.5%)	Ref	.
Washing hands before eating	Yes	16(16.0%)	84(84.0%)	0.09(0.04-0.20)	**<0.001**
	No	32(68.1%)	15(31.9%)	Ref	.

Multivariate analysis revealed that age <12 months ($p<0.001$, OR=0.07) and 12-36 months ($p<0.001$, OR=0.14) decreased chances of suffering from malnutrition compared to age 37-59 years. Similarly, regular deworming ($p<0.001$, OR=0.02) and washing hands before eating ($p<0.001$, OR=0.09) decreased chances of suffering from malnutrition. However, birth interval of ≤2 months ($p=0.005$, OR=18.54) increased chances of suffering from malnutrition more than eighteen times compared birth interval of 3-4.

4.4 Maternal related factors

4.4.1 Univariate analysis of maternal related factors

Table 5: Univariate analysis of maternal related factors

Variable	Category	Frequency	Percentage
Age of the mother	<20 years	43	29.3
	20-29 years	89	60.5
	30-39 years	15	10.2
Maternal education	None	15	10.2
	Primary	58	39.5
	Secondary	30	20.4
	Tertiary	44	29.9
Marital status	Married	103	70.1
	Single	44	29.9
Maternal occupation	Peasant	52	35.4
	Business	40	27.2
	Civil servant	28	19.0
	Others	27	18.4
Nutrition education	Yes	97	66.0
	No	50	34.0

Majority 89(60.5%) of the participants' mothers were aged 20-29 years. Majority 58(39.5%) of the participants' mothers had only primary level of education. Nearly three quarters 103(70.1%) of the participants' mothers were married and majority 52(35.4%) of them were peasants. More than a half the participants' mothers had received nutrition education regarding their children as indicated in table 5 above.

4.3.2 Bivariate analysis of maternal related factors

Table 6: Bivariate analysis of maternal related factors

Variable	Category	Malnutrition		OR	Df	P-value
		Yes	No			
Age of the mother	<20 years	29(67.4%)	14(32.6%)			
	<20-29 years	17(19.1%)	72(80.9%)	32.86	2	**<0.001**
	30-39 years	2(13.3%)	13(86.7%)			
Maternal education	None	15(100.0%)	0(0.0%)			
	Primary	31(53.4%)	27(46.6%)	87.28	3	**<0.001**
	Secondary	1(3.3%)	29(96.7%)			
	Tertiary	1(2.3%)	43(97.7%)			
Marital status	Married	18(17.5%)	85(82.5%)	35.23	1	**<0.001**
	Single	30(68.2%)	14(31.8%)			
Maternal	Peasant	33(63.5%)	19(36.5%)			
occupation	Business	1(2.5%)	39(97.5%)	62.07	3	**<0.001**
	Civil servant	1(3.6%)	27(96.4%)			
	Others	13(48.1%)	14(51.9%)			
Nutrition education	Yes	4(4.1%)	93(95.9%)	115.69	1	**<0.001**
	No	44(88.0%)	6(12.0%)			

According to bivariate analysis, mothers' age ($p<0.001$, OR=32.86), maternal education ($p<0.001$, OR=87.28), marital status ($p<0.001$, OR=35.23), maternal occupation ($p<0.001$, OR=62.07) and nutrition education ($p<0.001$, OR=115.69) were significantly associated with malnutrition among children under five years.

4.3.2 Multivariate analysis of maternal related factors

Table 7: Multivariate analysis of maternal related factors

Variable	Category	Malnutrition		OR(95%CI)	P-value
		Yes	No		
Age of the mother	<20 years	29(67.4%)	14(32.6%)	13.46(2.67-68.01)	**0.002**
	<20-29 years	17(19.1%)	72(80.9%)	1.54(0.32-7.45)	0.595
	30-39 years	2(13.3%)	13(86.7%)	Ref	.
Maternal education	None	15(100.0%)	0(0.0%)	.	.
	Primary	31(53.4%)	27(46.6%)	49.37(6.36-382.99)	**<0.001**
	Secondary	1(3.3%)	29(96.7%)	1.48(0.09-24.67)	0.784
	Tertiary	1(2.3%)	43(97.7%)	Ref	.
Marital status	Married	18(17.5%)	85(82.5%)	0.10(0.04-0.22)	**<0.001**
	Single	30(68.2%)	14(31.8%)	Ref	.
Maternal occupation	Peasant	33(63.5%)	19(36.5%)	1.87(0.73-4.80)	0.193
	Business	1(2.5%)	39(97.5%)	0.03(0.01-0.23)	**0.001**
	Civil servant	1(3.6%)	27(96.4%)	0.04(0.01-0.34)	**0.003**
	Others	13(48.1%)	14(51.9%)	Ref	.
Nutrition education	Yes	4(4.1%)	93(95.9%)	0.01(0.01-0.02)	**<0.001**
	No	44(88.0%)	6(12.0%)	Ref	.

Multivariate analysis revealed that age <20 years (p=0.002, OR=13.46) increased chances of suffering from malnutrition compared to age 30-39 years. Similarly, having primary level of education (p<0.001, OR=49.37) increased chances of suffering from malnutrition compared to tertiary level of education. However, being married (p<0.001, OR=0.1) reduced chances of suffering from malnutrition compared to being single. Regarding maternal occupation, being a business woman (p=0.001, OR=0.03) and civil servant (p=0.003, OR=0.04) reduced chances of suffering from malnutrition compared to other types occupation. Similarly, nutrition education (p<0.001, OR=0.01) reduced suffering from malnutrition.

CHAPTER FIVE

5.0 Discussion , Conclusion and Recommendation

5.1 Discussion

5.1.1 Results discussion

The prevalence of malnutrition among under five years children vary with type, time and geographical distribution (Hawks et., 2017). Although towards the end of the millennium development goals (MDGs) era the global prevalence of underweight children was reported to have dropped from 25% in 1990 to 15% in 2015 (WHO, 2016), our study revealed that the prevalence of malnutrition among children below five years was 56(37.2%). This was lower than that earlier found in western region (41%) (USAID, 2018). However, the prevalence was higher than that found in the Teso sub-region with 14% (USAID, 2018).

5.1.2 Child related factors

According to the previous studies on malnutrition under-five children revealed that the causes of stunting are multifactorial (Tiwari et al., 2014) and the commonly reported child related factors of malnutrition among under-five children include sex of the child, age, birth order and birth interval (Torlesse et al., 2016). In this study, age <12 months ($p<0.001$, OR=0.07) and 12-36 months ($p<0.001$, OR=0.14) decreased chances of suffering from malnutrition compared to age 37-59 years. This is because many of the younger children are still being breastfed and chronic malnutrition sets in only after weaning. This finding was congruent with Nguyen and Kam whose studies conducted in Vietnam found out that the risk of malnutrition increases with age of a child whereby children in the youngest age group 0-11 months had significantly lower risk of being stunted, underweight and wasted than children in the older age groups (Nguyen & Kam, 2018).

Regular deworming ($p<0.001$, OR=0.02) decreased chances of suffering from malnutrition. This is because helminthic infections deprive infants of their nutritients leading to stunted

growth, wasting and underweight. This finding was in agreement with Nwaneri & Omuemu whose studies on preschool aged children found that nearly all infested children had significant stunted growth (Nwaneri & Omuemu, 2012). However, the finding disagreed with Mugarura and others whose study found that infestation with helminths does not increase the chances of developing undernutrition (Mugarura et al., 2012).

Washing hands before eating ($p<0.001$, OR=0.09) decreased chances of suffering from malnutrition. Eating with unwashed hands can be a vehicle for transmitting both helminthes and other pathologic organisms that impair absorption and utilization of nutrients. This study finding was in agreement with De Onis whose study revealed that eating with unwashed hands contributes to malnutrition (De Onis et al., 2012).

5.1.3 Maternal related factors

In this study, the significant influence of maternal related factors was multifactorial. It was found that age <20 years ($p=0.002$, OR=13.46) increased chances of suffering from malnutrition more than thirteen times compared to age 30-39 years. This can be attributed to the low standards of care provided to children by the young mothers compared to older mothers. This finding was congruent with Nure and others whose study found that in Bangladesh where children whose mothers were less than 20 years at the time of birth were 1.22 times more likely to be stunted, wasted and underweight compared to children whose mothers were 20 years and above at the time of birth (Nure *et al;* 2011). Similarly, the findings were congruent with Bachou who found that in the Ugandan settings, severely malnourished infants were mostly from young mothers had low weight at birth with less access to breast feeding which is essential for the infants' protein intake (Bachou, 2020). However, the finding was incongruent with Ergin whose study found that it was important to note that children of the younger mothers were traditionally cared for by their grandmothers in Turkey and this was associated with low

levels of malnutrition among children of younger mothers less than 24 years (Ergin et al., 2017).

It was found that having primary level of education ($p<0.001$, OR=49.37) increased chances of suffering from malnutrition compared to tertiary level of education. This is because most women with low education spend more time in gardens and feed their children on less nutritious foods compared to educated mothers with adequate knowledge about the adequate intake of food for their children in terms of correct quantity, quality and frequency. This finding was in agreement with Babatunde, Olwedo, Webb & Block, and Shrimpton whose studies revealed that mothers' education is associated with good nutrition practices and particularly child nutrition of children under five years (Babatunde; 20101; Olwedo, 2018; Webb & Block, 2014; Shrimpton, 2014). However, the finding disagreed with Sommerfelt who found a negative association between the mother's education and malnutrition of children under- five years (Sommerfelt, 2014).

In a similar way, being married ($p<0.001$, OR=0.1) reduced chances of suffering from malnutrition compared to being single. This is due to the growing awareness of the importance of both parents participating in child upbringing and the involvement of men in the feeding of young children. This finding was in line with Teller whose study about mothers' marital status and under-five child nutrition in Ethiopia revealed that child's malnutrition is significantly associated with marital status whereby under-five child malnutrition is higher among unmarried rural and divorced/separated women compared to married ones (Teller, 2020). Similarly, it was congruent with Antwi whose study conducted in Volta region Ghana found that being a married mother was positively associated with good nutritional status among children below five years (Antwi, 2011). The finding was incongruent with Nyaruhucha whose study in Tanzania revealed that mothers who are married were more likely to have

undernourished children unlike those that were unmarried perhaps because of the cost of maintaining families hence sometimes these families fail to produce nutritious supplements to the under-five children (Nyaruhucha, 2016).

Regarding maternal occupation, being a business woman (p=0.001, OR=0.03) and civil servant (p=0.003, OR=0.04) reduced chances of suffering from malnutrition compared to other types occupation. This is because mothers who are civil servants or own business have higher income that could enable access to adequate food supplies, use of health services, availability of improved water sources, and sanitation facilities which are prime determinants of child nutritional status. This finding was in agreement with Sommerfelt, whose study revealed that malnutrition was more prevalent among children whose mothers did not work for instance according to DHS 1986-89, Burundi had 48% of stunted growth among children from non-working mothers while Zimbabwe had 31.0% of her children stunted among nonworking mothers while 27.5% were among working mothers (Sommerfelt, 2014).

Nutrition education (p<0.001, OR=0.01) reduced suffering from malnutrition. Having knowledge about proper ways of feeding children is important since they know what when to feed the child and this in turn reduces the risk of malnutrition. This was in agreement with Motebejan and others whose study found that nutrition education of caregivers was significantly associated with reduced chances of malnutrition among children below five years of age (Motebejan et al., 2015).

5.2 Conclusion

The researche concluded although the prevalence of malnutrition obtained in the study was lower than the previous findings in central Uganda, it was still higher than the general national and global estimation. Both child and maternal related factors are associated with malnutrition in under five children. The child related factors include child's age, regular deworming and

washing of hands before eating. The maternal related factors include maternal age, marital status, education level occupation and nutrition education.

5.3 Recommendation

Results suggest that more emphasis is still needed to be put on community nutrition and health education with a focus on diet, hygiene, sanitation, social-economic and livelihood programs, improvement of health care services and diversification of interventions especially into poverty alleviation programs with a nutrition focus.

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APPENDICES

APPENDIX I: INFORMED CONSENT FORM

I am a final year student of KCU , doing a research study as a partial fulfillment for the award of a Bachelor of Medicine and Bachelor of Surgery; I am conducting a study on "the prevalence of malnutrition and associated factors among children below 5 years attending Mulago National Referral Hospital nutrition unit". I kindly request you to participate in this study. The information given will be kept confidential. You are free to/or not to participate at any stage. I shall be asking you questions and reviewing your medical records while filling your questionnaire and we will be glad to explain where you will not understand. Thank you.

After carefully listening to the explanation from researchers, I do understand the purpose of the study and have willingly and have accepted to participate in this study. I promise to give the information to best of my knowledge.

Participant's signature…….Date……

Researcher's signature ……Date…….…….

APPENDIX II QUESTIONNAIRE

Topic:*Prevalence of malnutrition and associated factors among children less than five years of age attending Mulago National Referral Hospital nutrition unit*

Questionnaire number……..

PART ONE:CHILD FACTORS. (Please tick appropriately)

1. Sex of child: Male ( ) female ( )

2. Age of child (months)

<12 ( ) 12-36 ( ) 37-59 ( )

3. Birth order

1-2 ( ) 3-4 ( ) 5+ ( )

4. Birth interval (years)

<2 ( ) 3-4 ( ) 5+ ( )

PART TWO: MATERNAL FACTORS (Please tick appropriately)

5. Age of mother at birth (years)

<20 ( ) 20-29( ) 30-39 ( ) 40+ ( )

6. Maternal education

None ( ) primary ( ) secondary ( ) tertiary and university ( )

7. Marital status

Married ( ) single ( ) separated ( ) widowed ( )

8. Maternal occupation

Peasant farmer ( ) business ( ) civil servant/NGO staff ( ) others ( )

appropriately)

9. Regular recommended deworming

Yes ( ) No ( )

10 Type of drinking water

Boiled ( ) Unboiled ( )

11 Washing hands before eating

Yes ( ) No ( )

12 Wearing shoes especially in mudy environment

Yes ( ) No ( )

13 Nutrition education of caregivers

Yes ( ) No ( )

PART FOUR:CHILD ANTHROPOMETRY

14. Weight of child .....(kg)

15. Height/length of child .....(cm).

16. MUAC……

Thanks for your co-operation.

APPENDIX III: APPROVAL LETTER

TELEPHONE: +256-414-554008/1
FAX: +256-414-532591
E-mail: admin@mulago.or.ug
Website: www.mulago.or.ug

IN ANY CORRESPONDENCE ON THIS
SUBJECT PLEASE QUOTES NO.....

MULAGO NATIONAL REFERRAL HOSPITAL
P.O. BOX 7051,
KAMPALA, UGANDA

21 December 2023

Mr. Eeoi Jacob Lokamatei,
Student,
King Ceasor University.

Dear Mr. Jacob,

Re: Approval of Protocol MHREC 2677: "Prevalence of Mulnutrition and Associated Factors among children less than five years of age attending Mulago National Referral Hospital Nutrition Unit, Kampala Uganda."

The Mulago Hospital Research and Ethics Committee reviewed your proposal referenced above and granted approval of this study on 21 December 2023. The conductor of this study will therefore run for a period of one (1) year from 21 December 2023 to 20 December 2024.

The approval covers the protocol and the accompanying documents listed below;

- Consent form
- Questionnaire

The approval is subjected to the following conditions:

1. That the study site may be monitored by the Mulago Hospital Research and Ethics Committee at any time.
2. That you will abide by the regulations governing research in the country as set by the Uganda National Council for Science and Technology including abiding to all reporting requirements for serious adverse events, unanticipated events and protocol violations.
3. That no changes to the protocol and study documents will be implemented until they are reviewed and approved by the Mulago Hospital Research and Ethics Committee.
4. That you provide quarterly progressive reports and request for renewal of approval at least 60 days before expiry of the current approval.
5. That you provide an end of study report upon completion of the study including a summary of the results and any publications.
6. That you will include Mulago Hospital in your acknowledgements in all your publications

I wish you the best in this Endeavour.

APPROVED
APPROVAL DATE EXPIRY DATE
-2 1 DEC 2023 2 0 DEC 2024
MULAGO RESEARCH ETHICS COMMITTEE
IRC

DR. NAKWAGALA FREDERICK NELSON
CHAIRMAN - MULAGO HOSPITAL RESEARCH & ETHICS COMMITTEE

Vision: "To be the leading centre of Health Care Services"

APPENDIX IV: MAP OF UGANDA SHOWING KAMPALA DISTRICT



Kampala district

APPENDIX V: A MAP SHOWING THE STUDY AREA

