

**THE PREVALENCE OF UNDERNUTRITION AND ITS ASSOCIATED FACTORS
AMONG CHILDREN AGED BETWEEN 12 AND 59 MONTHS IN THE
PAEDIATRIC UNIT OF JINJA REGIONAL REFERRAL HOSPITAL**

BY

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BMS/0156/123/DU

**A DISSERTATION SUBMITTED TO THE FACULTY OF CLINICAL MEDICINE
AND DENTISTRY FOR THE PARTIAL FULFILMENT OF THE REQUIREMENTS
FOR THE AWARD OF BACHELORS DEGREE IN MEDICINE AND SURGERY**

JANUARY 2019

DECLARATION

I Twesigye Precious hereby declare that this research report and its content is my original work, apart from where references were made.

It has never been submitted for any academic award in any higher institution of learning.

Signature.....

Date

TWESIGYE PRECIOUS

APPROVAL OF SUBMISSION

This is to certify that the research entitled 'The prevalence of under nutrition and its associated factors in children between 12 to 59 months in the paediatric unit of Jinja regional referral hospital has been done under my supervision by the above student.

DR MBEKEEKA PROSSY

PAEDIATRICIAN

Signature.....

Date.....

DEDICATION

I dedicated this research study to my parents, Mr. Twesigye Paschal and Mrs. Nasasira Enid for the strong support in terms of material, financial and morals and for their prayers they offered to me throughout this academic battle.

Above all to God who is the free giver of wisdom!

ACKNOWLEDGEMENT

I take this opportunity to give thanks to the almighty God for giving me this offer in my entire life. In a special way, I acknowledge the tireless efforts made by my parents' for their material, spiritual and moral support which resulted into this academic success.

Sincere gratitude goes to my supervisor Dr. Mbekeeka Prossy for her inspirational instructions and guidance. Her tireless efforts in providing feedback and insightful comments that truly inspired me to complete this research dissertation.

Heartfelt acknowledgement and appreciation goes to entire K.I.U community and mostly the faculty of clinical medicine and dentistry for the support they gave me along the vein of academics. I also thank the Head of pediatrics department at Jinja regional referral hospital, Nalufenya children's hospital, for allowing me to carry out this research from the nutritional unit. This cannot go without thanking the staff at the nutritional unit and the parents of the children that were involved in this research for their selfless support.

Finally I would like to thank my classmates like, Ussaini Mansour Ahmed, Sr. Ezeofor Scholastica, for enabling me to consult them when it was necessary in order to pursue my academic ambitions, all my friends and family members who kept on encouraging me to complete this project. I'm truly indebted to you all. I pray to the almighty GOD to reward your efforts fruitfully.

ABBREVIATIONS

ANC – ANTE NATAL CARE

BCG – BACILLE CAMETTE GUARIN

DHS – DEMOGRAPHIC AND HEALTH SURVEY

DPT – DIPHTHERIA, PERTUSSIS, TETANUS

IMCI – INTEGRATED MANAGEMENT OF CHILDHOOD ILLNESSES

IREC -INSTITUTION OF ETHICS RESEARCH COMMITTEE

KIU – KAMPALA INTERNATIONAL UNIVERSITY

JRRH- JINJA REGIONAL REFERRAL HOSPITAL

MUAC – MID UPPER ARM CIRCUMFERENCE

OPV – ORAL POLIO VACCINE

PCV – PNEUMOCOCCAL VACCINE

SCD- SICKLE CELL DISEASE

SSA – SUB SAHARAN AFRICA

HIV- HUMAN IMMUNODEFICIENCY VIRUS

AIDS- ACQUIRED IMMUNODEFICIENCY SYNDROME

UBOS – UGANDA BUREAU OF STATISTICS

UDHS – UGANDA DEMOGRAPHIC AND HEALTH SURVEY

UMOH – UGANDA MINISTRY OF HEALTH

UNICEF – UNITED NATIONS CHILDREN’S FUND

WHO – WORLD HEALTH ORGANISATION

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OPERATION DEFINITION

Undernutrition is term used in malnutrition used to mean stunting (low height for age), wasting (low weight for height), Underweight (low weight for age), and micronutrient deficiencies or insufficiencies (a lack of important vitamins and minerals).

ABSTRACT

Worldwide, it is estimated that undernutrition accounts for 54% of mortality in children, and also estimated that eighty percent of undernourished children living in the developing countries live in countries that produce plenty of food. Out of 34 countries that account for 90% of the global burden of undernutrition, 22 are in Africa, and out of that, 52 million children are acutely undernourished, 13.8 million live in sub-Saharan.

According to UNICEF 2015, eastern and southern Africa had 25 million (40%) of children under five of age were suffering from stunting also referred to as chronic undernutrition, in addition, 18% of the under-fives were underweight and 7% were suffering chronic undernutrition.

Undernutrition is a major developmental concern in Uganda, affecting all regions equally. It has been known as the skeleton in the hospital closet because it's overlooked, undiagnosed and untreated by health practitioners. The study was a hospital based cross sectional descriptive study to determine the prevalence of undernutrition, biological factors and medical conditions among children aged between 12 months and 59 months who are admitted on the paediatric unit of Jinja regional referral hospital.

All children who were admitted on various wards of the paediatric unit including the nutritional unit were assessed for eligibility after the primary reason for admission had been taken care of and any urgent resuscitation (if required) had been done. A written informed consent statement was ascertained from mothers. Data including Nutritional assessment, biological factors, and medical conditions was collected from all wards and from special clinics like sickle cell clinic, neurology clinic, and HIV patient's clinic.

It was found out that the prevalence of undernutrition was high. Majority of children were stunted, (21.74%) and (13.59%) were wasted. The findings of undernutrition were more prevalent in children with HIV/AIDS (35%), Cerebral palsy (25%), and sickle cell disease (40%) and among male children, those above two years, first borns, as well as those with a birth order of >4 and those with birth intervals of 2 years and above.

CHAPTER ONE

BACKGROUND INFORMATION

1.1: INTRODUCTION

Each year 5.9 million children under-five die, mainly from easily preventable and treatable causes (IMCI global survey 2017) and many more fail to reach their full potential in terms of healthy growth and development. A major contributor to this statistic is Undernutrition; a pathological state resulting from the cellular imbalance between the supply of nutrients, energy and the body's demand for them to ensure growth, maintenance and specific functions. Undernutrition is an important public health issue particularly for children under five years old who have a significantly higher risk of mortality and morbidity than well-nourished children. (WHO 2017)

Undernutrition is occasionally used as a substitute of protein energy malnutrition, for which two forms exist, which are edematous(kwashiorkor) and none edematous protein energy malnutrition(marasmus), and they commonly coexist.

Worldwide, its estimated that undernutrition accounts for 54% of mortality in children, and also estimated that eighty percent of undernourished children living in the developing countries live in countries that produce plenty of food. Out of 34 countries that account for 90% of the global burden of undernutrition, 22 are in Africa, and out of that, 52 million children are acutely undernourished, 13.8 million live in sub-Saharan.

Globally, there were 165 million (56 million in Africa) stunted, 99 million underweight, and 51 million (13.4 million in Africa) wasting children by year 2012 (R.E.Black et al., 2013). Wasting implies that children are too thin for height, stunting indicates that children are too short for age while underweight means children are too thin for age.

According to UNICEF 2015, eastern and southern Africa had 25 million (40%) of children under five of age were suffering from stunting also referred to as chronic undernutrition, in addition, 18% of the under-fives were underweight and 7% were suffering chronic undernutrition.

Undernutrition is a major developmental concern in Uganda, affecting all regions of the country and most segments of the population. Our country is worryingly hit by undernutrition where 29% and 4% of our children below 5 years are chronically and acutely undernourished respectively, Richard Justin Odong, et;al

About 54% of under-five deaths are believed to be associated with undernutrition in developing countries. In Sub-Saharan Africa, 41% of under-five children are undernourished and deaths from undernutrition are increasing on daily basis in the region (Kimokoti and Hamer, 2008). Health and physical consequences of prolonged states of malnourishment among children are: delay in their physical growth and motor development; lower intellectual quotient (IQ), greater behavioural problems and deficient social skills and susceptibility to contracting diseases. The impaired mental development is taken as the most serious long-term handicap associated with under five malnutrition.

Undernutrition in Uganda starts at infancy and rises steeply, peaking at about two years when about 50% of toddlers are stunted and from the UDHS findings, Northern (40%) and South Western Uganda (50%) regions are more affected than other regions (UBOS & Macro International Inc., 2007). A more recent UDHS survey reveals that 29 percent of children under 5 are stunted, 4 percent are wasted and 11 percent are underweight(UDHS 2016). The substantial population of children born with low birth weight suggests that high fertility rates, short birth intervals, young maternal age, and maternal under nutrition are likely factors that contribute significantly and adversely to child under nutrition(UDHS 2016)

Several factors have been associated with undernutrition. Parental education, economic and nutritional characteristics, child feeding practices, were important risk factors contributing to the increase of severe underweight children in developing countries.(UDHS 2016)

The prevalence of wasting and underweight peaks in children between 9 to 13 months, and wasting rates are likely high are might be attributable to poor feeding practices where liquids other than breast milk are introduced early, increasing the risk of infection. The Northern region suffers from the highest levels of food insecurity, followed by parts of East and East Central regions and parts of Southwest Uganda.(UDHS 2016)

1.2 PROBLEM STATEMENT

The World Health Organisation(WHO) estimates that there are 178 million children that are malnourished across the globe, and at any given moment, 20 million are suffering from the most severe form of malnutrition. (WHO 2017)

Malnutrition remains a major public health problem particularly in the developing countries where it accounts for more than 90% of all nutritional related conditions with two third of all cases originating from sub-Saharan Africa, and morbidity and mortality due to malnutrition

is high among children under five years of age. Several studies have reported that poverty, inadequate access to a balanced diet and underlying diseases like HIV, Tuberculosis etc contribute to high levels of malnutrition.

Effective nutrition is one of the most important health determinants among citizens of any country including Uganda. However, Malnutrition remains a big threat to almost all regions in Uganda.

Majority of studies on child nutritional status at Jinja regional referral hospital in the children's nutritional unit have described prevalence of undernutrition among under-five and focused on socioeconomic, and cultural factors associated with under nutrition.

However biological, and medical conditions associated with the increasing rate of under nutrition among children between 12-59 months is not known.

1.3 OBJECTIVES OF THE STUDY

1.3.1 GENERAL OBJECTIVES

To assess the prevalence of under nutrition and its associated factors in children between 12-59 months at Jinja regional referral hospital

1.3.2 SPECIFIC OBJECTIVES

1. To determine the prevalence of undernutrition in children between 12-59 months at JRRH.
2. To ascertain the biological factors associated with under nutrition in children between 12-59 months at JRRH.
3. To identify the medical conditions associated with under nutrition in children between 12-59 months at JRRH.

1.4 RESEARCH QUESTIONS

1. What is the prevalence of under nutrition in children between 12-59 months at JRRH?
2. What are the biological factors that are associated with under nutrition in children between 12-59 months at JRRH?
3. What are the medical conditions that are associated with under nutrition in children between 12-59 months at JRRH?

1.5 JUSTIFICATIONS OF THE STUDY

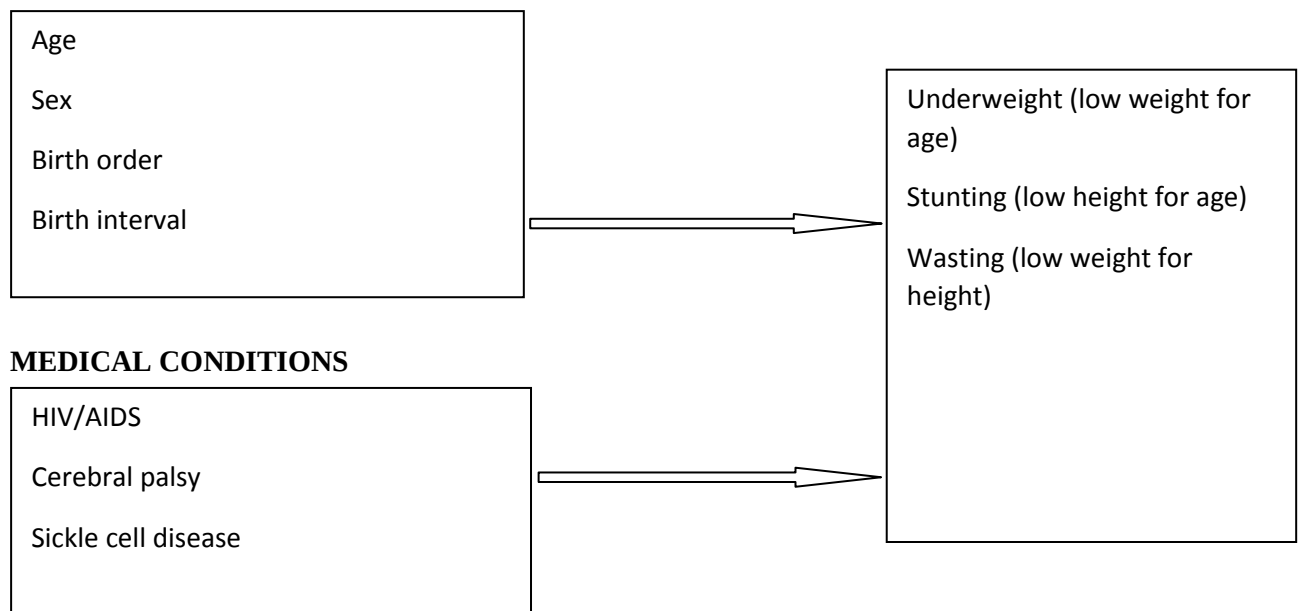
Under nutrition is one of the main health problems facing children between 12-59 months in developing countries. The prevalence of under nutrition imposes significant costs on the Ugandan economy as well as society. The high mortality rates due to under nutrition leads to the loss of the economic potential of the child. It affects children in many ways, predisposing them to different infectious diseases, psychosocial mal-development, and cognitive deficiencies (Mengistuk et al., 2013).

The prevalence of under nutrition in Uganda is relatively well documented, but not specific to the regions, localities and residence so far. It is also varied among regions, sub regions and districts and limited data is available in study area. Therefore, this study was designed to assess the prevalence of under nutrition and associated factors in children between 12-59 months and can be used as a reference in priority setting and designing effective nutritional programs at JRRH and Jinja district at large.

1.6 CONCEPTUAL FRAME WORK

INDEPENDENT FACTORSDEPENDENT FACTORS

BIOLOGICAL FACTORSUNDERNUTRITION



The above illustration indicates that practicing good family planning methods, encouraging exclusive breast feeding for the first six months and employment of good complementary feeding practices will significantly reduce the prevalence of under nutrition in children aged 12-59 months at JRRH. It also shows that prevention of medical conditions like HIV, cerebral

palsy, and sickle cell disease which have been seen to predispose children under five years to undernutrition, can significantly reduce the prevalence of undernutrition in children aged 12-59 months.

1.7 THE SCOPE OF STUDY

1.7.1 GEOGRAPHICAL SCOPE

This study took place in Nalufenyachildren's hospital which is annexed to Jinja regional referral Hospital which is located 95kilometres from the capital Kampala along Kampala-Jinja highway. Jinja regional referral hospital is located in the centre of Jinja town not far from the Nile Source. It serves the districts of Bugiri, Iganga, Jinja, Kaliro,Mayuge, Kamuli, Kayunga, and parts of Mukono. The coordinates of JRRH are: 00 25 52N, 33 12 18E (Latitude: 0.4310; Longitude: 33.2050).

1.7.2 CONTENT SCOPE

The study was hospital based and it was aimed at determining the prevalence of under nutrition in children between one and five years and how its associated factors influence it.

Study intended to show how biological factors and medical conditions interact with one another to cause under nutrition in children aged 12-59monthsat JRRH.

1.7.3 TIME SCOPE

This study was carried out between months June and December 2018. June and July were for proposal writing, and approval, August and September were for Data collection, October and November were for Data analysis and interpretation while December was for discussing and concluding the research dissertation.

CHAPTER TWO

LITERATURE REVIEW

2.1 Prevalence of undernutrition among children below five years.

Each year 5.9 million children under-five die, mainly from easily preventable and treatable causes (IMCI global survey 2017) and many more fail to reach their full potential in terms of healthy growth and development. A major contributor to this statistic is Undernutrition; a pathological state resulting from the cellular imbalance between the supply of nutrients, energy and the body's demand for them to ensure growth, maintenance and specific functions. Undernutrition is an important public health issue particularly for children under five years old who have a significantly higher risk of mortality and morbidity than well-nourished children. (WHO 2017)

Worldwide, it is estimated that undernutrition accounts for 54% of mortality in children, and also estimated that eighty percent of undernourished children living in the developing countries live in countries that produce plenty of food. Out of 34 countries that account for 90% of the global burden of undernutrition, 22 are in Africa, and out of that, 52 million children are acutely undernourished, 13.8 million live in sub-Saharan.

Globally, there were 165 million (56 million in Africa) stunted, 99 million underweight, and 51 million (13.4 million in Africa) wasting children by year 2012 (R.E.Black et al., 2013). Wasting implies that children are too thin for height, stunting indicates that children are too short for age while underweight means children are too thin for age.

According to UNICEF 2015, eastern and southern Africa had 25 million (40%) of children under five of age were suffering from stunting also referred to as chronic undernutrition, in addition, 18% of the under-fives were underweight and 7% were suffering chronic undernutrition.

In Uganda, undernutrition starts at infancy and rises steeply, peaking at about two years when about 50% of toddlers are stunted and from the UDHS findings, Northern (40%) and South Western Uganda (50%) regions are more affected than other regions (UBOS & Macro International Inc., 2007). A more recent UDHS survey reveals that 29 percent of children under 5 are stunted, 4 percent are wasted and 11 percent are underweight (UDHS 2016). The substantial population of children born with low birth weight suggests that high fertility rates, short birth intervals, young maternal age, and maternal under nutrition are likely factors that contribute significantly and adversely to child under nutrition(UDHS 2016)

2.2 Biological factors associated with under nutrition among children below 5 years.

The causes of malnutrition are numerous and multifaceted. These causes intertwine with each other and are hierarchically related. The most immediate determinants are poor diet and disease which are themselves caused by a set of underlying factors; household food security, maternal/ child caring practices and access to health services and healthy environment. These underlying factors themselves are influenced by the basic socio-economic and political conditions (Muller et al., 2005). These factors can be classified as child related or maternal related. Some of the child related factors include; sex of child, age of child, birth order and birth interval.

A 10 year retrospective study conducted in South east Nigeria revealed that male children are more likely to be malnourished than female. The study posited that sex of children is connected to malnutrition and prevalence of stunting was high among boys compared with girls (Yalew et al., 2014). Another study done in Kwara state Nigeria by Babatunde (2011) reported that there was a significant relationship between sex of a child and malnutrition; Male children were more likely to be malnourished than their female counterparts. Another study done in Botswana revealed that stunting, wasting and underweight were also significantly more prevalent among boys than girls (Salah and Nnyepi, 2006). A study by Olwedoet *al.*, (2008) 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.

Age of child is associated with malnutrition. (Manjunnath et al., 2008) Marasmus was more common in children between 6-12 months (57.7%) in south east Nigeria. (Ubesie et al., 2012). In Uganda, children aged between 3-24 months are at increase risks of suffering from acute malnutrition. (Olwedo et al., 2008). It is important to note that at specific ages, children's nutritional status is sensitive to feeding, weaning practices, care, and exposure to infection. A cumulative indicator of growth retardation (height-for-age) in children is positively associated with age. A study done in Ethiopia has also shown an increase in malnutrition with increase in age of the child (Yimer, 2000).

According to (UBOS and Macro International Inc., 2007), malnutrition increases with the age of the child through the first three years of life before declining in the fourth and fifth year. The increase is especially rapid during the first two years of life, as evidenced in the rise from 13 percent among children aged 6-8 months to 45 percent among children aged 18-23

months. It is expected that parents give less attention to older children when they give birth to a new child who needs much attention and care. Similar findings have been reported in different countries for instance in Kwara state of Nigeria (Babatunde, 2011), in Kenya (Kabubo-Mariara *et al.*, 2006) and rural India (Sarmistha, 1999). The findings are plausible considering that many of the younger children are still being breastfed and chronic malnutrition sets in only after weaning (Babatunde and Qaim, 2010). 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 *et al.*, 1994; Jeyaseelan, 1997).

In a study carried out among 6939 children under 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 and Hayat., 2006).

In a 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 *et al.*, 2011). The study indicated that preceding birth intervals and child stunting were statistically significant ($p < 0.05$). 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.

2.3 Medical conditions associated with under nutrition in under five children

2.3.1 Sickle cell disease:

This is a genetic condition that results from substitution of Valine for Glutamic acid in the beta globulin chain of the haemoglobin molecule (Pauling & Itano, 2000) and affects mostly people of African or Hispanic descent. The consequence of this amino acid substitution is the formation of haemoglobin S (HbS). Under low oxygen tension and/or conditions of acidosis.

Sickle cell disease has a high prevalence throughout equatorial Africa, sub-Saharan Africa especially in the west African country of Nigeria, where more than 130,000 (or 19-20:1000) children are born with the disease annually, and approximately 4 million people are afflicted with the disease (Aliyu, Tumblin, & Kato, 2006; Olabode & Shokunbi, 2007; World Health Organisation, 2006).

A study documented hypermetabolic states among children with Sickle cell disease (Borel et al., 1998; Hibbert et al., 2006). Hibbert and colleagues (2006) reported that increased myocardial energy demand, along with increased production of proinflammatory cytokines, is associated with increased resting energy expenditure (REE), a surrogate marker of a state of hypermetabolism. Other investigators supported their findings with the observation that, although individuals with the disease may consume diet deemed adequate for a person without the disease, it might be insufficient to maintain normal body function and metabolism, as reflected by delayed growth, slowed maturation, and low weight/height for age (Henderson et al., 1994; Leonard et al., 1998; Silva & Viana, 2005; Zemel et al., 2007); thus, they are in a state of increased energy demand.

This hypothesis thus posits that hypermetabolism has led to under nutrition because it causes a diversion of nutrients from growth and other required body functions to support the increased requirement for red cell production, increased myocardial energy demand due to increased heart rate, and propagation of the state of chronic subclinical inflammation reported among sickle cell disease patients (Akohoue et al., 2007; Hibbert et al., 2005; Hibbert et al., 2006).

Furthermore, high levels of interleukin-6, a circulating cytokine that is involved in inflammation and host immune defense, has been documented to be associated with appetite suppression and, by extension, decreased dietary intake in sicklers. (Rich et al., 2004; Van Lettow, Van der Meer, West, Van Crevel, & Semba, 2005).

Delayed growth and maturation among individuals with SCD is associated with low plasma zinc (Leonard et al., 1998), which is also associated with low levels of serum testosterone among males (Prasad, 2008; Sandstead et al., 1967) and decreased pubertal development in general (Leonard et al., 1998). Investigators have demonstrated that providing micronutrient supplements to individuals with SCD led to improvement in growth and maturation by way of improved serum testosterone levels. Prasad and Cossack (1984), as well as Zemel and colleagues (2002), demonstrated that administering zinc supplements to growing children with SCD led to improvement in growth. Supplementing other micronutrients like vitamin A (Schall, Zemel, Kawchak, Ohene-Frempong, & Stallings, 2004), vitamin B, and magnesium (De Franceschi et al., 2000) resulted in clinical benefits such as improved growth, decreased hospital emergency room visits, decreased frequency of pain crisis, and reduced frequency of infection. It also led to improvement in muscle function, cognition, and coordination;

decreased inflammation; and improvement in antioxidant and anemia status. These results, apart from demonstrating the benefits of nutrition in the management of SCD, provide further support to the hypothesis that some SCD-associated complications have as much nutritional underpinning as they do genetic.

2.3.2 HIV and undernutrition

The human immunodeficiency virus (HIV) epidemic is closely linked to the problem of hunger and undernutrition. Approximately 37 million people who are infected with HIV/AIDS are at an increased risk for food insecurity and undernutrition, which includes 2.1 million children under the age of 15 (UNAIDS, 2017). In fact, early in the HIV epidemic, it was known as ‘Slim disease’ in Africa because of the thin, wasted appearance of people with advanced disease.(Piwoz, 2000).

Children living with HIV/AIDS generally have a reduced food intake due to loss of appetite, which can cause weight loss. The virus also reduces the absorption of nutrients in the intestines, so that HIV infected people don’t absorb as many nutrients from the food they eat. Additionally, infection with HIV increases metabolism due to the chronic stimulation of the immune system, which is working hard to fight off the infection. HIV infected individuals have suppressed immune systems, which mean they are particularly vulnerable to co infections such as Tuberculosis. These combined factors result in AIDS- related wasting (low weight for height). It must be emphasized that the relationship between HIV infection and nutrition is highly complex and affected by numerous factors, including age, HIV disease stage, individual physiology and metabolism, diet and body composition (de Pee & Semba, 2010).

Over recent decades, the global community has recognised the importance the importance of integrating nutritional support and food security interventions into HIV programs (Aberman, 2014). The world food programme (WFP) joined the United Nations program on HIV/AIDS (UNAIDS), thus contributing their expertise in the area of food aid and nutritional support to UNAIDS programs, designed to reduce the HIV epidemic. The president’s Emergency plan for AIDS relief (PEPFAR) began providing funding directly for nutritional support for people living with HIV/AIDS, and created a program called Food by Prescription, which effectively viewed food as medicine in the context of fighting HIV infection and undernutrition in children between 1 and 5 years. (Aberman, 2014).

2.3.3 Cerebral palsy and undernutrition

Cerebral palsy is the most common physical disability in children and affects 3.6/1000 children (YeARGIN-Allsop et al., 2008). According to definition, cerebral palsy describes a group of permanent disorders of development of movement and posture, causing activity limitation, that are attributed to nonprogressive disturbances that occurred in the developing fetal or infant brain. The motor disorders of Cerebral Palsy are often accompanied by disturbances of sensation, perception, cognition, communication, and behaviour, by epilepsy, and by secondary musculoskeletal problems. (Rosenbaum et al., 2007). Although the primary impairment in Cerebral Palsy is in motor function, growth, and nutrition disorders are common. These growth differences may be present among all children with Cerebral palsy (Stallings et al., 1993b;Stevenson et al., 1994)

A significant contributor to poor growth in children with Cerebral Palsy is poor nutritional status. Typically, malnutrition occurs when a child is unable to take in necessary nutrients (due to difficulty feeding or scarcity) or when the needs of the child (because of illness or increased metabolic rate) exceed what he/she can consume. Undernutrition in children between 1 to 5 years with coexisting Cerebral Palsy is often caused by poor motor function, which impairs the child's ability to safely consume calories and nutrients necessary to support growth (Fung et al., 2002).

Undernutrition (predominantly protein energy malnutrition that is usually accompanied by micronutrient undernutrition) (Stallings et al., 1993b; Stevenson et al., 1995; Coniglio et al., 1996), and a variety of other factors, such as mechanical forces and neurological differences (Stevenson et al., 1995; Henderson et al., 2007) contribute to this poor growth.

These factors appear to act synergistically to affect growth in every dimension including diminished linear growth and weight gain, and abnormal body composition (decreased muscle mass, fat mass, and bone density).

CHAPTER THREE

3.0 METHODOLOGY

3.1 STUDY DESIGN AND GEOGRAPHICAL AREA

A hospital based descriptive cross-sectional study.

This study took place at Nalufenya children's ward which is annexed to Jinja regional referral Hospital which is located 95 kilometres from the capital Kampala along Kampala- Jinja highway. Jinja regional referral hospital is located in the centre of Jinja town not far from the Nile Source. It serves the districts of Bugiri, Iganga, Jinja, Kaliro. Mayuge, Kamuli, Kayunga, and parts of Mukono.

3.2 STUDY POPULATION

This study was carried out on children aged within 12-59 months who visit the hospital for health care services accompanied by their mothers or guardians of all educational levels.

3.3 SAMPLE SIZE

Sample size determination: The research sample size was determined using Fisher's formula of 1986 which states that:

$n = \frac{Z^2 Pq}{d^2}$ Where n = minimum sample size

d^2

Z = Standard deviation at the desired degree of accuracy(95%). Since the desired degree of accuracy is 95%, the Z = 1.96

P = The proportion of variable interest in the population, 0.396.

q = 1- P, proportion p was derived from findings of a study carried out by Richard Odong Justin et al; from the paediatric ward of Kampala international University Teaching Hospital.

d = The acceptable degree of error. Since the desired accuracy is 95%, the acceptable error was 5% (0.05)

Thus $n = \frac{1.96^2 \times 0.396(1-0.396)}{0.05^2}$

0.05^2

= 367.5397 approx 368 Therefore; n = 368

3.4 STUDY VARIABLES

3.4.1 DEPENDENT VARIABLE

Undernutrition indicated by stunting, wasting and underweight

3.4.2 INDEPENDENT VARIABLES

The following categories of factors were assessed as independent variables;

- Biological factors eg Age, Sex, birth order, birth interval.
- Medical conditions eg HIV/AIDS, cerebral palsy, Sickle cell disease.

3.5 PARTICIPANT SELECTION

3.5.1 INCLUSION CRITERIA

All children aged between one to five years admitted at the nutritional unit of Jinja regional referral Hospital.

3.5.2 EXCLUSION CRITERIA

Children who were very ill, and those below one year or above five years

3.6 DATA COLLECTION

Data was collected using structured questionnaires and anthropometric measurement. Mothers/care takers of the children were asked questions concerning their children according to the questionnaires after briefing them and getting informed consent. Assurance of confidentiality given to avoid bias in answering the questions. For each child between 12 and 59 months, the following variables were recorded: Anthropometrics measurements; age of the child; Sex of the child; Weight; Height; MUAC and were collected using the procedure stipulated by the WHO (2006) for taking anthropometric measurements.

3.7 STUDY PROCEDURE

After obtaining informed consent from mothers, there was consecutive enrolment of all children in the age bracket of study by measuring their weight, height or length to determine their height-for-age, weight-for age and weight-for-height as well as to determine Z scores to classify them across the different groups of malnutrition.

3.8 DATA MANAGEMENT AND QUALITY CONTROL

The data collected was checked for completeness and consistency and the incompletely answered questionnaires were excluded and the ones legible for examination were used. To reduce errors, five pre-test questionnaires were administered to mothers to check if questions were accurate and easy for participants to understand and necessary corrections were made. The data collected was analysed manually using scientific calculators in predesigned tables. Some of the information was tallied and then the figures manipulated to derive percentages and any derivations relevant to interpretation of the raw data to be obtained. Microsoft excel 2010 was used to compute the obtained data. Statistical charts were produced using Microsoft Excel 2010 to assist in easier examination and interpretation of the data being analysed.

3.9 ETHICAL CONSIDERATION

- The research proposal was submitted to Institution of Ethics Research committee (IREC) of Kampala International University for approval.
- After the approval an introductory letter was obtained from Kampala International University to Jinja regional referral hospital and the concerned bodies were informed about the study.
- Approval letter from the administration of Jinja regional referral Hospital was procured for the purpose of the research.
- Informed consent was received from the participants and duly documented; translations in the local language for clear understanding for those who did not understand English
- The participants were informed about the research and assured that participation is totally voluntary. The participants were informed that they can choose to stop at any level even after starting to answer the questionnaires. Confidentiality was upheld during and after the course of the research.
- During the data collection time no person was allowed to examine the data collected except the persons assisting in conducting the study.
- There was no use of names in order to protect the privacy of the willing participants, codes were used instead.
- Records obtained were kept safe to ensure privacy of all the participants.
- The researcher did not have any monetary benefits from carrying out the research.

3.9.1 LIMITATIONS AND DELIMITATIONS OF THE RESEARCH

- Some attendants of the children may have given biased answers. This was tackled by ensuring privacy of both the children and their attendants.
- Some attendants who declined to participate in the research due to having other commitments were allowed time and eventually they would get on board.

3.9.2 DISSEMINATION

The results obtained were handed over to the Department of Paediatrics and Office of the hospital Director, Jinja Regional Referral hospital, the Faculty of Clinical Medicine and Dentistry as well as the Library of Kampala International University Teaching Hospital.

CHAPTER FOUR

DATA ANALYSIS AND INTERPRETATION

4.1: Table 1 shows the prevalence of undernutrition in children between 12-59 months.

Variable	Frequency	Percentage
Acute undernutrition(Wasting)	50	13.59%
1.Moderate wasting	27	7.34%
2.Severe wasting	23	6.25%
a) Edematous	8	2.17%
b) Non edematous	15	4.08%
Chronic undernutrition (stunting)	80	21.74%
1.Moderate stunting	52	14.13%
2.Severe stunting	28	7.61%

It was found out that the prevalence of undernutrition was high. Of the 368 children who were assessed, 130 (35.3%) had undernutrition. Of the one hundred thirty, fifty (13.59%) had acute undernutrition which was further divided into two categories, moderate acute undernutrition twenty seven (7.34%) and severe acute undernutrition twenty three (6.25%). Eighty (21.74%) children had chronic undernutrition or stunting, of which fifty two (14.13%) had moderate stunting and twenty eight (7.61%) children had severe stunting.

4.2: BIOLOGICAL FACTORS AFFECTING CHILDREN'S NUTRITION STATUS

Table 1: A table showing biological factors of the children.

Characteristics	Frequency=368	Percentage (100%)
Age		
1-<2 yrs	120	32.61%
2-<5 yrs	248	67.39%
Sex		
Male	224	60.87%
Female	144	39.13%
Birth order		
1 st born	80	21.74%
2 nd born	60	16.3%
3 rd born	62	16.85%
4 th born	66	17.93%
5 and above	100	27.17%
Birth interval		
<1 yr	10	2.72%
1 yr	28	7.61%
2 yrs	180	48.91%
3 and above	150	40.76%

Table 2: Table showing biological factors associated with acute and chronic undernutrition.

VARIABLE	ACUTE UNDERNUTRITION		CHRONIC UNDERNUTRITION	
	NO(N=318)	YES(N=50)	NO(N=288)	YES(N=80)
Sex.				
Male	193	31	180	44
Female	125	19	108	36
Age.				
1-<2yrs	106	14	100	20
2-<5yrs	212	36	188	60
Birth order.				
1 st born	70	10	65	15
2 nd born	55	5	45	15
3 rd born	56	6	40	22
4 th born	59	7	48	18
5 th and above	78	22	90	10
Birth interval.				
<1 year	3	7	2	8
1 year	8	20	6	22
2years	170	10	153	27
3 and above	137	13	127	23

From the study, majority of the participants were males (61%) of which 62% had acute undernutrition and 55% chronic undernutrition. Females on the other hand took up 39% of which 38% had acute undernutrition and 45% chronic undernutrition.

Of the three hundred and sixty eight participants, majority were aged between 24 months and 59 months 248(67%) of which 72 % had acute undernutrition, and 75% chronic undernutrition. One hundred twenty 120 (39%) were aged between 12 and 23 months of which 14(28%) had acute undernutrition and 20(25%) chronic under nutrition.

Of the 368 participants, 80(21.74%) were first borns of which 10(20%) had acute undernutrition and 15(18.8%) had chronic undernutrition. Of the 60 (16.3%) second borns,

5(10%) had acute undernutrition, while 15(18.75%) had chronic undernutrition. Of the 62 (16.85%) third borns, 6(12%) had acute undernutrition, and 22(27.5%) had chronic undernutrition. Of the 66(17.93%) forth borns, 7(14%) had acute undernutrition, and 18(22.5%) had chronic undernutrition. Of the 100(27.17%) who were five years and above, 22(44%) had acute undernutrition, and 10(12.5%) had chronic undernutrition.

From the study, those who had a birth interval of less than one were 10(2.71%) of which 3(6%) had acute undernutrition and 7(8.75%) had chronic undernutrition. Those who had a birth interval of one were 28(7.61%) of which 20(40%) had acute undernutrition and 22(27.5%) had chronic undernutrition. Those who had a birth interval of two were 180(48.91%), 10(20%) had acute undernutrition while 27(33.75%) had chronic undernutrition. Of the 150(40.76%) who had a birth interval of more than three, 13(26%) had acute undernutrition and 23(28.75%) had chronic undernutrition.

4.3:Medical conditions affecting children's nutrition status

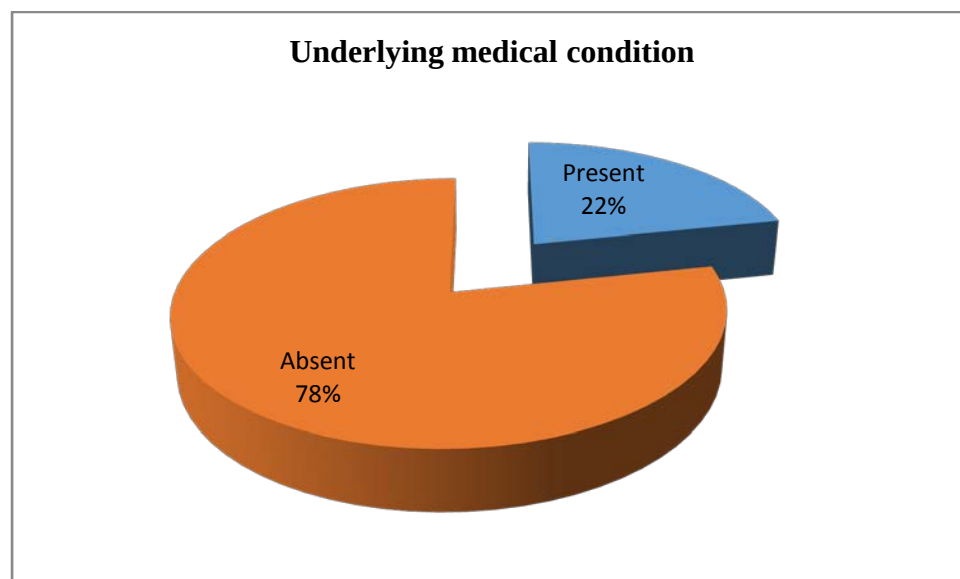


Figure 8: A pie chart showing the presence/absence of underlying medical condition

Out of 368 participants, 78% had no underlying medical condition while 22% had medical condition like HIV/AIDS, cerebral palsy and sickle cell disease.

4.3.1: PERCENTAGE OF UNDERLYING MEDICAL CONDITION

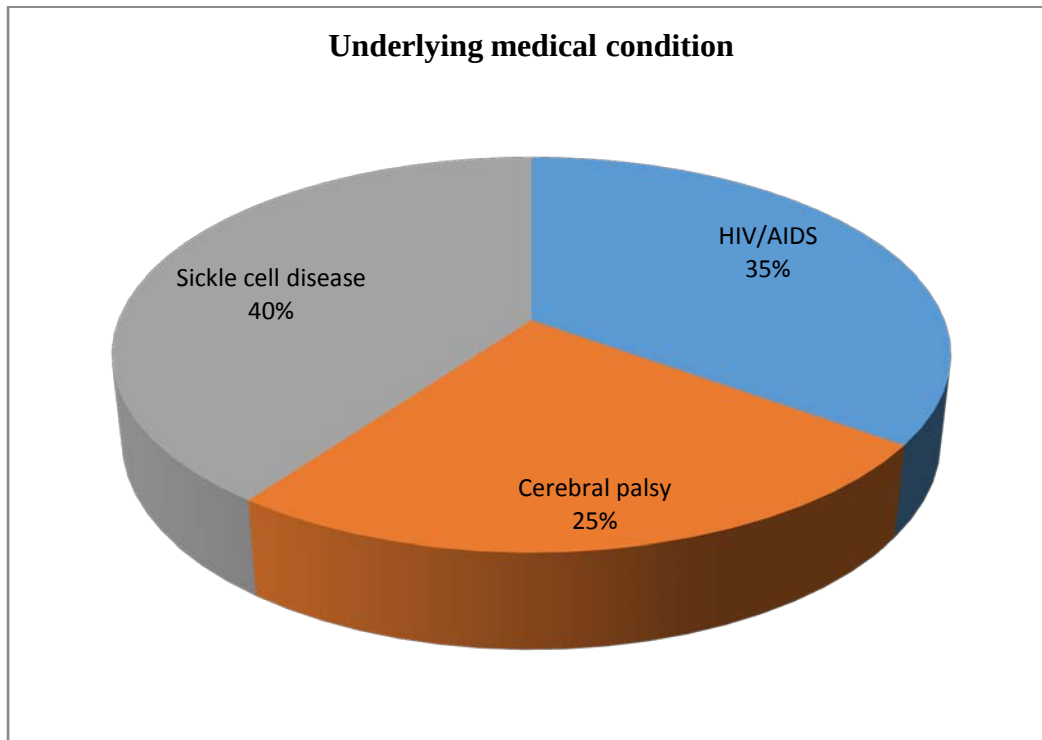


Figure 9: A pie chart showing the proportion of children with underlying medical conditions.

Of the 80% participants, 32(40%) has sickle cell disease, 28(35%) had HIV, and 20(25%) had cerebral palsy. Of the 32 children who had sickle cell disease, 20 children were underweight, while 12 were stunted. Of the 28 children who had HIV/AIDS, 16 were underweight, while 12 were stunted. Of the 20 children who had cerebral palsy, 12 were underweight while 8 were stunted.

CHAPTER FIVE

DISCUSSION

5.1. Prevalence of undernutrition among children between 12-59 months at Jinja Regional Referral Hospital

The proportion of undernutrition (35.3%) was high among children admitted at the paediatric unit of Jinja regional referral hospital. Stunting was the commonest pattern at 21.74% and wasting at 13.59%.

This trend was in agreement with a study done in the general paediatric ward at the Chris Hani Baragwaneth hospital Johannesburg, South Africa which found that stunting was the most common at 40.5%, and wasting 23.4%. Though they found a slightly higher prevalence, the difference could have been because Chris Hani hospital is the 3rd largest hospital in the world, and largest in Africa, with a general paediatric ward bed capacity of 408, compared to Jinja hospital's 250 bed capacity.

A more recent UDHS survey done in 2016 across the country revealed that 29% of children under 5 years were stunted, and 15% were wasted. The study findings showed a slight increase in the prevalence of undernutrition because the study was hospital based and most children who participated were sick, and had anorexia which would predispose them to acute undernutrition.

5.2. Biological factors affecting the nutrition status of children between 12 and 59 months.

From the study, 61% were males and 39% were females. This was in agreement with a study that was done in Kwara state, Nigeria by Babatunde (2011) in which he reported that there was a significant relationship between sex of a child and malnutrition; male children were more likely to be malnourished than their female counterparts. Another study done in Botswana revealed that stunting, wasting and underweight were also significantly more prevalent among boys than girls (Salah and Nnyepi, 2006).

A 10 year retrospective study conducted in South east Nigeria revealed that male children are more likely to be malnourished than female which too was in agreement with the results. The study posited that sex of children is connected to malnutrition and prevalence of stunting was high among boys compared with girls (Yalew et al., 2014).

Study findings regarding age of the child were in agreement with a study that was done in Nigeria that showed that the prevalence of undernutrition is especially high during the first two years of life, as evidenced in the rise from 13% among children aged 6-12 months to 45% among children aged 18-24 months. It is expected that parents give less attention to older children when they give birth to a new child who needs much attention and care. Similar findings have been reported in different countries for instance in Kwara state of Nigeria (Babatunde, 2011), in Kenya (Kabubo-Mariara et al., 2006) and rural India (Sarmistha, 1999).

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

The study found out that the prevalence of both stunting and wasting was high among first borns and among those of birth order of above 4 most likely due to many reasons including the fact that most first borns were as a result of unexpected pregnancies, and also because first borns tend to be given less attention as soon as new children come in. In addition the children with a birth order of above 4 were found to be stunted due to facts like having to share food with younger siblings and also reduced attention from parents as they have more children.

The results were in agreement with a research done in Bangladesh among 6939 children under five years, which showed that 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 and Hayat., 2006).

The study findings indicate that the prevalence of stunting increased with increasing birth interval and it is believed to be due to the fact that parents tend to concentrate on feeding younger children, or forthcoming children which results in impaired growth of older children.

The above results were supported by a study conducted in Bangladesh, which showed that 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 et al., 2011). 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.

5.3. Medical conditions that were found to affect the children's nutritional status.

The study found out that 40% has sickle cell disease, 35% had HIV, and 25% had cerebral palsy.

Of those who had HIV, (57%) were underweight, while 43% were stunted. The results were in line with a study which was done at Niloufer Institute for women and child health, India, which found out that 61% of the children living with HIV were underweight, while 56.8% were stunted. Their results revealed a much higher prevalence because theirs is a bigger hospital with a 500 bed capacity compared to ours of 250 beds.

Children living with HIV/AIDS generally have a reduced food intake due to loss of appetite, which can cause weight loss. The infected children have reduced absorption of nutrients. Additionally, infection with HIV increases metabolism due to the chronic stimulation of the immune system, which results in suppressed immune systems, which means they are particularly vulnerable to opportunistic infections such as Tuberculosis. These combined factors result in AIDS-related wasting and stunting which are highly suggestive of the study findings. (de Pee & Semba, 2010).

Regarding cerebral palsy, 60% of the children were underweight, while 40% were stunted. The results were in line with the findings from a study which was done at the pediatric Neurology clinic of Aminu Kano Teaching Hospital, Kano, Nigeria which found out that 66.9% were underweight while 53.3% were stunted. This further proves that Cerebral Palsy is a risk factor for both acute and chronic undernutrition in children under five years. This could be due to poor motor function, which impairs the child's ability to safely consume calories and nutrients necessary to support growth. Henderson et al., 2007 found out that the above factors appear to act synergistically to bring about poor growth and weight gain.

Regarding the results of nutritional status of children with sickle cell disease, the study showed that 62% of the children had acute undernutrition while 38% had chronic undernutrition. A study which was done in Northern Nigeria to find out the prevalence of undernutrition in children who had sickle cell disease showed that 34.2% were underweight while 36% were stunted. This study showed a much higher prevalence of underweight children because most of these children had underlying illnesses such as malaria, diarrhoeal diseases to mention but a few. Exposure to infections due to their suppressed immune system contributes to their anorexia, which results in macro and micro nutrient deficiencies vital for weight gain, bone density and linear growth. (De Franceschi et al., 2000)

CONCLUSIONS AND RECOMMENDATIONS

- The prevalence of undernutrition among children aged between 12 and 59 months was found to be high.
- Biological factors like age of 2 years and above, being a male child, being a first child and increasing birthorder of more than 4 and were associated with acute undernutrition.
- Medical conditions like HIV/AIDS, Cerebral palsy, Sickle cell disease were found to be greatly associated to both acute and chronic undernutrition.
- Stunting was however the commonest pattern of undernutrition.
- I therefore recommend that all children admitted on the paediatric ward should be assessed for their nutritional status.
- Regarding the fact that most of the children who had HIV/AIDS, Cerebral palsy, and sickle cell disease were found to be either severely or moderately undernourished, it's recommended that they should be assessed for nutritional status at each visit, and the necessary interventions done.
- Further studies on more factors associated with undernutrition at Jinja regional referral hospital should be carried out.

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APPENDIX I: STUDY QUESTIONNAIRE

KAMPALA INTERNATIONAL UNIVERSITY (KIU) WESTERN CAMPUS

Dear sir/Madam

I am Twesigye Precious a medical student from Kampala International University Western Campus and I am carrying out a study entitled, "The prevalence of malnutrition and its associated factors among children aged 12-59 months of age in Jinja regional referral hospital". I humbly request you to avail me with the necessary information regarding your child's health. The information provided will be kept confidential.

Instructions: This questionnaire comprised of 3 sections A, B and C. A researcher will write YES or NO or WRITE the correct answer he/she feels is right.

CONSENT

I.....agreed to give information about my child's illness having been explained to the risks and benefits of this research. I agree that I gave the right information out of good will. There are neither risks involved nor monetary benefits to the participants.

ATTENDANTS NAME.....SIGNATURE/THUMB PRINT.....DATE.....

SECTION A: Nutritional assessment

Weight (kgs).....Height(cm).....Length(cm).....MUAC(cm).....length/age.....

Weight/age.....Height/age.....Weight/height.....weight/length.....

SECTION B: Biological factors affecting the nutrition status of under five children

Age: 1-<2 years ☐

2-<5year ☐

Sex: Male ☐ Female ☐

Birth order: first born ☐ second born ☐ third born ☐ forth born ☐

Others ☐

Birth interval: <1 year ☐ 1 year ☐ 2 years ☐ Others(specify) ☐

SECTION C: Medical conditions affecting nutrition status of under five children

HIV/AIDS: SEROSTATUS: Positive ☐ Negative ☐

Cerebral palsy: Child has ☐ Child doesn't have ☐

Sickle cell disease: Child has ☐ Child doesn't have ☐

THE END

APPENDIX II: WORK PLAN

MONTH	ACTIVITY
June-July	Proposal writing and approval
August-September	Data collection
October-November	Data analysis and interpretation
December	Discussion and conclusion

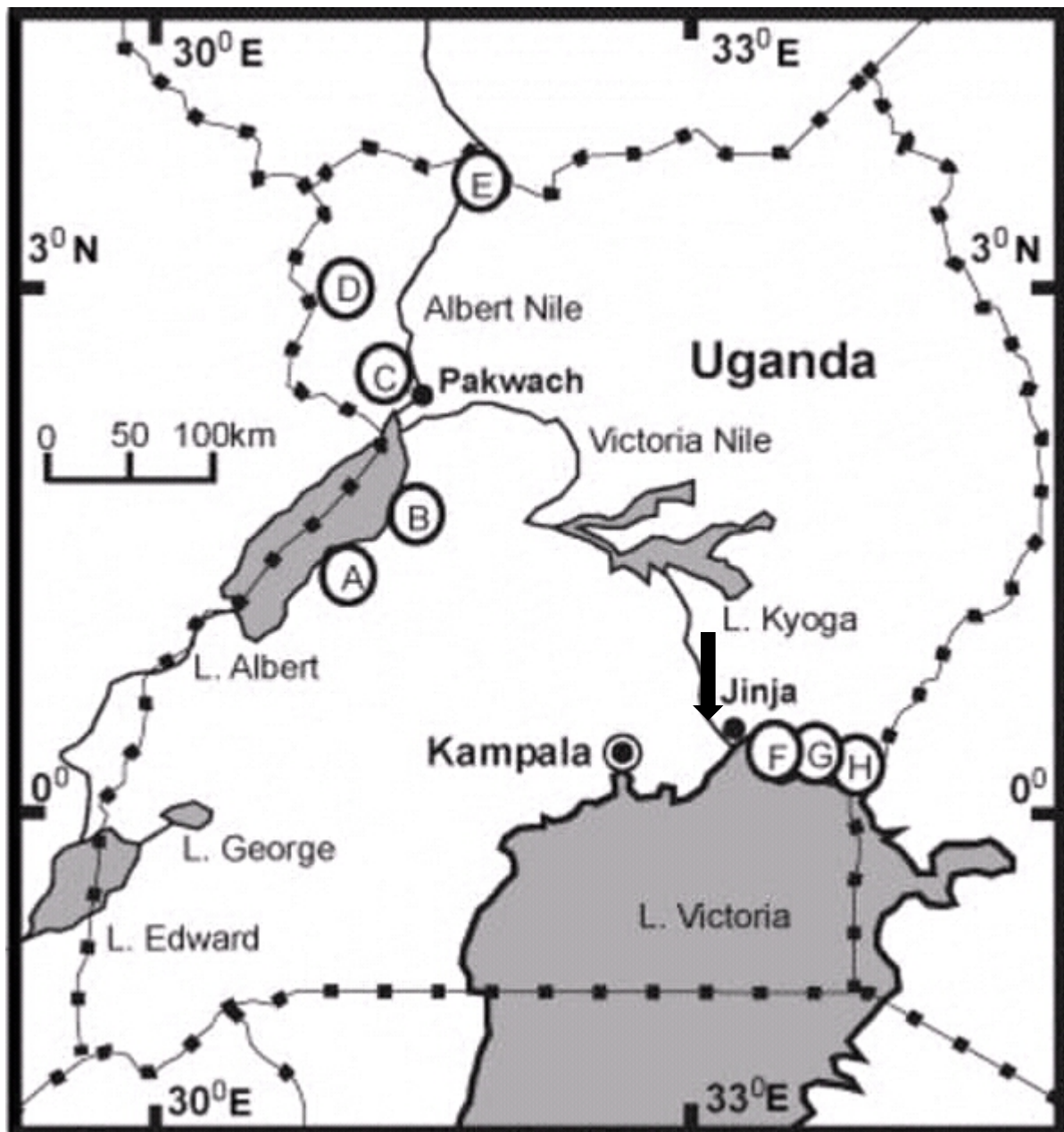
APPENDIX III: BUDGET

ITEM	EXPENDITURE (Ugshs)
STATIONERY	150,000/=
TRANSPORT	100,000/=
ASSISTANTS	250,000/=
TOTAL	500,000/=

APPENDIX IV: MAP OF THE STUDY AREA



MAP 1. Map of Jinjamunicipality showing the location of Jinja regional referral hospital indicated by a black arrow.



MAP 2. Map of Uganda showing the location of Jinja District indicated by a black arrow.

APPENDIX V: INTRODUCTORY LETTER FROM KIU



**KAMPALA INTERNATIONAL
UNIVERSITY – WESTERN CAMPUS**

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Tel: +256 200923534
www.kiu.ac.ug

OFFICE OF THE DEAN FACULTY OF CLINICAL MEDICINE & DENTISTRY

13/06/2018

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

RE: TWESIGYE PRECIOUS (BMS/0156/123/DU)

The above named person is a fifth year student at Kampala International University pursuing a Bachelor of Medicine, Bachelor of Surgery (MBChB) Programme.

She wishes to conduct her student research in your hospital

Topic: The Prevalence of Malnutrition and its associated factors among children under five years in Jinja Regional Referral Hospital

Supervisor: Dr. Mbekeeka Prossy

Any assistance given will be appreciated.

S. O. Akib
Dr. Akib Surat O
Deputy Executive Director/Assoc Dean (FCM & D)



“Exploring the Heights”

Assoc. Prof Ssebuufu Robinson, Dean (FCM & D) 0772 507248 email: rssebuufu@gmail.com
Dr. Akib Surat Associate Dean FCM & D) email: doctorakib@yahoo.com