

**NUTRITIONAL STATUS (WASTING) AND ASSOCIATED FACTORS  
AMONG HIV INFECTED UNDER-FIVES ATTENDING CARE AND  
TREATMENT CLINICS IN SHINYANGA REGION, TANZANIA**

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**Master of Public Health Dissertation  
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**Muhimbili University of Health and Allied Sciences**

**School of Public Health and Social Sciences**



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**By**

**Edward Leonidas Kinyamugera**

**A Dissertation Submitted in (Partial) Fulfillment of the Requirements for the Degree  
of Master of Public Health of**

**Muhimbili University of Health and Allied Sciences  
October, 2021**

## **CERTIFICATION**

The undersigned certifies that he has read and hereby recommends for acceptance by Muhimbili University of Health and Allied Sciences dissertation entitled; **“Nutrition status (wasting) and associated factors among HIV infected under-fives attending Care and Treatment Clinics in Shinyanga Region, Tanzania”**, in (partial) fulfillment of the requirement for the degree of Master of Public Health of Muhimbili University of Health and Allied Sciences.

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**Prof. Method Kazaura**

(Supervisor)

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**Date**

**DECLARATION AND COPYRIGHT**

I, **Edward Leonidas Kinyamugera**, declare that this **dissertation** is my original work and that it has not been presented and will not be presented to any other University for a similar or any other degree award.

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## **DEDICATION**

This work is dedicated to my lovely family for their encouragement and support for the entire period of my studies.

## **ABSTRACT**

**Introduction:** Available scientific evidence has revealed that macronutrients and micronutrients are critical for fighting HIV-infection because they are required by the immune system and major organs to attack infectious pathogens. It is believed that weight gain or maintenance might be achieved through good nutrition and has helped to reduce the consequences of wasting in people living with HIV/AIDS (PLHIV). Good nutrition helps to strengthen the immune system and reduce the severity and impact of opportunistic infections in people living with HIV/AIDS.

**Objectives:** The objective of this study was to assess nutrition status and associated factors among HIV infected under-fives attending Care and Treatment Clinics in Shinyanga, Region, Tanzania. For the sake of this study, the nutritional status that was assessed was wasting.

**Methods:** A health facility-based cross-sectional study was conducted in Shinyanga region. Using simple random sampling technique a total of 237 HIV-infected under-fives accompanied by a parent/caregiver at the care and treatment clinic were recruited. Data on house hold socioeconomic status and child's clinical as well as demographic information were collected using a pre prepared questionnaire and was captured using Microsoft Excel and exported to SPSS version 24 for analysis. Descriptive statistics was used to describe the characteristics of the study population and to establish the prevalence of wasting among HIV infected underfives. Factors associated with nutritional status among HIV infected under-fives were determined using Chi square test. P-value <0.05 was used as a cut-off point for the association.

**Results:** The prevalence of wasting in this study was found to be 30.8% and wasting among HIV infected children was not statistically associated with any of the clinical, socio-economic and breast feeding factors that were assessed.

**Conclusion:** The high prevalence of wasting among HIV-infected under-fives in this study indicates the need for the joint effort between parents and caregivers, the government and stake holders to design and implement interventions to improve nutritional status among these under-

fives. But also a further study to determine the nutrition status as whole and the factors associated is also recommended using a larger sample size.



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Figure 1: The Modified UNICEF Conceptual framework for the undernutrition among HIV infected under-fives [30]. .....7

**LIST OF ABBREVIATIONS**

AIDS-	Acquired Immune Deficiency Syndrome
CTC-	Care and Treatment Clinic
DHIS-	District Health Information System
EDHS-	Ethiopia Demographic and Health Survey
HAART-	Highly Active Anti-retroviral Therapy
HIV-	Human Immunodeficiency Virus
MoHCDGEC-	Ministry of Health, Community Development, Gender, Elders, and Children
MUHAS –	Muhimbili University of Health and Allied Sciences
PLHIV-	People Living with HIV
PMTCT-	Prevention of Mother to Child transmission
RAS-	Regional administrative secretary
SPSS-	Statistical Package for Social Sciences
TACAIDS:	Tanzania Commission for AIDS
TB-	Tuberculosis
TDHS-	Tanzania Demographic and Health Survey
TFNC-	Tanzania Food and Nutrition Centre
WHO-	World Health Organization

## DEFINITIONS OF KEY TERMS

**Macronutrients:** Are nutrients needed by the body in relatively large quantities (many grams per day and include carbohydrates, fats, and proteins).

**Micronutrients:** Are nutrients needed by the body in very small quantities (usually less than 1 gram per day) and include vitamins and minerals

**Exclusive breastfeeding:** Means giving a baby only breast milk, and no other liquids or solids, not even water. Exclusive breastfeeding is recommended until the baby is 6 months old

**Mother-to-Child Transmission:** Transmission of HIV to an infant from an HIV-infected mother during pregnancy, delivery, or breastfeeding.

**Nutrient:** A chemical substance or component in food that is released during digestion and helps maintain, repair or build body tissues and regulate body functions

**Body mass index:** A statistical measure of the body based on weight and height, calculated by dividing weight in kilograms (kg) by height in meters (m) squared, or (kg/m<sup>2</sup>)

**Antiretroviral:** A medication used for HIV prophylaxis or treatment (not a cure)

**AIDS:** A group of illnesses caused by HIV that weaken the immune system; the last and most severe stage of the clinical spectrum of HIV-related diseases

**Nutritional status:** A measurement of the extent to which a person's physiological needs for nutrients are met

**Nutritional supplements:** Products containing vitamins, minerals, herbs, amino acids, or other substances such as enzymes, organ tissues, metabolites, extracts, or concentrates

**Opportunistic infection:** this is an infection that takes advantage of the weakness in the immune system. People with HIV are vulnerable to opportunistic infections as tuberculosis, bacterial pneumonia, candidiasis, herpes simplex, and Kaposi's sarcoma.

**Nutrition:** The intake of food and drink and the chemical and physical processes that break down food and release nutrients needed for development, growth, energy, reproduction, immunity, warmth, movement, work, and cell maintenance, replacement, and repair



## CHAPTER ONE

### 1.1 Background Information

Despite various multi-sectoral efforts, malnutrition remains among the devastating and major public health concerns around the world. The recent statistics show that 45% of the deaths that occur annually in children aged from 6 to 59 months in developing countries are attributed to malnutrition and this account for approximately 2.3 million children's deaths globally [1]. On the other hand, it is estimated that 165 million under-fives were affected with undernutrition globally, of which 26% were stunted. In Africa, the prevalence of stunting was approximated at 36% and 27% in Asia [2]. The World Health Organization reported that 54% of all childhood mortality was attributable, directly or indirectly, to malnutrition [3].

The problem seems to be more prevalent in Africa and Asia, as the recent data estimate that, more than 90% of stunted children in the world have been living in Africa and Asia in the distribution of 40% and 39%, respectively. Of 90% stunted children in the world, 80% lived in just fourteen countries including Tanzania [4, 5]. Again, Africa is the most affected region, with 31.2% of children under 5 years of age suffering from stunting, 5.2% of overweight, and 7.4% of wasting. Severe forms occur in 2.2% of the population according to a report in 2015 [6]. One in three children under-five is stunted or too short for their age. Stunting is an indication of chronic undernutrition and is more common among children who were very small at birth (51%), those with a thin mother (40%) and those from the poorest households (40%) [7].

The under nutritional status of children in Tanzania is estimated at 34%. By region, stunting ranges from 15% in Dar es Salaam to 56% in Rukwa, where Shinyanga is rated at 30%. Wasting (too thin for height), which is a sign of acute malnutrition, is far less common (5%) in the country and 4.3% in Shinyanga. Also, 14% of children are underweight or too thin for their age [8].

The main causes of undernutrition have been classified as biological, behavioral and sociological factors. The biological causes may be infectious diseases like HIV/AIDS, TB etc and also helminthes infestations which decreases intestinal nutrients absorption and thus developing poor nutrition. Behavioral factors include insufficient access to food, inadequate or inappropriate

knowledge, practice, and sanitation. Also the major social risk factors are political situation, lack of education and economic inequality. Moreover, cultural factors influences on food habits along with several religious taboos and social customs may also cause nutritional deficiency [9].

Malnutrition in childhood and pregnancy has many adverse consequences for child survival, long term well-being and increases susceptibility to infections and predisposes to poor physical and cognitive development [10, 11]. Every year, malnutrition accounts for more than one-third of all deaths among children under-fives in resource-limited-settings [12]. The risk of death among children with severe malnutrition is three times higher in HIV-infected children compared to those who are not infected [13]. In addition, children living with HIV are at greater risk for malnutrition [14]. Moreover, undernutrition is reported to be the most common nutritional disorder affecting South African children's physical growth and cognitive development and is considered the strongest predictor of mortality in HIV infected children below 5 years of age [15].

It is estimated that, over one million HIV-exposed children are born worldwide every year, and evidence suggests that these children are at higher risk of morbidity and mortality compared with their unexposed peers [16, 17, 18, 19]. HIV-infected children below 5 years of age are also faced with chronic undernutrition which creates a physical vulnerability and weakens the immune system, impairing their ability to fight off opportunistic infections caused by HIV/AIDS, increased the risk for premature death, and vulnerability to other health-related challenges [20, 21].

Furthermore malnutrition among under-fives has been reported not only to be associated with mortality and morbidity but also leads to physical and mental impairment. Consequences of prolonged states of malnourishment among children have been reported to cause a delay in their physical growth, lower intellectual quotient, poor cognitive ability, decreased economic productivity, decreased reproductive performance, poor school achievement and poor school performance, greater behavioral problems and deficient social skills as well as susceptibility to contracting diseases [22, 23, 24]. It also has far-reaching consequences for human capital,

economic productivity, and national development overall. Therefore the consequences of malnutrition should be a significant concern for policymakers in Tanzania [25].

Nutritional assessment is normally done for the purpose of defining nutritional status of the target population, to develop health care programs as well as measuring the effectiveness of nutritional programs and interventions. Globally, nutritional status is used as an appropriate measurement for gauging the wellbeing of children, and in particular, to identify those children who are at risk of disease vulnerability and developmental deficits [26]. There are various methods for estimating children's nutritional status, but the widely used methods for determining childhood undernutrition can be classified clinically based on three nutritional indicators: low height for age (stunting), low weight for height (wasting), and low weight for age (underweight) [27].

Basing on the current information, Shinyanga remains among regions with a high prevalence of undernutrition among under-fives which is estimated to be at 30% and a high HIV prevalence of 5.9% and rated among regions with highest HIV prevalence rates in the country [28]. On the same note the gap still exists thereby lacks information on nutrition status among HIV infected children despite the link between malnutrition and HIV. Therefore, it is of paramount importance to establish the nutritional status of HIV infected under-fives in the region so as to link HIV care and nutrition programs.

## **1.2 Problem Statement**

Under-nutrition accounts for 34% of the under-five population in Tanzania and 30% in Shinyanga region. On the other hand, Shinyanga is ranked fifth among regions with high HIV prevalence in the country. On the same note scholars have linked the association between HIV and malnutrition.

The Ministry of Health, Community development, Gender, Elderly and Children through Tanzania Food and Nutrition Centre, produced the third edition of the National guideline for Nutrition care and support for people living with HIV. This aimed at integrating Nutrition assessment counseling and support in routine HIV care services to address nutrition challenges among HIV infected individuals.

However, despite of having the guideline it is currently not clear whether under-fives are benefitting from this guideline and what could be the factors associated with undernutrition among HIV-infected under-fives in the region. This is basing on the fact that there is currently no data on undernutrition status and the associated factors in the region and Tanzania as well.

Furthermore, the link between HIV and undernutrition requires the understanding on the prevalence of undernutrition in HIV infected under-five population and the associated factors so as to facilitate taking appropriate action and thus lead to improved treatment outcomes and improved quality of life among HIV infected under-fives.

### **1.3 Rationale of the Study**

These findings will contribute to creating awareness, understanding and will add knowledge on the undernutrition status among HIV infected under-fives attending CTC Clinics in Shinyanga Region. Understanding the prevalence of undernutrition (Wasting) among HIV infected children in the region will be an entry point for the policymakers and stakeholders to establish strategies in addressing undernutrition in this vulnerable group so that appropriate measures can be initiated to improve nutrition status among HIV infected under-fives and thus improving their treatment outcome and improved quality of life.

On the other hand, findings on the nutritional status can also be a clue of what might be happening elsewhere in other health facilities regarding undernutrition among HIV infected under-fives. Furthermore, findings from this study will trigger for more research to establish the factors that may be associated with undernutrition among this population.

Moreover, findings on the nutritional status among HIV infected under-fives will add up as a piece of evidence to support the current global campaigns that insist on stakeholders funding of nutrition programs as well as addressing Nations to increase their spending to support nutrition programs [29].

Lastly, lack of association between the nutritional statuses of HIV infected under-fives and the socioeconomic status, clinical and breast feeding factors calls for a more detailed study to find out what might be the other factors associated with undernutrition in this group.

#### **1.4 The Conceptual Framework**

The conceptual frame work depicted below is a modified UNICEF's conceptual frame work for the cause of undernutrition and it has considered that undernutrition is attributable to three major factors which are the socioeconomic factors, breast feeding factors and HIV clinical care factors which feed into the framework as follows:

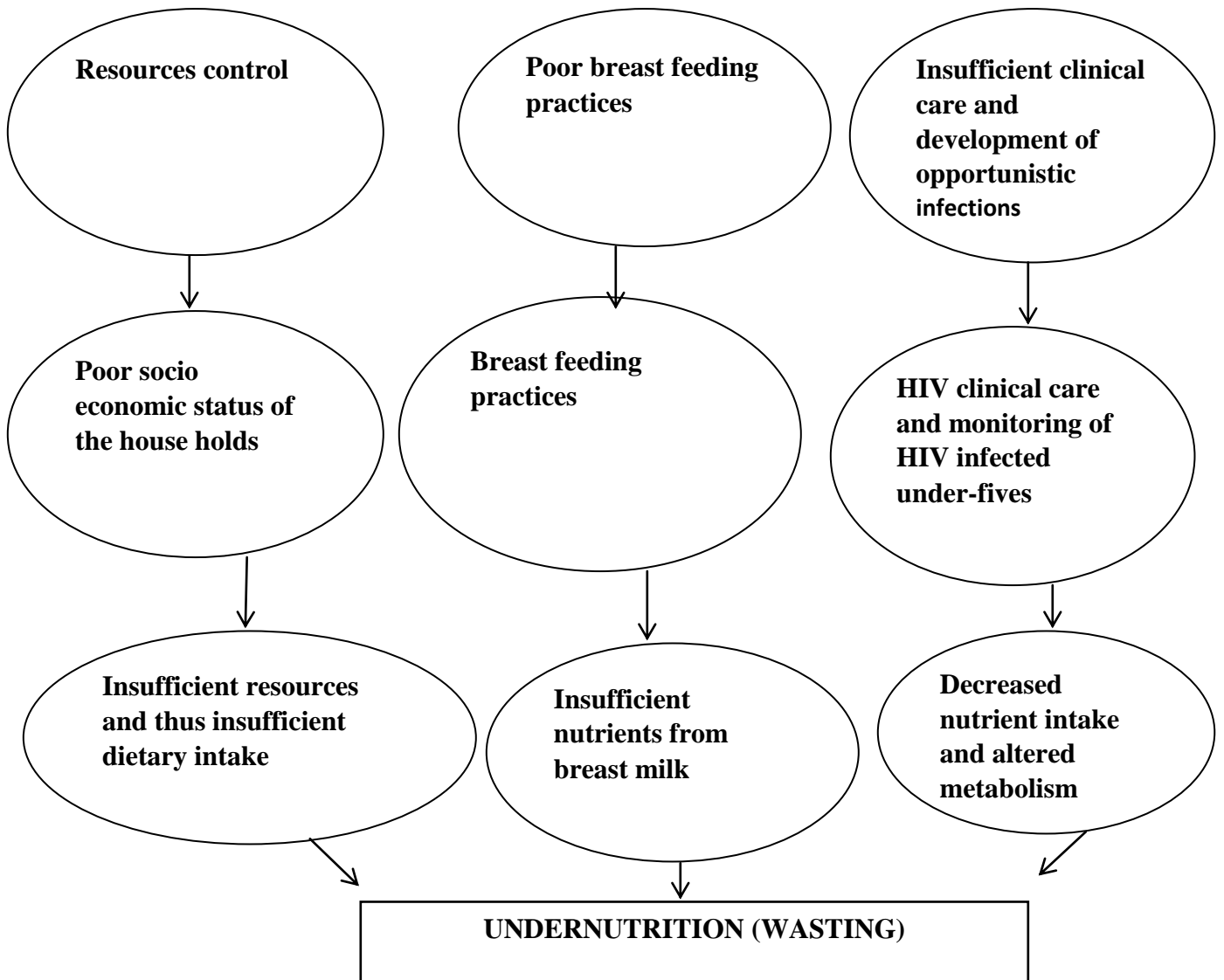
The first important contributor of this framework is the socioeconomic/demographic status of the house hold; these include education status of the care taker, care takers employment status, house hold food security, parental survival status as well as care taker's age. It is expected that poor socioeconomic status of the household will lead to insufficient house hold food security and thus lead to inadequate dietary intake which in turn will result to undernutrition (wasting)

The second contribution of the conceptual framework is breast feeding practices: These include: Breast feeding practices and duration and Exclusive breast feeding practices. It is expected that children not sufficiently breast fed will receive inadequate nutrients to facilitate their growth and development and thus will be undernourished.

Lastly, HIV clinical care among HIV infected under-fives is another contributor in the conceptual frame work, these will include, child's age at ART start, presence of opportunistic infections (TB, oral thrush, Malaria and diarrhea episodes), ART adherence status and HIV viral load. It is expected that children starting ART treatment at the later ages, those suffering from opportunistic infections, those with poor adherence status and those with high viral load will suffer from undernutrition due to increased body demand and altered nutrient metabolism.

For the sake of this study, the dependent variable was the nutrition status (wasting) that was defined as being normal, mild wasting, moderate wasting or severe wasting depending on the Z-score values whereas the independent variables were categorized into three categories as follows; the first one was parent/caregivers social economic status (Parent survival, caretaker's educational status, care taker's age, caretaker's occupational status and household's food security score), the second one was the child's clinical characteristics (Age at ART start, ARV adherence status, HIV-clinical stage, HIV viral load, Presence of opportunistic infections such as (TB,

diarrhea and Oral thrush) and the last one was on breastfeeding practices that were assessed basing on breast feeding duration and exclusive breast feeding practices.



**Figure 1: The Modified UNICEF Conceptual framework for the undernutrition among HIV infected under-fives [30].**

## **1.5 Research Questions**

### **1.5.1 Broad Research Question**

What is the level of nutrition status and associated factors among HIV infected under-fives attending Care and Treatment Clinics in Shinyanga, Region, Tanzania?

### **1.5.2 Specific Research questions**

1. What is the nutritional status among HIV infected under-fives attending Care and Treatment Clinics in Shinyanga, Region, Tanzania?
2. What are the parental/caregiver's social-economic factors associated with nutrition status among HIV infected under-fives attending Care and Treatment Clinics in Shinyanga, Region, Tanzania?
3. What are the breast feeding practices -related factors associated with nutrition status among HIV infected under-fives attending Care and Treatment Clinics in Shinyanga, Region, Tanzania?
4. What are the child's clinical factors associated with nutrition status among HIV infected under-fives attending Care and Treatment Clinics in Shinyanga, Region, Tanzania?



## **1.6 Objectives**

### **1.6.1 Broad Objective**

To assess nutrition status and associated factors among HIV infected under-fives attending Care and Treatment Clinics in Shinyanga, Region, Tanzania.

### **1.6.2 Specific Objectives**

1. To assess nutrition status among HIV infected under-fives attending Care and Treatment Clinics in Shinyanga, Region, Tanzania.
2. To determine the parental/guardian socio-economic factors related to nutrition status among HIV infected under-fives attending Care and Treatment Clinics in Shinyanga, Region, Tanzania.
3. To determine the breast feeding practices related to nutrition status among HIV infected under-fives attending Care and Treatment Clinics in Shinyanga, Region, Tanzania.
4. To determine the child's clinical factors related to nutrition status among HIV infected under-fives attending Care and Treatment Clinics in Shinyanga, Region, Tanzania.

## CHAPTER TWO

### 2.0 LITERATURE REVIEW

The World Health Organization (WHO) has estimated that 5.4 million under-five children die each year with 2.7 million deaths occurred in Sub-Saharan African countries including Ethiopia [32].

Nutrition is the sum of all processes involved in the intake, assimilation, and utilization of the proper amounts of nutrients to maintain health, well-being, and productivity. Good nutrition relies on a diverse, adequate diet and is essential for the development and maintenance of the body from infancy to old age [33]. According to a WHO report, Africa and Asia, carry the greatest burden of nutritional disorders, with more than 150 million children under the age of 5 years suffer from stunting, this account for 16% of children below five years of age [34].

About one-third of deaths among children below five years of age were attributed to undernutrition. Undernutrition increases the risk of death and severe illness due to common childhood infections, such as pneumonia, diarrhea, malaria, human immune deficiency virus (HIV) or AIDS [35]. World Health Organization in 2001 reported that 54% of all childhood mortality was attributable, directly or indirectly, to malnutrition [36]. In Ethiopia, the levels of undernutrition were not decreased significantly. The report from, 2011 Ethiopian Demographic and Health Survey (EDHS) showed that stunting was 58% in 2000, 51% in 2005, and 44% in 2011. This report also showed that wasting was 12% from 2000 to 2005 and 10% in 2011. The third predictor is underweight, which was 41% in 2000, 33% in 2005, and 29% in 2011 [37].

Despite steady trends in the reduction of the rates of undernutrition over the last two decades, the prevalence and the burden of undernutrition remains high in Tanzania. Due to the rate of population growth outstripping the rate of reduction, the numbers of stunted and wasted children are high, and in some instances increasing nationally. Chronic malnutrition affects 34% of children under the age of five in Tanzania, with 11.5% of children being affected with severe stunting nationwide. The prevalence of chronic malnutrition exceeds 40% in six regions of

Tanzania namely; Dodoma, Ruvuma, Rukwa, Kigoma, Katavi, and Geita. In three regions, more than half of children are chronically malnourished Iringa 51.3%, Njombe 51.5%, and Kagera 51.9%. Overall, more than 2.7 million children under-five in Tanzania are stunted, which affects their future learning, productivity, and their opportunities to escape poverty [38].

Nutritional status is used as an appropriate measurement for gauging the well-being of children, and in particular, to identify those children who are at risk of disease vulnerability and developmental deficits [39]. There are various methods for determining child's nutrition status, these include Weight for height, height for age, weight for age where undernutrition is classified clinically based on three nutritional indicators: low height for age (stunting), low weight for height (wasting), and low weight for age (underweight) [40].

Socio-economic factors have been reported to be associated with malnutrition. The study conducted by Islam et al. [41] revealed a significant relationship between socio-economic status and literacy of parents on the prevalence of malnutrition. In this cycle, socio-economic status focused on income levels. Low income and maternal literacy were also recently identified as key factors determining malnutrition status [42].

In addition, there seems to be a strong linkage between maternal level of education and nutritional status. The maternal level of education is associated with the nutritional status of children in Kenya [43]. Direct knowledge transfer to the mother's literacy and numeracy skills acquired from formal education enhances the ability of the caregiver to recognize illness and take appropriate action concerning child wellbeing [44]. It appears that there is a demonstration on how maternal education may influence the nutritional status of children even though gaps exist on the direct linkage within malnutrition pattern. Again, the education level was associated with the nutritional status of children (6-59 months) within an urban slum setting. Religious beliefs and level of education of the mother has a strong linkage with the nutritional status of children under five years [45]. Religious attribution has a strong influence on food consumption patterns and indirect to influence nutritional status as some religious doctrines to restrict the consumption of certain foods.

Gender/sex inequalities have received research focus concerning the effect on nutritional status [46]. There seems to be conflicting information as to whether girls and boys would show differences in nutritional status within a similar setting [47].

Breastfeeding is the normal way of providing young infants with the nutrients they need for healthy growth and development. Exclusive breastfeeding is the feeding of an infant with breast milk only, to the exclusion of all other foods including water, during the first 6 months of life [48], it is very important to ensure and maintain both physical and mental health. Breastfeeding is one of the oldest practices known to mankind. For almost all infants, breastfeeding remains the simplest, healthiest and least expensive feeding method that fulfils the infant's needs. It is considered as the most complete nutritional source for infants because breast milk contains the essential fats, carbohydrates, proteins, and immunological factors needed for infants to thrive and resist infection in the formative first year of life [49]. Exclusive breastfeeding is recommended by WHO for each new-born up to six months of age and the 'innocent declaration' emphasize that breastfeeding should be for at least two years. Breastfeeding has many benefits both to mother and child; it confers both short-term and long-term benefits to the child. It reduces infections and mortality among infants, improves mental and motor development, and protects against obesity and metabolic diseases later in the course of life [50]. The centres for disease control and prevention found out that exclusive breastfeeding (EBF) in the first six months of life and continued breastfeeding from 6 to 11 months has been identified as the single most effective preventive intervention in reducing child mortality, with the potential of saving 1.3 million lives annually. Studies have shown that children who were breastfed for the first 6 months rather than formula-fed children have a small but significant advantage in cognitive ability [51]. Though, the study by Ani I.F metal .revealed no association of exclusive breastfeeding practices and breastfeeding practices with wasting [52].

Furthermore, HIV infection and undernutrition often coexist in children and undernutrition is a major problem for HIV-infected children [53]. Undernutrition act as a predisposing factor for infection among HIV infected individuals as it results in severe illness and may affect recovery from infection. It has been estimated that over 90% of children with HIV infection/AIDS will

experience delayed growth; major contributors are poor socio-economic status, poor nutritional intake, malabsorption, and the disease itself [54].

In addition to HIV infection in sub-Saharan Africa, underweight, stunting, and wasting were present in 21 million, 28 million, and 14 million respectively among children less than 5 years of age [55]. Although there is no cure for HIV infection, effective ART can control the virus and help prevent transmission. Early initiation of ART was associated with decreased opportunistic infections and HIV viral loads, which lead to a positive health status with prolonged life, especially in younger children [56].

The availability of antiretroviral therapy (ART) has improved the survival of HIV-infected children and converted a rapidly fatal disease to chronic disease. In such a scenario, there is going to be an increasing challenge of managing various aspects of chronic care in children; nutrition being one of the most important ones. Several studies in HIV-infected children from different parts of the world have shown varying degrees of malnutrition predominantly wasting and stunting with anemia. Availability of food, associated co-morbidities, and medications received [57]. The Government of Tanzania, through the Ministry of Health, Community Development, Gender, Elderly and Children (MoHCDGEC) and Tanzania Food and Nutrition Centre (TFNC) developed the guidelines on nutrition care and support for people, specifically adults living with HIV although even HIV-infected under-fives would also benefit from these guidelines [58].

Despite the nutrition care and support from the Government for people living with HIV, the prevalence of undernutrition for under-five children in Shinyanga is still high at 30%. Shinyanga is also reported to have an HIV prevalence of 5.9%, being one of the regions with high levels of HIV prevalence [59]. It is also currently not clear whether under-fives are benefitting from the nation's guidelines or not and what could be the factors associated with undernutrition among HIV-infected under-fives in the region. Therefore, this study is focused on assessing the nutrition status and associated factors among HIV infected under-fives receiving HIV care and treatment in health facilities in Shinyanga region

## **CHAPTER THREE**

### **3.0 METHODOLOGY**

#### **3.1 Study design and setting**

A health facility-based cross-sectional study was conducted among HIV infected under-fives attending Care and Treatment Clinics in Shinyanga, Region, Tanzania.

#### **3.2 Study Area**

The study was conducted in Shinyanga region health facilities. Shinyanga being one of Tanzania's 31 administrative regions whose regional capital is the Municipality of Shinyanga. The population of the region as per the 2012 census is estimated at 1,534,808. For 2002-2012, the region had a 2.1% average annual population growth which was the twentieth highest in the country.

Shinyanga was selected as a study area because; it is one of the Regions with a high prevalence of malnutrition among under-fives, which is estimated to be around 30% and it is also reported to have an HIV prevalence of 5.9%, also being one of the regions with high HIV prevalence rates.

#### **3.3 Target and Study Population**

Although the target population for this study was children below the age of five years who are HIV infected, the study population was children aged between 24 to 59 months.

#### **3.4 Sample size and sampling procedure**

##### **3.4.1 Sample size**

Data on the prevalence of stunting for HIV infected children in Shinyanga region, Lake zone, Tanzania and sub Saharan Africa was not available, Therefore the sample size was determined using the prevalence of wasting among HIV infected children in Dar es Salaam [60].

Therefore, the minimum sample size for this study was calculated using a prevalence of 72%, with a standard normal deviate of 1.96 for a 95% confidence interval and a 5% margin of error [61].

Therefore, the estimated minimum sample size was:

$$n = \frac{Z^2 p (100-p)}{\varepsilon^2}$$

Where:

n= required sample size

Z= Critical value of the standard normal distribution for the 95% confidence interval around the True proportion which is 1.96

p= expected proportion of interest to be studied which was 72%, which was the prevalence of under-nutrition among HIV infected children

$\varepsilon$ = accepted margin of error set at 5%

Therefore:

$$n = \frac{Z^2 p (100-p)}{\varepsilon^2}$$

Substituting in the above formula;

$$n = \frac{1.96^2 72 (100-72)}{5^2} = 309.78$$

$$n = 310$$

Therefore, the minimum required sample for this study was 310 under-fives

### 3.4.2 Sampling Technique

To achieve the desired sample size using the minimum number of facilities, only facilities with a minimum number of 15 under-fives registered for HIV care were included in the study. The list of all CTC facilities with this characteristic was obtained from the regional medical officer's office with the aid of DHIS2 which is an official database for storing health data in Tanzania.

From those facilities, 20 facilities to be involved in the study were randomly selected using a simple random technique as follows:-

The serial number of each eligible health facility was written on a small piece of paper and placed in a box. An independent person was asked to pick one paper at a time, the number on the paper was recorded and the corresponding facility was listed as a study facility. The piece of paper was folded and put back in the box and shuffled to make sure equal probability of selecting a facility before the next pick until the required number was obtained.

The second stage was, the selection of HIV-infected under-fives attending care in the selected health facilities. HIV-infected under-fives attending care in the selected health facilities were summed up and the number to be studied in each facility was determined by the proportion the facility contributes to the total. Then the required number from each facility was purposively selected until the required sample size of 310 was reached. Study participants were reached during their routine monthly ART refill.

### **3.5 Inclusion and exclusion criteria**

#### **3.5.1 Inclusion criteria for the study participants**

- HIV infected under-fives aged 6 to 59 months.
- HIV infected under-fives who have been on HAART and followed up during the last 6 months before start of the study. The reason for excluding children who have been on HAART for less than 6 months was to exclude the confounding factor of getting malnourished children secondary to unmanaged HIV. Studies have shown that 6 months of antiretroviral therapy are adequate for viral suppression and clearance of opportunistic infections [62].
- Under-fives registered at the facility: This was mainly done to avoid including children who might have incomplete information since their medical records were not possible to be retrieved. In addition inclusion of children not registered at the facility may have led to repetition if these children happen to come from the facility which was involved in the study. Furthermore, children not registered at the facility might have been registered elsewhere outside the region and this was not the study area.



### **3.5.2 Exclusion criteria for study participants**

- Children who were too ill to participate in the study during their visit. (The child was considered too ill if he/she had one of the following conditions during the visit, had severe pneumonia, had febrile convulsions or lethargic and thus in need of medical attention as well as all those who were considered as having any medical emergency)
- Children with any physical or mental disorder (deformity). These were excluded from the study due to the fact that both physical and mental disorder may have interference with normal growth and development.
- Children known to suffer from any sort of malignancy & sickle cell disease: These may as well interfere with a child's normal growth.
- Children under the guidance of parents/caregivers with communication disorders ( Under this study, a person was considered having communication disorder if he/she was dumb, deaf, or was unable to understand and respond coherently). These were excluded from the study to avoid collecting incomplete or irrelevant information that may be caused by communication barrier.
- All children from multiple births (twins, triplets, quadruplets, etc.). These were excluded from the study to avoid repetition of information from the same household.

## **3.6 Variables measurements and data collection methods**

### **3.6.1 Variables and measurement**

1. Demographic and socio-economic information such as child's age, sex, breastfeeding history, birth history as well as parental marital status, occupation, educational level, income, and parents' survival were obtained from the under-fives parents/caregivers using self-reported information of parents or caregiver.
2. Information on House hold food security was obtained using Household hunger scale [63]. Care givers were asked on food availability and access through the predesigned tool, each response was scored and the maximum score was 6. The score of 0-1 was considered little to no hunger in the house hold, 2-3 was considered Moderate hunger in the household and the score of 4-6 was considered to have severe hunger in the house hold. (Appendix3a and 3b)

3. Anthropometric assessment for children included:

- Length: This was used for children who were <87cm length and this was done using the height board as follows:-
  - a) The height board was placed on the ground.
  - b) The child was stripped off his/her foot wear and head coverings.
  - c) The child was placed on his/her back in the middle of the board with arms at the sides and feet at right angles to the board. The heels, knees, buttocks, back of the head and shoulders touching the board.
  - d) The child's head was gently held so eyes point straight up, and then the fixed end of the board was gently brought to the top of the head.
  - e) Then the child's ankles and knees was gently held with one hand while the other hand sliding the moveable foot piece until all heels touch it.
  - f) The child's feet were immediately removed from the foot piece to prevent kicking while holding the foot board securely with the other hand.
  - g) Measurement was read and recorded using the nearest 0.1cm
  
- Height: This was measured using the height board to children whose height was 87cm+, this was done as follows:-
  - a) The height board was vertically placed on the flat surface.
  - b) Then the child was stripped off his/her foot wear and head coverings.
  - c) While standing straight with arms at the sides, shoulder blades, buttocks and heels were made to touch the vertical surface of the board.
  - d) The child's head was gently held to make sure he/she is looking straight ahead. Then the moveable head piece was brought to rest firmly on top of the client's head, while the other person holding the feet of a client.
  - e) Measurement was recorded using the nearest 0.1cm.

➤ **Weight Measurement**

Weight measurement was done using the manual standing scale as follows:

- a) The care giver was asked to undress the child.
  - b) Secondly the child was asked to stand still on the weighing scale and then the weight of the child was recorded in the nearest 100g.
  - c) Lastly, the weighing scale was recalibrated to zero before taking weight of another child.
4. Clinical assessment data for each under-five included: ARV adherence, Age at diagnosis and ART start, HIV clinical stage at the start of ART, Current HIV clinical-stage, Duration of HAART, Documented nutritional status, HIV viral load results, and Records of opportunistic infections. This information was retrieved from respective client paper base medical records called CTC2 cards or eCTC2 database which are the official tools for recording client information and are being updated at subsequent visits. Client records were retrieved by the aid of a client's unique identification number called Unique CTC ID, usually recorded on a client card called CTC1 card, which is normally carried with a client and presented at each visit. Where needed, records from the CTC2 electronic database were obtained by the aid of the facility data clerk.

### **3.6.2 Data collection tools and procedures**

Data were collected using a pre-tested face-to-face interview schedule (Appendix1). The interview form was prepared in the English and translated into Kiswahili (Appendix2); the language understood by care-givers. But respondents who preferred to be interviewed in English, some copies in an English version were made available. But by the end of data collection, English version was not used since none of the respondent opted to be interviewed in English.

Research assistants identified eligible respondents during triage where each of the caregiver was approached individually and assessed for the readiness to participate in the study. For those who consented to participate, their children's medical files were retrieved from CTC2 card or electronic CTC2 database for the primary data to be extracted and then interviews and measurements were followed thereafter. All this took place while the client was waiting for

medical consultations and ART refill. Furthermore, the child's nutritional status was determined based on the interpretation of the obtained child's sex, weight and height or length.

### **3.7 Pre-testing of data collection instruments**

The data collection tool was pretested among 10 participants before the actual data collection. This was done at the facility that was not involved in the study to avoid sampling the same respondents during the actual study and thus interferes with the results due to the possibility of providing a different response as provided during the pre-testing phase. Corrections were made to bring a meaningful and logical sequence of the questions before the beginning of data collection. The tool was also shared with peers and colleagues (Work mates and district nutritional officer in the facility that was involved) to make sure that the concepts measured reflect the objectives of the study intended to be measured. To improve on validity, the questionnaire was checked to ensure all variables were included and then checked for consistency and omissions.

### **3.8 Research personnel**

One nurse or medical attendant working at the respective facility CTC was assigned to serve the purpose of a research assistant. Each of the identified research assistant was oriented before being assigned the duties of a research assistant. The orientation focused on the familiarization with the research purpose, data collection, and sampling techniques as well as managing the completed research questionnaires.

### **3.9 Data management and analysis**

Using Microsoft excel, data were coded, cleaned and then data were exported to SPSS version 24.1 for analysis. The analyses included were descriptive and bivariate analyses. Descriptive analysis was used to describe the characteristic of study participants and the proportion of undernutrition among HIV infected children who were involved in the study. In the bivariate analysis, the Chi-square test was used to assess the association between nutrition status and selected categorical independent variables which were; social economic factors, breastfeeding

characteristics as well as the child's clinical characteristics. The socioeconomic/demographic factors that were assessed included house hold food security, employment status of care givers, and education level of care givers, parental survival status and type of care taker. Breast feeding characteristics were assessed using breast feeding practices which included exercise and duration of exclusive breast feeding as well as duration of breast feeding. Lastly the child's clinical characteristics were assessed through the age at starting ART, clinical stage at starting ART, current HIV clinical-stage, current HIV viral load results, ART adherence status and current or preexisted illnesses (opportunistic infections) such as TB, oral thrush and diarrhea.

The p-values of  $<0.05$  was used to to assess the association between the dependent and independent variables at 95% CI.

### **Interpretation of Height/length and Weight measurements**

For the sake of this study, interpretation of child's measurements was determined based on the widely used children growth measures using the WHO standard z-scores from weight for height look up table for children 24-59 months for boys and girls respectively.

- Weight-for-height z-scores interpretation. This is the measure of wasting, the child's growth was measured against its weight and height based on the following interpretations where:
  - i. A child with a z-score  $>-1$  was considered as having normal nutritional status.
  - ii. A child with z-score of  $-1$  had mild malnutrition
  - iii. A child with z-score of  $-2$  had moderate malnutrition and
  - iv. A child with z-score of  $-3$  had severe malnutrition

### **3.10 Ethical considerations**

This study was approved in writing by the Institution Review Board under the directory of Research and Publication of Muhimbili University of Health and Allied Sciences (MUHAS). Permission to conduct the study in the region was granted by the office of the regional administrative secretary (RAS) of Shinyanga through a letter written to respective district authorities in the region and then councils communicated the information to the medical officer in charges in the health facilities where the study was conducted. The written consent was obtained from participants/parents of caregivers on behalf of their children before the interviews. Participant's confidentiality and anonymity were assured throughout the process and for all reports and publications that were generated from this report. Confidentiality was assured through the use of participants' CTC ID instead of names, data, and study reports were password-protected to avoid unauthorized personnel's to access research data. Respondents' participation was voluntary upon receiving informed consent. There was no fine, penalty, or any implications upon refusal to participate in the study.

## CHAPTER FOUR

### 4.0 RESULTS

#### 4.1 Socio-demographic/economic characteristics of care takers.

A total of 237 (76.5% participation rate) under-fives were enrolled in this study. The mean age of these under-fives was 39.2 (SD = 11.4) months. The results in Table 1a show that most, 104 (43.9%), of the under-fives lived with fathers who were heads of the household and 87 (36.7%), reported having insecure food availability.

**Table 1a: Socio-demographic/economic characteristics of caregivers (n=237)**

Characteristics	Number (%)
<b>Head of house hold</b>	
Father	
Mother	104 (43.9)
Grand parent	87 (36.7)
Other	34 (14.3)
	12 (5.1)
<b>Food security</b>	
Secure	84 (35.4)
Insecure	87 (36.7)
Hunger	66 (27.8)

Furthermore table 2 shows that, majority of children 159 (67.1%), had both of their parents alive. With regard to care giver's education, 103 (43.5%) reported having attained at most primary education, 167 (71.3%) of care givers reported not to be employed and 215(90.7%) of care takers were aged 25 years and above.

**Table 2: Socio-demographic/economic characteristics of caregivers (n=237)**

<b>Characteristics</b>	<b>Number (%)</b>
<b>Parent survival status</b>	
Only Mother/father alive	49 (20.7)
Both deceased	29 (12.2)
Both alive	159 (67.1)
<b>Caregivers age</b>	
18-24	22 (9.3)
25+	215(90.7)
<b>Caregiver's education</b>	
Never went to school	65 (27.4)
Primary education	103 (43.5)
Secondary and above	69 (29.1)
<b>Caregiver's employment status</b>	
Formally Employed	15 (6.3)
Self employed	53(22.4)
Not employed and those inform.	169 (71.3)



#### 4.2 Demographic and clinical characteristics of HIV infected children

Table 3 shows that most of under-fives, 127 (53.6), were girls. 72(30.4) were aged from 24 to 31 months, the majority, 184 (77.6) had <15 Kg and 143(60.3) had the height of 80-100cm and 200(84.4) had a birth weight of greater than  $\geq 2.5$  kilograms.

**Table 3: Demographic and clinical characteristics of HIV infected children (n=237)**

<b>Characteristics</b>	<b>Number (%)</b>
<b>Sex</b>	
Male	110 (46.4)
Female	127 (53.6)
<b>Age group (months)</b>	
24 – 31	72 (30.4)
32 – 39	57 (24.1)
40 – 47	39 (16.5)
48 – 55	42 (17.7)
56+	27 (11.4)
<b>Child's weight (Kg)</b>	
<15	184(77.6)
>15	53(22.4)
<b>Child's height(cm)</b>	
<80	36(15.2)
80-100	143(60.3)
>100	58(24.5)
<b>Child's birth weight (Kg)</b>	
< 2.5	32 (13.5)
2.5+	200 (84.4)
Unknown	5 (2.1)

Furthermore, results in table 4 shows that, most children 221(93.2%) had history of breast feeding, where 170(72.0) received 6months exclusive breast feeding and 90(38) received breast feeding for more than one year whereas 101(42.6) started ART at the age of <12months and 183(77.2) started ART during their first or second HIV clinical stages and 173(73%) were currently having first or second HIV clinical stages (Early disease stage).

**Table 4: Demographic and clinical characteristics of HIV infected children (n=237)**

<b>Characteristics</b>	<b>Number (%)</b>
<b>Breast Feeding History</b>	
Yes	221(93.2)
No	15(6.3)
<b>Exclusive breast feeding history and duration</b>	
No EBF	17(7.2)
<6 months	44(19.0)
6 months	170(72.0)
<b>Breast Feeding duration</b>	
<1 year	58(24.5)
1 year	86(36.3)
> 1 year	90(38)
<b>Age at Antiretroviral start (months)</b>	
< 12	63 (26.6)
12 – 23	101 (42.6)
24 – 59	73 (30.8)
<b>Clinical stage at ART start</b>	
1 or 2	183 (77.2)
3 or 4	54 (2.8)
<b>Current clinical stage</b>	
1 or 2	173 (73.0)
3 or 4	54 (27.0)

With regard to table 5, majority had no history of TB, respiratory tract infections nor history of oral thrush and diarrhea thrush during the last six months at the rate of 226(95.4%), 160(67.5), 224(95) and 182(77.1) respectively.

**Table 5: Demographic and clinical characteristics of HIV infected children (n=237)**

<b>Characteristics</b>	<b>Number (%)</b>
<b>History of Respiratory Tract Infections in the past 6 months</b>	
Yes	77(32.5)
No	160(67.5)
<b>History of TB in the past 6 months</b>	
Yes	
No	11(4.6)
<b>History of oral thrush in the past 6 months</b>	226(95.4)
Yes	
No	12(5.0)
<b>History of diarrhea in the past 6 months</b>	225(95.0)
Yes	
No	54(22.9)
	182(77.1)

#### **4.3 Proportion of wasting among HIV infected under-fives attending Care and Treatment Clinics in Shinyanga**

The prevalence of wasting was found to be 30.8% where severe wasting was 6.3%, moderate wasting was 9.3% and mild wasting was 15.2%.

#### 4.4.1 Association of household/parents social economic characteristics with child's nutrition status

Table 6 and 7: shows that all variables have p-values above 0.05. These results demonstrate that none of the socio-economic factor was found to have statistical significance associating it with nutritional status (wasting).

**Table 6: Association of household/parents social economic characteristics with child's nutritional status**

Characteristics	N=73		
	Number (%)	Chi square	P-value
<b>Care giver's age</b>			
18-24	13 (17.8)	1.375	0.241
25+	60 (82.2)		
<b>Care giver's employment status</b>			
Employed	15 (20.0)	0.339	0.561
Self employed	11 (15.0)		
Not employed	47 (65.0)		
<b>Caregiver's education</b>			
Never went to school	29 (39.7)	0.287	0.962
Primary education	36 (49.3)		
Secondary and above	8 (11)		

**Table 7: Association of household/parents social economic characteristics with child's nutritional status**

<b>Characteristics</b>	<b>N=237</b>		
	<b>Number (%)</b>	<b>Chi square</b>	<b>P-value</b>
<b>Head of house hold</b>			
Father	29 (39.7)	1.189	0.679
Mother	26 (35.6)		
Grandparent & others	18 (24.7)		
<b>Food security</b>			
Secure	25 (34.2)	2.371	0.306
Insecure	23 (31.6)		
Hunger	25 (34.2)		
<b>Parents survival status</b>			
Only father/mother alive	20 (27.4)	0.229	0.973
Both deceased	13 (17.6)		
Both alive	40 (55.0)		

#### 4.4.2 Association of breast feeding characteristics with nutrition status

Results from Table 8 demonstrates that none of the breast feeding practice was found to have statistical significance to have association with nutritional status among HIV infected under-fives.

**Table 8: Association of child's breast feeding characteristics with child's nutritional status**

Characteristics	N=73		
	Number (%)	Chi square	P-Value
<b>Breast Feeding History</b>			
Yes	25 (34.2)	7.174	0.700
No	48 (65.8)		
<b>Exclusive Breast Feeding History and duration</b>			
No EBF	6 (8.2)	0.226	0.893
<6 months	15 (20.5)		
6 months	52 (71.2)		
<b>Breast Feeding duration</b>			
<1 year	19 (26)	0.517	0.772
1 year	24 (33.0)		
> 1 year	30 (41)		

#### 4.4.3 Association of child's clinical/demographic characteristics with nutrition status

In Table 9 and 10, all variables have p-values above 0.05 and therefore lacking statistical significance to have had any association with children undernutrition.

**Table 9: Association of child's clinical/demographic characteristics with nutritional status**

Characteristics	N=73		
	Number (%)	Chi square	P-Value
<b>Sex</b>			
Male	40 (54.8)	2.979	0.084
Female	33 (45.2)		
<b>Child's birth weight</b>			
<2.5	10 (13.8)	0.001	0.977
>=2.5	62 (86.2)		
<b>Age at Antiretroviral start</b>			
<12 months	17 (23.3)	5.273	0.072
12 – 23	26 (35.6)		
24 – 59	30 (41.1)		
<b>Clinical stage at Antiretroviral start</b>			
1 or 2	56 (76.7)	0.036	0.850
3 or 4	17 (23.3)		
<b>Current clinical stage</b>			
1 or 2	57 (78.1)	0.452	0.501
3 or 4	16 (21.9)		

**Table 10: Association of child's clinical/ demographic characteristics with nutrition status**

Characteristics	N=73		
	Number (%)	Chi square	P-Value
<b>History of Respiratory Tract Infections</b>			
<b>in the past 6mths</b>			
Yes	25 (34.2)	0.148	0.700
No	48 (65.8)		
<b>History of TB in the past 6mths</b>			
Yes	6 (8.2)	0.067	0.795
No	67 (91.8)		
<b>History of Oral thrush in the past 6mths</b>			
Yes	7 (9.6)	0.034	0.853
No	66 (90.4)		
<b>History of Diarrhea in the past 6 months</b>			
Yes	17(23.3)	0.031	0.860
No	56(76.7)		
<b>HIV Viral load</b>			
1000 c/ml+	8(16.3)	0.287	0.962
50-999 c/ml	10(20.4)		
<50 c/ml	31(63.3)		



## CHAPTER FIVE

### 5.0 DISCUSSION

Nutritional status is used as an appropriate measurement for gauging the well-being of children, and in particular, to identify those children who are at risk of disease vulnerability and developmental deficits. [37]. HIV poses a greater risk of undernutrition among infected people where the risk of death is three times higher, therefore for the sake of this study, descriptive cross-sectional study was conducted to assess nutrition status (Wasting in particular) and associated factors among HIV infected under-fives attending Care and Treatment Clinics in Shinyanga, Region, Tanzania.

The proportion of wasting found in this study was 30.8% and the factors that were presumed to have association with the nutritional status were the socioeconomic, breastfeeding practices and the clinical factors. This study did not find any association between the presumed factors and nutritional status (wasting). The lack of association between nutritional status (wasting) and the factors presumed to have association may in one way or the other be caused by the nature of HIV disease itself, the sample size used to arrive at the results and the type of nutritional indicator (wasting) that was used in isolation.

#### 5.1 Nutritional status (wasting) of HIV infected under-fives

The finding from this study is higher than 14%, which is the prevalence of undernutrition (wasting) among the under-five population in Tanzania [28]. The proportion of undernutrition found in this study was also lower than 51.3% reported in Iringa, 51.5% reported in Njombe and 51.9% reported in Kagera [36]. And it was as well lower than 74% among the infected children in Dar es Salaam [57]. But the finding from this study is slightly higher than 30% proportions of undernutrition previously reported in Shinyanga region [28].

The difference in the prevalence of undernutrition among different countries and other places could be due to the size of the study population, differences in population characteristics, and other risk factors. Also, the differences in the prevalence of undernutrition might be due to a difference in socioeconomic and other factors that may predispose the community to the problem, such as food habits and culture.

## **5.2 Caregivers Socio-economic and demographic factors associated with undernutrition**

The finding from this study did not find the association of socioeconomic status with undernutrition (wasting). And therefore findings from this study are different from the findings reported by previous studies which reported the association of low socio-economic status with undernutrition. The findings are different from the findings reported by Islam et al. [39], which revealed a significant relationship between socio-economic status and literacy of parents on the prevalence of malnutrition. In this cycle, socio-economic status focused on income levels. Low income and maternal literacy were key factors determining nutritional status. [40].

The study did not also find statistical significance associating education level with nutritional status. The findings from this study are different from the results in the study done in Kenya, which reported that, maternal level of education is associated with nutritional status among under-fives children in Kenya [41]. The findings from this study is also different from the study that indicated that direct knowledge transfer to the mother's literacy and numeracy skills acquired from formal education enhances the ability of a caregiver to recognize illness and take appropriate action [42].

The difference observed from this study that did not provide a link between wasting with socio-economic status may have been affected by seasonal variation of food availability that can have an effect on weight for height parameters, in addition existence of nutritional programs at community level and nutrition radio programs can have the masking effect on the link of undernutrition and socio-economic status.

### **5.3 Breast feeding practices factors associated with undernutrition**

The results from this study did not find association of nutritional status (wasting) with breastfeeding practices that were assessed. A result from this study was similar to the findings by Ani I.F. et al [52].

### **5.4 Under-five demographic factors associated with malnutrition**

The study did not find statistical significance for the male under-fives to have more risk of having malnutrition compared to female under-fives. The finding from this study is different from the previous study which stressed that gender/sex inequalities have received research focus on the effect on nutritional status [46]. And it is partly supported by the statement that there seems to be conflicting information as to whether girls and boys would show differences in nutritional status within a similar setting [47].

### **5.5 Clinical Characteristics and Nutritional status of HIV infected children**

The study did not find the association of viremia with nutritional status (wasting) among under-fives receiving care and treatment services in Shinyanga region. Findings from this study is different from the previous finding which reported that high viral load count among under-fives is associated with severe undernutrition among under-fives with HIV infection [56]

Findings from this study was also contrary to the study done by Sunguya et al, which reported that Advanced HIV clinical stage is strongly associated with undernutrition among under-fives [60]. But these findings supports the role ART have in minimizing the morbidity and mortality among HIV infected children [57].

The study found that diarrhea had no statistical significance associating it with undernutrition among HIV infected under-fives, finding from this study is different from previous findings reported, which showed that children who had diarrhea were 3.3 times more likely to develop malnutrition than those who had not diarrhea [57]. The lack of statistical significance on the cited clinical factors may have been caused by the fact that, presence of an ailment or clinical condition was assessed retrospectively within the previous six months.

But also undernutrition can manifest due to presence of HIV infection regardless of other associated clinical manifestations.

### **5.6 Strength of this study**

The strength of this study is that it included both gender and it did not discriminate participants based on their socioeconomic status, in addition it was conducted in a low resource setting and it produced the prevalence of undernutrition( wasting) among HIV infected under-fives receiving care and treatment services in the region. Finally, based on undernutrition findings from this study, can assist stakeholders to solicit for the resources to support nutritional programs in HIV continuum of care services and also policymakers can use the information to improve HIV and nutrition interventions.

### **5.7 Study limitation and mitigation**

This study has several limitations that could be addressed as follows; Being a cross-sectional design in nature, the study only managed to assess nutrition status and associated factors among HIV infected under-fives attending Care and Treatment Clinics in Shinyanga, Region, Tanzania and not the casual association between them. Hence, a prospective study design supplemented with a qualitative approach will solve the limitations of this study.

In addition, being the facility based study; some of the socio economic factors could be assessed much better through community based study that would allow assessing the parameters being used to estimate the economic status of the house hold. This limitation was mitigated by minimizing the confounders using relevant study respondents, and finally the inclusion of a statistically significant value for the association between independent variables and the outcome variable.

Loss of study participants due to incomplete questionnaires was another limitation; this was mainly caused by delay collecting the completed questionnaires and thus failure of taking appropriate action on time, this was due to geographical location of some of the facilities that were involved in the study but also due to budgetary implications.

This could be mitigated by planning collecting the completed questionnaires within the shortest time possible by setting a budget to assist timely follow up of the completed questionnaires.

## **CHAPTER SIX**

### **6.0 CONCLUSION AND RECOMMENDATION**

#### **6.1 Conclusion**

The prevalence of undernutrition (wasting) found in this study was higher than those in general population. Basing on the impact of undernutrition on growth and development as well as the impact it has on treatment outcome this indicate the need for the Government to design and implement interventions to improve nutritional status among under-fives living with HIV.

There was also lack of statistical significance between nutritional status(wasting) and factors customary linked, these include socioeconomic factors, breast feeding factors and the clinical factors, this calls for further studies to explore the factors linked to undernutrition among HIV infected population but also to conduct this study using a large sample size may come up with a different picture. In addition, more nutritional indicators can be studied to come up with comprehensive results regarding the subject matter.

The observed proportions of wasting among HIV infected under-fives in Shinyanga region indicate the need for effectiveness of Nutritional Counselling to caregivers as well as capacitation to health care workers to provide effective nutritional guidance during their routine care and treatment clinics. The enhanced nutritional counselling and support program will support the current global campaigns that insist on stakeholders funding of nutrition programs as well as addressing Nations to increase their spending to support nutrition programs [29].

#### **6.2 Recommendations**

Based on undernutrition rates found from this study, the Government and stakeholders are recommended to strengthen nutritional interventions in HIV/AIDS care and treatment services. Strong support is highly emphasized especially with nutritional assessment, counseling and support in HIV care and treatment settings. In addition the government and stake holders should consider providing nutritional support and supplementation to vulnerable and needy children receiving HIV continuum of care.

Lastly, despite the link between undernutrition and HIV, there are still inadequate data on the nutritional status among HIV infected population, therefore this is a call to the government and stakeholders to conduct the larger scale nutritional survey among HIV infected population so as to come out with informative information that could help in providing appropriate support of nutritional programs in HIV continuum of care services.

**REFERENCE**

1. Julie J., David M. et al. Prevalence of malnutrition among HIV-infected children in Central and West-African HIV-care programs supported by the *Growing Programme* in 2011: a cross-sectional study. *BMC Infect Dis.* 2015; 15: 216.
2. The Global Health Observatory (GHO): WHO's portal providing access to data and analyses for monitoring the global health situation (2015).
3. Joss. A, Ohnson. *Challenges in Health and Development: From Global to Community Perspectives*, Springer Science & Business Media, 2010.
4. C.K.Lutter, J.A.Rivera. "Nutritional status of infants and young children and characteristics of their diets," *The Journal of Nutrition*, vol.133, no.9, pp.2941S–2949S, 2003.
5. UNICEF, *Improving Child Nutrition: The Achievable Imperative for Global Progress*, United Nations Children's Fund, 2013.
6. M. Deonis, D. Brown, M. Blossner, and E.Borghi. *Levels, and Trends in Child Malnutrition. UNICEF-WHO-The World Bank Joint Child Malnutrition Estimates*, UNICEF, New York, NY, USA, 2012.
7. Pechlaner , Otero. *Food nutrition*, 2010.
8. *Tanzania Demographic and Health Survey, 2015-2016*.
9. Bhattacharya A., Pal B. et al. Assessment of nutritional status using anthropometric variables by multivariate analysis : *BMC public health* (2019) 19:1045
10. UNICEF (2017). *Les visages de la malnutrition*. Accessed 7 June 2017.



11. Van Royen K, Lach C, Holds worth M, Smit K, Kinabo J, et al. How can the Operating Environment for Nutrition Research Be Improved in Sub-Saharan Africa: the views of African researchers. *Plos One*. 2013; 8(6):e66355.
12. United Nations Children's Fund, World Health Organization, and the World Bank. Global Health Observatory visualizations. Joint child malnutrition estimates 2017 (UNICEF-WHO-WB) Accessed 21 September 2017. [Google Scholar]
13. WHO. Children: reducing mortality, Fact Sheet N ° 178. Geneva, Switzerland: 2016.
14. Rose. A.M, Hall C.S, Martinez-Alier N. Etiology and management of malnutrition in HIV-positive children. *Arch Dis Child* 2014; 99:546–51.
15. Berry L, Hall K, Hendricks M. Child Health: Nutrition. In: South African Child Gauge 2009/2010, Kibel M, Lake L, Pendlebury S, Smith C (eds.) (2010). Cape Town: Children's Institute, University of Cape Town ISBN: 978-0-9814320-4-5
16. Sugandhi N, Rodrigues J, Kim M.H, Ahmed S, Amzel A, Toile M, et al. HIV Exposed Infants: Rethinking care for a lifelong condition. *AIDS*. 2013; 27:S187–S95.
17. Landes M, van Lettow M, Chan AK, Mayuni I, Schouten E.J, Bedell R.A. Mortality and health outcomes of HIV-exposed and unexposed children in a PMTCT cohort in Malawi. *PLoS One*. 2012; 7(10):
18. World Health Organization. Principles and Recommendations for Infant Feeding in the Context of HIV and a Summary of Evidence. World Health Organization; Geneva: 2010. Guidelines on HIV and Infant Feeding
19. Sugandhi N, Rodrigues J, Kim M, Ahmed S, Amzel A, Tolle M, Dziuban EJ, Kellerman SE, Rivadeneira E, Child Survival Working Group of the Interagency Task Team on the Prevention and Treatment of HIV Infection in Pregnant Women, Mothers, and Children. *AIDS*. 2013 Nov; 27 Suppl 2():S187-95.

20. Berry L, Hall K, Hendricks M. Child Health: Nutrition. In: South African Child Gauge 2010, Kibel M, Lake L, Pendlebury S, Smith C (eds.) (2010). Cape Town: Children's Institute, University of Cape Town ISBN: 978-0-9814320-4-5.
21. Nutritional status of perinatal HIV-infected children on antiretroviral therapy from a resource-poor rural South African community: 2018
22. Ayenew Negesse, Baye Tsegaye, Birtukan Assefa and Birehanu Ayenie. (2016). Prevalence of Undernutrition and Its Associated Factors among Children below Five Years of Age in Bure Town, West Gojjam Zone, Amhara National Regional State, Northwest Ethiopia
23. G. Pechlaner and G. Otero, (2012). "The neoliberal food regime: neo regulation and the new division of labor in North America," *Rural Sociology*, vol.75, no.2, pp.179–208, 2010.
24. Maternal & Child Nutrition (2016). Improving Child Feeding, Women's Nutrition and Household Sanitation
25. UNICEF. Global and regional trends. UNICEF data: Monitoring the situation of children and women.2016.
26. Iversen P.O, du Plessis L, Marais D, Morseth M, Herselman M. Nutritional health of young children in South Africa over the first 16 years of democracy. *South African Journal of Child Health* 2011; 5:72-7.
27. Melina Mgongo,<sup>1,2,\*</sup> Nikolas A. S. Chotta,<sup>1</sup> Tamara H. Hashim,<sup>2,3</sup> Jacqueline G. Uriyo,<sup>1,2</sup> Damian J. Damian,<sup>4,5</sup> Babill Stray-Pedersen,<sup>1,2,6</sup> Sia E. Msuya,<sup>2,4,5</sup> Margareta Wandel,<sup>3</sup> and Siri Vangen<sup>1,6,7</sup>. Underweight, Stunting and Wasting among Children in Kilimanjaro Region, Tanzania; a Population-Based Cross-Sectional Study; *Int J Environ Res Public Health*. 2017 May; 14(5):

28. Tanzania Demographic and Health Survey, 2015–2016
29. Global nutrition report 2018: 96-123.
30. Roger S.& Yongyout K. Analyzing the causes of child stunting
31. Comprehensive Nutrition Care for People Living with HIV/AIDS; A Trainers Manual for Facility-Based Health Providers
32. United Nations Children’s Fund, World Health Organization, and the World Bank. UNICEF WHO-World Bank Joint Child Malnutrition Estimates. New York, Geneva, Washington, DC: UNICEF, World Health Organization, the World Bank; 2017.
33. Comprehensive Nutrition Care for People Living with HIV/AIDS; A Trainers Manual for Facility-Based Health Providers
34. United Nations Children’s Fund, World Health Organization, and the World Bank. UNICEF WHO-World Bank Joint Child Malnutrition Estimates. New York, Geneva, Washington, DC: UNICEF, World Health Organization, the World Bank; 2017.
35. M. Deonis, D.Brown, M.Blossner, and E. Borghi. Levels and Trends in Child Malnutrition. UNICEF-WHO-The World Bank Joint Child Malnutrition Estimates, UNICEF, New York, NY, USA, 2012.
36. Ministry of Health and Social Welfare of the United Republic of Tanzania (2014) « Tanzania National Nutrition Survey 2014
37. UNICEF, Improving Child Nutrition: The Achievable Imperative for Global Progress, United Nations Children’s Fund, 2013
38. Nutrition Landscape Information System (NLIS) 2010. Country Profile Indicators Interpretation Guide

39. Lahiru Sandaruwan Galgamuwa, Devika Iddawela, Samath D. Dharmaratne & G.L.S. Galgamuwa. Nutritional status and correlated socio-economic factors among preschool and school children in plantation communities, Sri Lanka. *BMC Public Health* volume 17, Article number: 377 (2017).
40. Kavosi, E. Hassanzadeh, Z.R., Kavosi, Z., Nasihatkon, A., Moghadami, M. & Heidari, M. (2014). Prevalence and determinants of under-nutrition among children under six: a cross-sectional survey in Fars province, Iran. *International Journal of Health Policy Management*; 3(2): 71–76.
41. Abuya BA, Onsomu EO, Kimani JK, Moore D: Influence of Maternal Education on Child Immunization and Stunting in Kenya. *Matern Child Health J* 2011, 15:1389–1399. doi:10.1007/s10995-010-0670-z
42. Abuya, B.A., Ciera, J. and Kimani-Murage, E. (2012) Effect of Mother's Education on Child's Nutritional Status in the Slums of Nairobi. *BMC Pediatrics*, 12, 80.
43. Adeladza, A. T. (2013). The influence of socio-economic and nutritional characteristics on child growth in Kwale district of Kenya. *African Journal of Foods, Agriculture Nutrition, and Development*, 9 (7): 1570
44. Religion's impact on peoples' diets (2013)
45. Jeanine U. Condo, Anastasia Gage, Nancy Mock, Janet Rice, Ted Greiner. 2015. Sex differences in nutritional status of HIV-exposed children in Rwanda: a longitudinal study. *Tropical Medicine & International Health* 20:1, 17-23.
46. Swetha GK, Hemalatha R, Prasad UV, et al. Health & nutritional status of HIV infected children in Hyderabad, India. *Indian J Med Res* 2015; 141:46–54.
47. World Health Organization, Exclusive breastfeeding. Available from: [http://www.who.int/nutrition/topics/exclusive\\_breastfeeding/en/](http://www.who.int/nutrition/topics/exclusive_breastfeeding/en/). Accessed 13 July, 2019

48. Okafor I.P, Olatona F.A, Olufemi O.A (2014). Breastfeeding practices of mothers of young children in Lagos, Nigeria. *Nigerian Journal of Pediatric* 41(1) 43-47
49. Gareth J, Richard W.S, Robert E.B, Zulfiqar A. B, Saul S. M. (2003). How many child deaths can we prevent this year? *The Lancet* vol 362: 65-71
50. Michaelsen K.F, Lotte L, Erik L.M. (2009). Effect of breastfeeding on cognitive function. *Breast-feeding: early influences on later health*, Springer Science 199-215.
51. Ani I.F, Adeoye B.K, et.al. Breast feeding practices and nutritional status of under-five children at Babcock university staff school Ogun state, Nigeria: *GSJ: Volume 7, Issue 6, June 2019 ISSN 2320-9186*
52. Ndagije F, Baribwira C, Coulter JB. Micronutrients and T-cell subsets: a comparison between HIV-infected and uninfected, severely malnourished Rwandan children. *Ann Trop Pediatric*. 2007; 27:269–75.
53. Feucht UD, Van Bruwaene L, Becker PJ, et al. Growth in HIV-infected children on long-term antiretroviral therapy. *Trop Med Int Health* 2016; 21:619–29.
54. Rose AM, Hall CS, Martinez-Alier N. Aetiology and management of malnutrition in HIV-positive children. *Arch Dis Child* 2014; 99:546–51.
55. Mwiru RS, Spiegelman D, Duggan C, Seage GR, 3rd, Semu H, Chalamilla G, et al. Nutritional status and other baseline predictors of mortality among HIV-infected children initiating antiretroviral therapy in Tanzania. *J Int Assoc Provid AIDS Care*. 2015; 14:172–9.
56. The United States president’s emergency plan for AIDS relief, Report on Food and Nutrition for People with HIV/AIDS May. 2006.

57. Julie J., David M. et al. Prevalence of malnutrition among HIV-infected children in Central and West-African HIV-care programs supported by the Growing Up Programme in 2011: a cross-sectional study. *BMC Infect Dis.* 2015; 15: 216.
58. The united republic of Tanzania Ministry of health, community development, gender, elderly and children: National Guidelines for Nutrition Care and Support of People with HIV, 2016.
59. Tanzania Demographic and Health Survey (TDHS) 2015–2016
60. Sunguya BF, et al. Undernutrition among HIV-positive children in Dar es Salaam, Tanzania: antiretroviral therapy alone is not enough. *BMC Public Health* 2011,11:869
61. Daniel W.W, editor. 7th ed. New York: John Wiley & Sons; 1999. *Biostatistics: a foundation for analysis in the health sciences.* [Google Scholar]
62. Ministry of health, community development, gender, elderly and children Tanzania: National guidelines for the management of HIV and AIDS April,2019
63. Ballard T., Coates J., Swindale A. and Deitchler M. House hold hunger scale: Indicator definition and measurement guide (2011). Washington DC: Food and Nutrition Technical Assistance Project, FHI360.
64. Sunguya et al, 2017; High magnitude of undernutrition among HIV infected adults who have not started ART in Tanzania--a call to include nutrition care and treatment in the test and treat model; Article in *BMC Nutrition*. DOI: 10.1186/s40795-017-0180-0, December 2017.

## APPENDICES

### Appendix 1: Questionnaire

Serial No 

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### QUESTIONNAIRE FOR ASSESSING THE NUTRITION STATUS AND ASSOCIATED FACTORS AMONG HIV INFECTED UNDER-FIVES ATTENDING CARE AND TREATMENT CLINICS IN SHINYANGA, REGION, TANZANIA

<b>SECTION A; HOUSEHOLD INFORMATION</b>			
Put a tick (✓) for each of the appropriate choices and fill the number of the appropriate response in the given box on the right-hand side			
01	Who is the head of the household in the family where the child is residing?	1) Father of the child 2) Mother of the child 3) Grandparent of the child 4) Other	(      )
02	Food security score (0-6), Go to appendix 3	1) Secure/ little or no hunger 2) Insecure/moderate hunger 3) Hunger/Severe hunger	(      )
03	Are there any food stuffs that are restricted in the household?	1) None 2) Yes 3) Don't know	(      )
04	If yes in 5 above, what are the basis for restricting such foods?	1) Religious 2) Traditional 3) Medical 4) Other	(      )

<b>SECTION BA; PARENTS INFORMATION</b>			
Put a tick (√) for each of the appropriate choices and fill the number of the appropriate response in the given box on the right-hand side			
05	What is the survival status of the parents?	1) Only Father alive 2) Only Mother alive 3) Both parents alive 4) Both parents are dead	(      )
06	If both parents are dead, who is taking care of the child?	1) Sibling 2) Grandparent 3) Uncle/Aunt 4) Stepparent 5) Orphanage home 6) Others	(      )
07	Current parental marital status of the immediate parents if alive ( Stop here if one or both parents are deceased)	1) Married 2) Separated 3) Single. 4) Widow/widower 5) Cohabiting 6) Divorced	(      )
8	Age of the mother	1) <18 2) 18-24 3) ≥25	(      )
09	Maternal education status	1) None 2) Primary 3) Secondary 4) Tertiary	(      )



10	Maternal employment status	1) Employed 2) Not employed	( )
11	Employer	1) Government 2) Private and formal 3) Private and informal 4) Oher	( )
12	Paternal education status	1) Non 2) Primary 3) Secondary 4) Tertiary	( )
13	Paternal employment status	1) Employed 2) Not employed	( )
14	Employer	1) Government 2) Private and formal 3) Private and informal 4) Other	( )
<p><b>SECTION B: CARE GIVER'S INFORMATION</b></p> <p>Put a tick (√) for each of the appropriate choices and fill the number of the appropriate response in the given box on the right-hand side ( This section will be filled if and only if the child is not under biological parents care)</p>			
15	How does the caretaker related to the child?	1) Sibling 2) Grandparent 3) Aunt/uncle 4) Other	( )
16	What is the age of the caretaker	1) <18 2) 18-24 3) 25-59 4) ≥60	( )

17	Care taker's education status	1) Non 2) Primary 3) Secondary 4) Tertiary	(      )
18	Care taker's employment status	1) Employed 2) Not employed	
19	Employer	1) Government 2) Private and formal 3) Private and informal 4) Other	
<p><b>SECTION CA</b></p> <p><b>CHILD'S DEMOGRAPHIC INFORMATION</b></p> <p>Put a tick (√) for each of the appropriate choices and fill the number of the appropriate response in the given box on the right-hand side</p>			
20	Current child's age in months Asks for date of birth. If unknown, then you can ask the age	DOB: YEARS..... MONTHS.....	(      )
21	Sex of the child	1) Male 2) Female	(      )
22	Child's birth weight(Kg)	1) <2.5 2) ≥2.5	(      )

23	Was the child breastfed?	1) Yes 2) No 3) Don't know	( )
24	Is the child currently breastfeeding? If <2yrs	1) Yes 2) No 3) NA	( )
<p><b>SECTION CB</b></p> <p><b>CHILD'S CLINICAL INFORMATION</b></p> <p>Put a tick (√) for each of the appropriate choices and fill the number of the appropriate response in the given box on the right-hand side ( To be extracted from patient CTC2 file and from 32-36 the parent/caregiver can respond if the information is missing in the patient file)</p>			
25	Age (months) at ART start (as recorded in CTC2 card or eCTC2 data base)	1) <12 2) 12-23 3) 24-59months	( )
26	HIV clinical stage at ART start ( as recorded in CTC2 data base)	1) 1-2 ( Early disease) 2) 3-4 ( Advanced disease)	( )
27	Current HIV clinical stage (as recorded in CTC2 card or e CTC2 database)	1) 1-2 ( Early disease) 2) 3-4 ( Advanced disease)	( )
28	ART adherence status ( As documented in CTC2 card)	1) Good 2) Poor 3) Not documented	( )

29	Most recent HIV viral load results tested within the last 12months as recorded in CTC2 card or CTC2 database	1) $\geq 1000\text{c/ml}$ 2) 50-999c/ml 3) $\leq 50$ 4) Not recorded	( )
30	Has the child encountered diarrhea episodes (current or in past 6 months) Recorded in the patient file or reported by caregiver.	1) Yes 2) No 3) No records	( )
31	Has the child suffered from Malaria ( current or in the past 6 months), recorded in the patient file or reported by the caregiver	1) Yes 2) No 3) No records	( )
32	Has the child suffered from respiratory tract infections ( current or in the past 6 months), recorded in the patient file or reported by the parent/caregiver	1) Yes 2) No 3) No records	( )
33	Has the child suffered from TB (Current or in past 6 months)	1) Yes 2) No 3) No records	( )

34	Has the child suffered from oral thrush in the past 6months( recorded in the patient file or reported by the caregiver	1) Yes 2) No 3) No records	(      )
<b>SECTION D</b>			
<b>INFORMATION ON NUTRITION ASSESSMENT AND SUPPORT AT FACILITY LEVEL</b>			
Put a tick (√) for each of the appropriate choices and fill the number of the appropriate response in the given box on the right-hand side			
35	Was nutrition assessment done during the last visit (As per the records in CTC2 card or eCTC2 database)	1) Yes 2) No	(      )
36	What was the last recorded nutrition status( as recorded in CTC2 card or eCTC2 database)	1) Ok 2) Mod 3) Sev 4) Not documented	(      )
37	Does the facility provide Nutritional supplements to malnourished children (To be responded by CTC health service providers)	1) Yes 2) No 3) Don't know	(      )
38	If yes in 39 above, who supplies those supplements	1) Government through MSD 2) NGO/FBO/CBO 3) Other 4) Don't know	(      )

39	How reliable is the supply of those Supplements?	1) Always available 2) Sometimes available 3) Don't know	(      )
40	How are the supplements ordered?	1) Routine R&R 2) Supplied at the discretion of the supplier 3) Don't know	(      )

Child's weight (Kg)..... Child's height/Length (cm).....

**Appendix 2: Swahili Version Questionnaire**

Serial No

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**DODOSO KWA AJILI YA TATHMINI YA LISHE NA VISABABISHI VYAKE KWA WATOTO WENYE UMRI CHINI YA MIAKA MITANO (5) WANA OISHI NA MAAMBUKIZI YA VIRUSI VYA UKIMWI WANAOPATIWA HUDUMA KATIKA VITUO VYA MATUNZO NA TIBA KATIKA MKOA WA SHINYANGA, TANZANIA**

<b>SEHEMU A: TAARIFA ZA KAYA ANAYOISHI MTOTO</b>			
Weka alama ya vema (√) katika kila chaguo sahihi na jaza namba ya chaguo katika mabano upande wa kulia ( Kipengele hiki kijibiwe na mzazi/mlezi wa mtoto)			
01	Nani ni mkuu wa kaya anayoishi mtoto?	1) Baba wa mtoto 2) Mama wa mtoto 3) Babu/Bibi wa mtoto 4) Wengine	(      )
02	Kipimo cha Uhakika wa upatikanaji wa chakula (0-6), Angalia kielelezo namba 4	1) Inajitosheleza 2) Haijitoshelezi 3) Hafifu	(      )
03	Je, kuna aina ya vyakula ambavyo ni mwiko kutumika katika kaya?	1) Ndiyo 2) Hapana 3) Haifahamiki	(      )
04	Kama ndiyo, Je ni sababu zipi zinapelekea vyakula hivyo kuwa mwiko?	1) Sababu za kimila 2) Sababu za kidini 3) Sababu za kiafya 4) Sababu nyinginezo 5) Haifahamiki	(      )

<b>SEHEMU BA; TAARIFA ZA WAZAZI WA MTOTO</b>			
Weka alama ya vema (√) katika kila chaguo sahihi na jaza namba ya chaguo katika mabano upande wa kulia ( Kipengele hiki aulizwe mzazi au mlezi wa mtoto)			
05	Je, wazazi wa mtoto wako hai?	1) Baba pekee ndo yupo hai 2) Mama pekee ndo yupo hai 3) Wazazi wote wako hai 4) Wazazi wote wamefariki	(      )
06	Kama wazazi wote wamefariki, je, nani anamtunza mtoto?	1) Ndugu wa kuzaliwa na ye 2) Babu/Bibi 3) Mjomba/Shangazi 4) Mzazi wa kambo 5) Kituo cha kulea yatima 6) Wengineo	(      )
07	Hali ya ndoa kwa wazazi wa mtoto kama wapo hai. ( Usiendelee na kipengele hiki iwapo mzazi mmojawapo au wote wamefariki)	1) Wameoana 2) Wametengana 3) Hawajaoana 4) Mjane/Mgane 5) Wachumba 6) Wametarikiana	(      )
08	Umri wa mama	1) <18 2) 18-24 3) ≥25	(      )
09	Kiwango cha juu cha elimu ya mama	1) Hajawahi kwenda shule 2) Ana elimu ya msingi 3) Ana elimu ya sekondari 4) Ana elimu ya juu	(      )
10	Je, mama ameajiriwa?	1) Ndiyo 2) Hapana	(      )



11	Kama ameajiliwa, ameajiriwa na nani?	1) Serikali 2) Ajira rasmi katika sekta binafsi 3) Kibarua 4) Nyinginezo	( )
12	Kiwango cha juu cha elimu cha baba	1) Hajasoma 2) Ana elimu ya msingi 3) Ana elimu ya sekondari 4) Ana elimu ya juu	( )
13	Je, baba wa mtoto ameajiriwa	1) Ndiyo 2) Hapana	( )
14	Kama ameajiriwa, nani mwajiri?	1) Serikali 2) Ajira rasmi sekta binafsi 3) Kibarua 4) Nyinginezo	( )
<b>SEHEMU BB: TAARIFA ZA MLEZI</b>			
Weka alama ya vema (√) katika kila chaguo sahihi na jaza namba ya chaguo katika mabano upande wa kulia ( Sehemu hii ijazwe iwapo mtoto haishi na baba au mama yake)			
15	Je, mtoto na mlezi wa sasa wana uhusiano gani?	1) Ndugu wa kuzaliwa 2) Babu/Bibi 3) Shangazi au mjomba 4) Wengineo	( )
16	Je, mlezi wa mtoto ana miaka mingapi?	1) <18 2) 18-24 3) 25-59 4) ≥60	( )
17	Kiwango cha juu cha elimu cha mlezi	1) Hajawahi kwenda shule 2) Elimu ya msingi 3) Elimu ya sekondari 4) Elimu ya juu	( )

18	Je, mlezi ameajiriwa?	1) Ndiyo 2) Hapana	( )
19	Kama ameajiriwa, nani mwajiri wake?	1) Government 2) Ajira rasmi sekta binafsi, 3) Kibarua 4) Nyinginezo	( )
<b>SEHEMU CA</b> <b>TAARIFA ZA MTOTO</b> Weka alama ya vema (✓) katika kila chaguo sahihi na jaza namba ya chaguo katika mabano upande wa kulia ( Aulizwe mzazi au mlezi)			
20	Umri wa sasa wa mtoto,	Tarehe ya kuzaliwa: Miaka..... Miezi.....	( )
21	Jinsi ya mtoto	1) Me 2) Ke	( )
22	Uzani wa mtoto wakati wa kuzaliwa	1) <2.5 Kg 2) ≥ 2.5 Kg	( )
23	Je, mtoto alinyonya maziwa ya mama	1) Ndiyo 2) Hapana	( )
24	Je, mtoto ananyonyeshwa? Iwapo ana umri chini ya miaka miwili	1) Ndiyo 2) Hapana 3) Haihusiani	( )

<b>SECTION CB</b> <b>TAARIFA ZA KITABIBU ZA MTOTO</b>			
Weka alama ya vema (✓) katika kila chaguo sahihi na jaza namba ya chaguo katika mabano upande wa kulia ( Taarifa hizi zitapatikana katika fail la mtoto na kuanzia 32 mpaka 36 anaweza kuulizwa mzazi au mlezi iwapo taarifa hazimo kwenye faili la mtoto)			
25	Je, mtoto alianza dawa akiwa na umri wa miezi mingapi?	1) <12 2) 12-23 3) 24-59	(   )
26	Je, mtoto alianza dawa akiwa katika hatua gani ya ugonjwa?	1) 1 au 2 2) 3 au 4	(   )
27	Kwa sasa mtoto yupo hatua ipi ya ugonjwa?	1) 1 au 2 2) 3 au 4	(   )
28	Ufuasi wa dawa kwa sasa kama unavyoonekana kwenye kazi ya mgonjwa	1) Mzuri 2) Hafifu 3) Haijulikani	(   )
29	Majibu ya kipimo cha wingi wa virusi katika damu, kipimo cha hivi karibuni ndani ya miezi 12 iliyopita	1) $\geq 1000\text{c/ml}$ 2) 50-999c/ml 3) $\leq 50$ 4) Hakuna majibu	(   )
30	Je, mtoto amewahi kuugua ugonjwa wa kuhara ndani ya kipindi cha miezi 6 iliyopita	1) Ndiyo 2) Hapana 3) Haifahamiki	(   )

31	Je, mtoto amepata kuugua Malaria katika kipindi cha miezi 6 iliyopita?	1) Ndiyo 2) Hapana 3) Haifahamiki	( )
32	Je, mtoto amepata uambukizo wa magonjwa ya njia ya hewa katika kipindi cha miezi 6 iliyopita.	1) Ndiyo 2) Hapana 3) Haifahamiki	( )
33	Je, mtoto anakifua kikuu au ametibiwa kifua kikuu katika kipindi cha miezi 6 iliyopita?	1) Ndiyo 2) Hapana 3) Haifahamiki	( )
34	Je, mtoto kwa sasa anavidonda au utando mweupe mdomoni au ndani ya kipindi cha miezi 6 iliyopita?	1) Ndiyo 2) Hapana 3) Haifahamiki	( )
<p><b>SEHEMU: D</b></p> <p><b>TAARIFA JUU YA TATHMINI YA LISHE NA UPATIKANAJI WA VIINI LISHE KATIKA KITUO CHA KUTOLEA HUDUMA ZA AFYA</b></p> <p>Weka alama ya vema (√) katika kila chaguo sahihi na jaza namba ya chaguo katika mabano upande wa kulia ( Taarifa hizi zitapatikana kwenye fail la mtoto na nyingine zitapatikana kwa mtoa huduma wa afya kadiri dodoso linavyo elekeza)</p>			
35	Je, mtoto alifanyiwa tathmini ya lishe katika hudhurio lililo pita? ( Angalia katika kadi ya CTC2 ya mtoto katika safu husika)	1) Ndiyo 2) Hapana	( )

36	Kama ndiyo, jaza ilivyo andikwa kwenye kadi ya CTC2	1) Ok 2) Mod 3) Sev 4) Haikujazwa	( )
37	Je, watoto wenye changamoto za lishe hupatiwa viini lishe vya nyongeza? (Aulizwe mtoa huduma za afya katika kliniki ya matunzo na tiba)	1) Ndiyo 2) Hapana 3) Haifahamiki	( )
38	Kama ndiyo, viini lishe hivyo hupatikana kutoka wapi?	1) Serikalini kupitia mfumo wa ugavi wa dawa na vifaa tiba 2) Shirika lisilokuwa la kiserikali 3) Wengineo 4) Sijui	( )
39	Je, upatikanaji wa viini lisheni ni wa kiwango gani?	1) Hupatikana wakati wote 2) Mara chache 3) Haifahamiki	( )
40	Je, ni mfumo gani unatumika kuleta/kuagiza chakula hicho?	1) Kupitia mfumo wa ugavi wa dawa na vifaa tiba (R&R) 2) Kinaletwa kadiri kinavyopatikana 3) Haifahamiki	( )

Uzito wa mtoto (**Kg**)..... Urefu wa mtoto (**Cm**).....

**Appendix 3: House hold hunger scale (English Version)****MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES****A tool for assessing and defining the house holds food security**

<b>No</b>	<b>Question</b>	<b>Response</b>	<b>Code</b>
Q1	In the past (four weeks/30 days) was there ever no food to eat of any kind in your house because of lack of resources to get food	0=No(Skip to q2) 1=Yes	
Q1a	How often did this happen in the past 4 week/30 days	1= Rarely 2=Sometimes(3-10times) 3=Often(more than 10 times)	
Q2	In the past (four weeks/30 days) did you or any house hold member go sleep at night hungry because there was not enough food	0=No(Skip to q3) 1=Yes	
Q2a	How often did this happen in the past 4 week/30 days	1= Rarely 2=Sometimes(3-10times) 3=Often(more than 10 times)	

Q3	In the past (four weeks/30 days) did you or any house hold member go whole day and night without eating anything at all because there was not enough food	0=No(Skip to q3) 1=Yes	
Q3a	How often did this happen in the past 4 week/30 days	1= Rarely 2=Sometimes(3-10times) 3=Often(more than 10 times)	

#### HHS categorical indicators

Household hunger score	Household hunger categories
0-1	Little to no hunger in the house hold
2-3	Moderate hunger in the household
4-6	Severe hunger in the house hold

**Appendix 4: House hold hunger scale (Kiswahili version)****MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES**

**Kitendea kazi kwa ajili ya kufanya tathmini ya kiwango cha uhakika wa upatikanaji wa chakula ngazi ya kaya.**

No	Swali	Jibu	Jibu
Q1	Je, katika kipindi cha majuma manne yaliyopita, kuna kipindi hakukuwa na chakula ndani ya kaya.	0=Hapana(Nenda swali la 2) 1=Ndiyo	
Q1a	Ni kwa mara ngapi hali hapo juu ilijitokeza?	1= Mara chache 2=Mara kwa mara(3-10) 3=Mara nyingi(zaidi ya mara10)	
Q2	Je, katika kipindi cha majuma manne yaliyopita, kuna kipindi ambapo mmoja wa wanakaya amewahi kulala njaa sababu ya kukosa chakula cha kutosha ndani ya kaya?	0=Hapana(Nenda swali la 3) 1=Ndiyo	
Q2a	Ni kwa mara ngapi hali hapo juu ilijitokeza?	1= Mara chache 2=Mara kwa mara(3-10) 3=Mara nyingi(zaidi ya mara10)	



Q3	Je, katika kipindi cha majuma manne yaliyopita, Imewahi kutokea mmoja wa wanakaya kukaa usiku na mchana bila kula chakula sababu hakukuwa na chakula cha kutosha nyumbani.	0=Hapana( 1=Ndiyo	
Q3a	Ni kwa mara ngapi hali hapo juu ilijitokeza?	1= Mara chache 2=Mara kwa mara(3-10) 3=Mara nyingi(zaidi ya mara10)	

### Jinsi ya kuanisha hali ya upatikanaji wa chakula

Household hunger score	Household hunger categories
0-1	Inajitosheleza
2-3	Hajitoshelezi
4-6	Hafifu

**Appendix 5: Consent Form (English Version)****MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES****DIRECTORATE OF RESEARCH AND PUBLICATIONS****Informed Consent Form**

ID-NO

**Consent to participate in interview****Greetings!**

My name is **Edward Leonidas Kinyamugera**; I am a student at Muhimbili University pursuing a Master of Public Health. Currently, I am conducting this research on nutrition status and associated factors among HIV-infected under-fives attending care and treatment clinics in Shinyanga Region, Tanzania. This study will create awareness and understanding and will add knowledge on the nutritional status and factors associated with poor nutritional status among HIV infected under-fives attending ART Clinic in Shinyanga Region. This finding will be of clinical importance to health care professionals and all other stakeholders in HIV/AIDS specifically on the future management of HIV-infected under-fives with immunologic and clinical failure.

**Purpose of the study**

The finding of this study will help to strengthen the immune system and thus decrease vulnerability among HIV-infected under-fives to opportunistic infections by increasing the effectiveness of antiretroviral therapy and improving quality of life and delays the progression of HIV to AIDS. The finding from this study will also help in the prevention, care, and treatment of HIV-infected under-fives and assist in the future management of HIV-infected under-fives with immunologic and clinical failure.

**What participation involves**

If you agree to join the study, you will participate by responding to the asked questions. The interview will ask you about Socio-demographic and Socioeconomic factors associated with nutritional status among HIV-infected under-fives attending care and treatment clinics in Shinyanga Region, Tanzania. The interview will be conducted by three research assistants that will help you in case of any clarification is needed.

**Confidentiality**

All the information on the forms will be entered into the computer with only the identification number; no names will appear on the questionnaire.

**Risk/discomfort**

Some of the questions may be sensitive and personal so may feel uncomfortable at the same time it will take your time. There will be no risk associated with this study, as there will be no invasive procedure associated with this study. However, if there will be a risk associated with this study, it will be prevented.

**Right to withdraw and alternatives**

Taking part in this study is completely your choice. You are free to choose either to participate in this study or not. You can decide to stop participating in this study any time you wish even if you have already given your consent. Refusal to participate or withdrawal from the study will not involve penalty or loss of any benefits to which you are otherwise entitled.

**Cost/ compensation**

This exercise is voluntary; therefore there will be no payment to participants.

**Whom to Contact**

If you ever have questions about this study, your rights as a participant, you should contact the principal investigator Edward Leonidas Kinyamugera, Mobile 0755674408, and Prof Method Kazaura. Who is the supervisor of this study, phone number; 0784767717 of Muhimbili University of Health and Allied Sciences, P.O. Box 65004, Dar es Salaam.

If you have any questions about your rights as a participant you may call Dr. Bruno Sunguya Chairman of the University Research and Publications Committee, P.O. Box 65001, Dar es Salaam. Telephone number: 21503026. He will be glad to answer you

**Do you agree?**

Participant agrees \_\_\_\_\_ Participants does not agree \_\_\_\_\_

I, \_\_\_\_\_ have read the content in this form. My questions have been answered. I agree to participate in this study.

Signature of participant \_\_\_\_\_

Signature of researcher \_\_\_\_\_

**Date of signed consent** \_\_\_\_\_

**Appendix 6: Fomu Ya Ridhaa****CHUO CHA SAYANSI ZA TIBA MUHIMBILI****KURUGENZI YA UTAFITI NA MACHAPISHO**

**NAMBARI YA SIRI YA FOMU:**

**Ridhaa ya ushiriki katika utafiti**

**Fomu ya ridhaa**

Ridhaa ya kushiriki kwenye utafiti

**Habari**

Naitwa Edward Leonidas Kinyamugera, mwanafunzi wa chuo cha afya na tiba Muhimbili (MUHAS) ninasomea shahada ya uzamiri ya afya ya umma. Kwa sasa ninafanya utafiti kuhusu Tathmini ya hali lishe na sababu zake miongoni mwa watoto wenye umri chini ya miaka 5 ambao wanaishi na virusi vya ukimwi mkoa wa Shinyanga.

**Lengo la utafiti**

Matokeo ya utafiti huu yatasaidia kujenga uelewa na ufahamu Zaidi juu ya hali ya sasa ya lishe miongoni mwa watoto wenye umri chini ya miaka 5 ambao wanaishi na virusi vya ukimwi mkoa wa Shinyanga na maeneo mengine ya Jamhuri ya Muungano wa Tanzania. Matokeo ya utafiti huu pia yatakuwa ni Muhimu kwa wataalamu wa afya na lishe na wadau mbalimbali katika sekta ya afya na lishe katika siku za mbeleni hasa wakati wa kutibu, kuzuia na kupambana na Ugonjwa wa Ukimwi miongoni mwa watoto wenye umri chini ya miaka 5 ambao wanaishi na virusi vya ukimwi Shinyanga na maeneo mengine ya Tanzania.

**Utaratibu wa kushiriki**

Kama utakubali kushiriki katika utafiti huu, utashiriki Kwa kujibu Maswali. Utasailiwa kuhusu taarifa zako binafsi, kijamii na kiuchumi, zinazohusiana hali ya lishe miongoni mwa watoto wenye umri chini ya miaka 5 ambao wanaishi na virusi vya ukimwi mkoa wa Shinyanga.

**Usiri**

Maelezo yote utayotoa na kujaza kwenye karatasi ya Maswali yataingizwa katika kompyuta kwa kutumia namba ya utaulisho, hakuna maina yatakayoingizwa katika fomu ya Maswali.

**Athali**

Maswali mengine yatayoulizwa yatakuwa nyeti na yatahusu wewe binafsi. Hivyo unaweza kujisikia vibaya na hata kukuchukulia muda wako. Hakutakuwa na athari zozote zitakazoambatana na utafiti huu. Ila pindi zitakapojitokeza zitazuiliwa kikamilifu.

**Kujitoa kwenye utafiti/ mbadala**

Ushiriki wako ni hiari na unaweza kuchagua kushiriki au kukataa. Unaweza ukasitisha kushiriki katika utafiti huu muda wowote hatakama ulisharidhia mwanzo. Ukikataa kushiriki hakutakuwa na adhabu yoyote ile wala hutapoteza chochote.

**Gharama/ malipo**

Zoezi hili ni hiari, kwa hiyo hakuna malipo yoyote yatakayotolewa.

**Nani wakuwasiliana naye**

Kama unamasawali yoyote kuhusu utafiti huu, kuhusu haki zako, unaweza kuwasiliana na mtafiti mkuu Edward Leonidas Kinyamugera, simu nambari 0755674408 na Prof Method Kazaura simu nambari 0784767717 wa Chuo Kikuu cha Sayansi zaTiba Muhimbili, S. L. P 65004, Dar es Salaam. Kama unaswali lolote kuhusiana na haki zako Kama mshiriki, unawezak uwasilaiana na Dr Bruno Sunguya ambayeni Mwenyekiti wa Kamati ya Utafiti na Machapisho, P.O.Box 65001, Dar es Salaam. Simu namba: 2150302-6.

**Je unakubali?**

Mshiriki kakubali \_\_\_\_\_ Mshiriki kakataa \_\_\_\_\_

Mimi, \_\_\_\_\_ nimesoma na nimeelewa fomu hii ya ridhaa. Maswali yangu yote yamejibiwa na nakubali kushiriki katika utafiti huu.

Sahihi ya mshiriki \_\_\_\_\_

Sahihi ya mtafiti \_\_\_\_\_

Tarehe \_\_\_\_\_