



**DETERMINANTS OF NUTRITIONAL STATUS AMONG ADOLESENTS  
(10-19 YEARS) ATTENDING ANTI-RETROVIRAL THERAPY CLINIC AT  
ZEWDITU MEMORIAL HOSPITAL, ADDIS ABABA, ETHIOPIA**

**BY  
HABIL ADAMU NEWAY**

**A THESIS SUBMITTED TO CENTER FOR FOOD SECURITY STUDIES**

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**ADDIS ABABA UNIVERSITY  
COLLEGE OF DEVELOPMENTAL STUDIES  
CENTER FOR FOOD SECURITY STUDIES**

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**BY  
HABIL ADAMU NEWAY**

**ADVISOR  
ABEBE HAILE (PhD)**

**MSc THESIS SUBMITTED TO COLLEGE OF DEVELOPMENT STUDIES  
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ADDIS ABABA, ETHIOPIA**

**ADDIS ABABA UNIVERSITY**  
**DECLARATION**

This Thesis is my original work and has not been presented for a degree of masters in any other University and that all sources and materials used for the thesis have been duly acknowledged.

Declared by:

Name: Habil Adamu Neway

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Place: Addis Ababa University, Addis Ababa

**ADDIS ABABA UNIVERSITY**  
**COLLEGE OF DEVELOPMENTAL STUDIES**  
**CENTER FOR FOOD SECURITY STUDIES**

As thesis research advisor, I hereby declare that I have read and evaluated this thesis prepared by under my supervision, by Habil Adamu Neway: *Determinants of Nutritional Status among Adolescents (10-19 years) attending Anti-Retroviral Therapy Clinic at Zewditu Memorial Hospital, Addis Ababa*. I recommend that this thesis work can be submitted as fulfilling the requirement for the Degree of Masters of Science in Food Security and Development.

Abebe Haile (PhD) \_\_\_\_\_

Advisor

Signature

\_\_\_\_\_

Date

This is to certify that Thesis prepared by Habil Adamu Neway entitled: *Determinants of Nutritional Status among Adolescents (10-19 years) attending Anti-Retroviral Therapy Clinic at Zewditu Memorial Hospital, Addis Ababa* and submitted in a partial fulfillment of the requirements for the Degree of Master of Science in Food Security and Development complies with the University and meets the accepted standards with respect to originality and quality.

Signed by the examining committee:

Mr. Bechaye Tesfaye \_\_\_\_\_

Chairman

Signature

\_\_\_\_\_

Date

Prof. Mogessie Ashenafi \_\_\_\_\_

Internal examiner

Signature

\_\_\_\_\_

Date

Dr. Gizachew Abdeta \_\_\_\_\_

External examiner

Signature

\_\_\_\_\_

Date

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Chairperson of the Center or Graduate Program Coordinator

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## Table of Contents

Acknowledgment .....	i
List of tables .....	v
List of figures.....	vi
List of appendixes .....	vii
List of acronyms and abbreviations .....	viii
Abstract .....	ix
CHAPTER ONE: INTRODUCTION.....	1
1.1. Background of the study .....	1
1.2. Statement of the problem .....	2
1.3. Objective of the study .....	3
1.3.1. General objective.....	3
1.3.2. Specific objectives.....	3
1.4. Research questions.....	3
1.5. Significance of the study.....	4
1.6. Scope and limitation of the study .....	4
1.8. Organization of the paper.....	5
CHAPTER TWO: REVIEW OF RELATED LITERATURE .....	6
2.1. Adolescent nutrition status: The concept of determinants .....	6
2.2. Operational terms.....	7
2.3. Empirical related review .....	9
2.3.1. Prevalence of HIV/AIDS in adolescents .....	9
2.3.2. Malnutrition and its consequences in adolescents .....	10
2.3.3. Determinants of nutrition status among adolescents .....	13
2.3.4. Determinants of nutrition status among people living with HIV/AIDS .....	15

2.3.5. Research gap.....	19
2.4. Conceptual framework.....	19
<b>CHAPTER THREE: DESCRIPTION OF THE STUDY AREA AND THE RESEARCH</b>	
<b>METHODS.....</b>	<b>22</b>
3.1. Description of the study area.....	22
3.2. Study design.....	23
3.3. Study population.....	23
3.4. Inclusion and exclusion criteria.....	23
3.5. Data sources.....	23
3.6. Sample size determination, sampling techniques and procedures.....	24
3.6.1. Sample size determination.....	24
3.6.2. Sampling techniques and procedures.....	25
3.7. Data collection instrument and procedure.....	25
3.8.1. Descriptive statistics analysis.....	27
3.8.2. Statistics analysis.....	27
3.9. Diagnostic Tests.....	28
3.10. Hypothesis and Definition of Variables.....	29
<b>CHAPTER FOUR: RESULTS AND DISCUSSIONS.....</b>	
4.1. Descriptive Statistics on linkage between Nutritional Status and Determinants.....	32
4.1.1. Nutrition status and demographic characteristics of the respondents.....	32
4.1.2. Nutrition status and socio-economic characteristics of the respondents.....	33
4.1.3. Nutrition status and environmental factors.....	37
4.1.4. Health status (medical history).....	40
4.1.5. Nutrition status and dietary supplement.....	42
4.1.6. Nutrition status and IDDS calculated from food group.....	43

4.1.7. Nutrition status and previous anthropometric measurement .....	43
4.2. Adolescent’s nutritional status .....	44
4.3. Statistical Analysis and Discussion .....	47
4.3.1. Determinants of stunting among adolescents living with HIV/AIDS .....	47
4.3.2. Determinants of thinness among adolescents living with HIV/AIDS .....	52
4.4. Individual Dietary Diversity Score (IDDS) .....	55
CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS .....	57
5.1. Conclusion.....	57
5.2. Recommendations.....	58
References .....	59
Appendixes .....	66

## List of tables

Table 1:	Types of Explanatory Variables, and Expected Sign .....	31
Table 2:	Demographic Characteristics and Stunting for Continuous Variables .....	33
Table 3:	Demographic Characteristics and Stunting for Categorical Variables .....	34
Table 4:	Demographic Characteristics and Thinness for Continuous Variables .....	34
Table 5:	Socio-economic Characteristics and Stunting for Categorical Variables .....	35
Table 6:	Socio-economic Characteristics and Thinness for Continuous Variables .....	35
Table 7:	Socio-economic Characteristics and Thinness for Categorical Variables .....	36
Table 8:	Environmental Characteristics and Stunting for Categorical Variables .....	38
Table 9:	Environmental Characteristics and Thinness for Categorical Variables .....	40
Table 10:	Health Status (medical history) and Stunting for Continuous Variables .....	41
Table 11:	Health Status (medical history) and Stunting for Categorical Variables .....	42
Table 12:	Health Status (medical history) and Thinness for Continuous Variables .....	42
Table 13:	Dietary Supplement and Thinness for Categorical Variables .....	43
Table 14:	IDDS and Thinness for Categorical Variables .....	44
Table 15:	Previous anthropometric measurement and Stunting for Continuous Variables	45
Table 16:	Previous anthropometric measurement and Thinness for Continuous Variables	45
Table 17:	Overall Prevalence of Stunting and Thinness among Adolescents living with HIV/AIDS attending ART clinic at Zewditu Memorial Hospital .....	46
Table 18:	Prevalence of Stunting (height-for-age) by Sex and Age in Zewditu Memorial Hospital (ART clinic), 2019 .....	47
Table 19:	Prevalence of Thinness by Sex and Age group in Zewditu Memorial Hospital (ART clinic), 2019 .....	48
Table 20:	Ordered Logit Model for Stunting .....	52
Table 21:	Ordered Logit Model for Thinness .....	54
Table 22:	Overall Individual Dietary Diversity Score .....	56
Table 23:	Individual Dietary Diversity Score by Sex .....	56

**List of figures**

Figure 1: Conceptual Framework for Determinants of Nutrition Status of Adolescents  
Living with HIV/AIDS, (source: Own Constructed) ..... 21

Figure 2: Study Area Map ..... 22

## List of appendixes

Appendix 1:	Multicollinearity Test for Stunting and Thinness .....	68
Appendix 2:	Logistic Model Test (Model Goodness Fit) .....	69
Appendix 3:	Ordered Logit Model Result for Stunting and its Marginal Effects .....	70
Appendix 4:	Ordered Logit Model Result for Thinness and its Marginal Effects .....	72
Appendix 5:	Questionnaire (English version) .....	74
Appendix 6:	Translated Questionnaire (Amharic) .....	83

## **List of acronyms and abbreviations**

AIDS:	Acquired Immuno- Deficiency Syndrome
ART:	Anti- Retroviral Therapy
ARV:	Anti-retro Viral
BMI:	Body Mass Index
CBN:	Community Based Nutrition
CDC:	Communicable Diseases Control
CSA:	Central Statistical Agency
DD:	Dietary Diversity
EDHS:	Ethiopia Demographic Health Survey
FANTA:	Food and Nutrition Technical Assistance
FAO:	Food and Agriculture Organization of the United Nations
FMOH:	Federal Ministry of Health
HAART:	Highly Active Anti-Retroviral Therapy
HIV:	Human Immuno- Deficiency Virus
ICRW:	International Center for Research on Women
IDDS:	Individual Dietary Diversity Score
NCD:	Non Communicable Diseases
NNP:	National Nutrition Program
OI:	Opportunistic Infection
PLWHA:	People Living with HIV/AIDS
SD:	Standard Deviation
SSA:	Sub-Saharan Africa
UNAIDS:	United Nation Program on HIV/AIDS
UNICEF:	United Nation International Children Education Fund
USAID:	United States Agency International Development
WFP:	World Food Program
WFS:	World Food Summit
WHO:	World Health Organization
ZMH:	Zewditu Memorial Hospital

## **Abstract**

*Nutrition is an important component of comprehensive care for people living with HIV specially adolescents, since it is a period of rapid growth and maturation in human development that demands extra nutrients and energy to support growth. Focusing on adolescents' nutrition, provides a unique opportunity to break the intergenerational cycles of malnutrition. This study was aimed to assess determinants of nutritional status among Adolescents (10-19 years) living with HIV/AIDS and attending Anti- Retroviral Therapy (ART) clinic at Zewditu Memorial hospital (ZMH), Addis Ababa. Institutional based Cross-sectional survey design was employed among randomly selected 226 adolescents (10-19 years) attending the ART clinic. Structured questionnaire was used to gather necessary information from the respondents and Key informant interviews was also held for the purpose of the study. Whereas, anthropometric measurement was used to collect height and weight following the standard measurement tools and procedures. Data was entered into SPSS version 22 and anthropometric measurements were converted into Z-score by WHO Anthroplus version 1.0.4 software. Then exported to STATA 14 and was analyzed using descriptive and inferential statistics. Ordered logit model was employed to analyze factors determining nutritional status of adolescents living with HIV/AIDS while descriptive statistics was employed using T-test and chi-square. Nutritional status was assessed using Height-for-age (HAZ) and BMI-for-Age (BAZ) as measures of stunting and thinness respectively. The result revealed that the prevalence of stunting was (37.5%) and thinness (49.8%). The result of ologit model indicated that, sex of adolescent, age of adolescent, no of children in the family, mother level of education, place of residence, initial CD4 count, ART duration in moths, previous weight and previous height were found positive and negative significant determinants for adolescent stunting at 1%, 5% and 10% level of significance. While, age of adolescent, parental status, mother employment status, average monthly income of the family, recent viral load, feeding support and nutrition counseling were found to be positive and negative significant determining factors for adolescent thinness at  $p < 0.01$ ,  $p < 0.05$  and  $p < 0.1$ . The findings from individual dietary diversity score indicated that 73.89 % of them consume less than the standard (four) food groups within the last 24 hours during the time of research period. Lastly, based on the findings of this study we recommends that, as HIV infected adolescents are at higher risk of malnutrition, need to assess their dietary practices, nutrient intake and nutritional status in different context in order to advocate for interventions promoting a healthy life style as a complement to their treatment.*

**Keywords:** *Adolescents (10-19years), Nutritional Status, Zewditu Memorial Hospital, ART, determinant*

## **CHAPTER ONE: INTRODUCTION**

### **1.1. Background of the study**

Malnutrition in all its forms includes undernutrition, micronutrient deficiency or excess, and overweight and obesity. Undernutrition among adolescents takes the form of severe acute malnutrition or thinness (low weight-for-height or low BMI-for-age), usually caused by recent and severe weight loss due to extreme deprivation and famine; or micronutrient-related malnutrition due to inadequate micronutrient intake or absorption. Undernutrition limits growth and the body's ability to combat disease or to heal following an injury. Undernutrition may develop consequent to an illness or infection that impairs nutrient intake or the metabolism (such as gastrointestinal disorders and malabsorption, pneumonia, parasitic infections, tuberculosis and HIV) and an inadequate diet or both (WHO, 2018).

Adolescence is a period of rapid growth: up to 45% of skeletal growth takes place and 15 to 25% of adult height is achieved during adolescence (Stang and Story, 2008). During the growth spurt of adolescence, up to 37% of total bone mass may be accumulated. Nutrition influences growth and development throughout infancy, childhood and adolescence; it is, however, during the period of adolescence that nutrient needs are the greatest (WHO, 2005). It may be said that adolescents are a nutritionally vulnerable group for a number of specific reasons, including their high requirements for growth, their eating patterns and lifestyles, their risk-taking behaviors and their susceptibility to environmental influences.

Inadequate nutrition in adolescence can potentially retard growth and sexual maturation, although these are likely consequences of chronic malnutrition in early infancy and childhood. It can affect adolescents' current health and put them at high risk of chronic disease as well, particularly if combined with other adverse lifestyle patterns, even if the detrimental effects may take long to show (Stang and Story, 2008). Moreover, malnutrition during adolescence manifests in three broad groups of conditions: undernutrition (wasting, stunting or chronic undernutrition and thinness or underweight); micronutrient deficiency or excess (inadequate or excessive intake of vitamins or minerals); and overweight or obesity (WHO, 2017). Prioritization of adolescents' nutrition services is a current area of concern. Adolescent nutrition services receive inadequate attention as

most nutrition-related resources are traditionally directed towards young children and pregnant women.

A combination of these factors, at a time of high growth spurt, makes adolescents more vulnerable to nutritional deficiencies. The role played by nutrition in determining the physical, mental and social aspects of HIV-exposed children has been documented (McDonald *et al.*, 2012). Additionally, the HIV infection and drugs such as antiretroviral drugs may compromise nutrients intake as well as increasing the nutrients demanded through a number of metabolic pathways (Duggal *et al.*, 2012). Yet, good nutrition is expected to promote effectiveness of ART drugs and minimize progression of HIV in the body of patients.

## **1.2. Statement of the problem**

Several studies have mainly focused on the prevalence or risk factors of malnutrition among children in different parts of Ethiopia. Furthermore, there is no enough data to quantify the problem of malnutrition in adolescents living with HIV/AIDS. However, the fact that patients of this age group have high risk and vulnerable to malnutrition, since this age group is in big and rapid developmental changes that prepares them for the adulthood and their growth basically depends on nutrition. Malnutrition exacerbates HIV/AIDS progression resulting in increased morbidity and mortality, and also HIV/AIDS predisposes to malnutrition. The magnitude of malnutrition in HIV/AIDS patients has not been well studied in Ethiopian setup (Habtamu *et al.*, 2016). Clinically, the HIV infected adolescents present as physically stunted individuals, with delayed puberty.

Even if lots of efforts have been done to minimize prevalence of HIV/AIDS in Ethiopia, still number of adolescents with perinatally or behaviorally acquired HIV is increasing. Also, there is limited evidence about nutrition related intervention and nutritional status of adolescents living with HIV/AIDS especially those taking ART drugs. In addition to this, HIV specifically affects nutritional status by increasing energy requirements to fight the infection, reducing food intake, and adversely affecting nutrient absorption and metabolism. The critical role of adolescent nutrition in the intergenerational cycle of Growth failure has not been well addressed in Ethiopia (FMOH, 2016).

In 2016, globally adolescent population accounts 1.8 billion, 24.3% of the global population (UNICEF, 2018). According to the (CSA, 2016), projection from the 2007 population and housing census estimates the total population of Ethiopia for the year 2015 to be 90 million, the country is characterized by a young population with 33.8% of its population being in the age range of 10-24 years. The age group 10-14, 15-19, and 20-24 account for 15.6%, 10.6%, and 7.6% respectively.

In developing countries, the magnitude of stunting among adolescent age groups ranges from 32% to 48% (Omidvar *et al.*, 2013). As evidenced by some scholars, it affects females than males and also primarily affects those rural resided adolescents than urban (Rahman and Karim, 2014). In Ethiopia, the prevalence of stunting among adolescents (10-19 years) ranges from 7.2% to 26.5% (Huruy *et al.*, 2013; Yoseph *et al.*, 2014). Therefore, the study was aimed to assess the determinants of nutritional status of adolescents (10-19 years) living with HIV/AIDS attending ART clinic at Zewditu Memorial hospital, Ethiopia (ZMH).

### **1.3. Objective of the study**

#### **1.3.1. General objective**

The general objective of this study is to assess determinants of nutritional status among adolescents (10-19 years) living with HIV/AIDS attending anti- retroviral therapy (ART) clinic at Zewditu Memorial hospital (ZMH), Addis Ababa, 2019.

#### **1.3.2. Specific objectives**

This study was conducted to achieve the following specific objectives to:

- Determine the nutritional status of adolescents receiving ART at ZMH.
- To identify factors influencing nutritional status of among adolescents receiving ART at ZMH.

### **1.4. Research questions**

The research is intended to answer the following questions

1. Why is malnutrition prevalent among HIV/AIDS positive adolescents (10-19 years) attending ART clinic at ZMH?
2. What are the factors determining nutritional status among HIV/AIDS positive adolescents (10-19 years) attending ART clinic at ZMH?
3. How do these determinants affect nutritional status of HIV/AIDS positive adolescents attending ART clinic at ZMH?

### **1.5. Significance of the study**

The findings of the study will provide ground information by initiating and encouraging researchers to conduct further researches in regard to the influence of nutrition on adolescents living with HIV/AIDS. Thus, sufficient and clear information required on the prevalence and factors affect nutrition status besides the health condition. Moreover the findings of this study will contribute at policy and program level to plan suitable nutritional and health programs and effective intervention for adolescent living with HIV/AIDS. For the study area the facts and figures discovered from this study will contribute to see the extent of the problem related to the importance of strengthening dietary counseling and provision of supplements. Ultimately the study findings will give valuable information for researchers, policy makers, governmental and non-governmental organizations working on the area.

### **1.6. Scope and limitation of the study**

This study was conducted focusing on determinants of nutritional status among adolescents (10 – 19 years) living with HIV/AIDS and who are taking ART attending ZMH. Nutritional status was indicated by stunting and thinness and their determining factors were studied. Those determining factors considered in this study were demographic factors, socio economic factors, environmental factors, health related factors, dietary supplement and individual dietary diversity.

Due to time and resource constraints the study did not assess minerals and micronutrients deficiencies like iodine, iron, zinc, etc, daily caloric intake, side effects of ART drugs in food intake and absorption, cause and effect of OI, hospitalization history, concerning birth of the adolescent mode and place of delivery, psychosocial problems related to being born HIV positive.

### **1.7. Ethical consideration**

Ethical clearance was obtained from the College of Development Studies, Center of Food Security Studies, AAU; and permission was secured from Zewditu Memorial Hospital (ZMH) Administration and ART clinic directors. The research process was completely dependent on mutual respect and transparency. Consent was obtained from study participants by notifying the data to be gathered from them should be kept confidential and their input is important for the result of the study. Moreover, involvement in answering the questionnaires, any interviews and overall participation was based on voluntary bases. In such away, participants willingly participated without obligation or any inducement just on their consent. As far as possible, communication

barriers were eased through avoiding technical terms and translating the questionnaire as well as discussion media during interview in to common language for mutual understanding.

### **1.8. Organization of the paper**

This thesis is organized into five chapters. The first chapter deals with the background of the study and defines the problem of the study, basic questions and objectives of the study, the scope and limitation of study and the significance of the study and ethical consideration. Chapter two covers review of the literature which consists of theoretical, operational, empirical and conceptual framework of the study. Description of the study area, research methodology and sampling procedure is discussed in the third chapter. Chapter four, is about analysis, discussions and findings of the study which constitutes the main body of the document. Conclusions and recommendations are presented in the final chapter five.

## **CHAPTER TWO: REVIEW OF RELATED LITERATURE**

### **2.1. Adolescent nutrition status: The concept of determinants**

Adolescence is a time of rapid physical growth that increases demands for energy and nutrients. One-half of all new HIV infections occur in young people 15–24 years old, and HIV compromises the nutritional status of adolescents and increases vulnerability to infection. Adolescents have increased requirements for energy and nutrients (protein, calcium, and iron, micronutrients). Many adolescents are vulnerable to chronic energy deficiency (protein-energy malnutrition), iron deficiency anemia, and vitamin A deficiency because of inadequate intake and infections. It is important to screen and counsel adolescents to prevent and treat these deficiencies. Moreover, patients with HIV infection are more prone to malnutrition due to loss of appetite, malabsorption and loss of nutrients through vomiting and diarrhea (OIs). However, adolescents are rarely a priority group for nutrition interventions (WHO, 2008).

The goals of nutrition care and support for adolescents with HIV are to promote adequate intake and reducing loss of nutrients for growth and development during puberty and prevent infection, manage diet-related problems of HIV infected adolescents, and manage drug-related complications. This care and support should include nutrition assessment and screening, nutrition education and counseling, psychosocial support, and food security support (FMOH, 2008).

According to UNICEF (1990), for many adolescents, inadequate quality and quantity of food are the prime determinants of nutrition problems. These conditions may be due to household food insecurity, intra-household allocation of food that does not meet their full range of dietary needs, livelihoods insecurity, and lack of nutrition knowledge. Micronutrient malnutrition and chronic energy deficiency resulting in thinness (low BMI for age) and stunting stem primarily from poor diet. Excessive physical activity patterns (e.g., heavy workloads and walking long distances) and infection may also contribute to undernutrition.

The underlying determinants, deemed relevant for adolescents irrespective of geographic area or income level, although the magnitude of problems and priority issues may differ from one country to another, and even within countries. With the epidemiological and nutritional transition, coupled with globalization of economies, nutritional problems of industrialized countries become increasingly prevalent in low- and middle-income countries, notably obesity. Obesity, diabetes and hypertension are present in wealthy, middle-income and poor groups. It is recognized that the

extremes of over-nutrition and undernutrition are oftentimes concurrent problems in adolescent populations. Deficiencies can be found in poor societies because of poverty and in better-off group because of poor eating patterns. The same determinants are at play anywhere: dietary inadequacies as the primary underlying cause, frequently coupled with lifestyle factors and health conditions that further compromise nutritional status. Infection as a factor of malnutrition may be relatively less important in adolescents than in under-five children (although adolescents are highly exposed to HIV), while lifestyle factors become more critical. Early pregnancy is a major risk factor in adolescence anywhere. Past malnutrition, or low body nutrient stores, are in the background; they may have consequences during adolescence or further increase chronic disease risk later on in adulthood. Stunting, for instance, originates in fetal life, in infancy or in childhood. Determinants of dietary inadequacies are many, and they have been grouped under psycho-social and socioeconomic factors, while recognizing that they are intertwined (WHO, 2005).

In addition, there are also pathological conditions that alter nutritional status or require specific nutritional management, in particular diabetes and HIV/AIDS. HIV/AIDS is associated with symptoms that cause a reduction in food intake and also affects digestion and absorption of nutrients. It is also alters metabolism, or the way the body transports, uses, stores, and excretes many nutrients. Nutritional problems have been shown to be significant and contribute to health and death in HIV positive and AIDS patients (FANTA, 2003).

In this context, this study is attempts to correlate the determinants focus only on adolescent health status, underlying determinants given socioeconomic factors, past and present medical history including viral load status, demographic factors, environmental factors and diet related factors in adolescents of age group 10-19 years.

## **2.2. Operational terms**

**Adolescent-** the World Health Organization (WHO) classifies persons in the age range of 10-19 years as adolescents and those 15-24 years as youth. While the adolescent classification is mostly universal, different continents or nations adopt different age ranges for youth. The definition of youth is also influenced by the constant changes in demographic, economic, and socio cultural circumstances. In the African Youth Charter, youth are people 15 to 35 years. The National Youth Policy of Ethiopia adopts the age of 15-29 years for youth and 10-19 years for adolescents (FMOH, 2016).

**Malnutrition-** Malnutrition refers to deficiencies, excesses or imbalances in a person's intake of energy and/or nutrients. The term malnutrition covers 2 broad groups of conditions. One is 'undernutrition'—which includes stunting (low height for age), wasting (low weight for height), underweight (low weight for age) and micronutrient deficiencies or insufficiencies (a lack of important vitamins and minerals). The other is overweight, obesity and diet-related non-communicable diseases (such as heart disease, stroke, diabetes and cancer) (WHO, 2005).

**Undernutrition-** is defined as the outcome of insufficient food intake and repeated infectious diseases. It includes being underweight for one's age, too short for one's age (stunted), dangerously thin for one's height (wasted) and deficient in vitamins and minerals (micronutrient malnutrition).

**Stunting-** is reflection of chronic undernutrition, occurs when a child or adolescent does not grow to his/her potential because of the long-term cumulative effects of inadequate dietary intake, frequent illness/infection, or both. The result is that the child or adolescent is shorter than would be expected for a healthy child of his/her age and sex. Stunting identified during adolescence is usually a result of poor growth during the first 1,000 days from pregnancy through age 2, after which it is difficult to regain lost growth and fully recover from the effects of stunting (Victora *et al.*, 2010). Stunting can not only impair an individual's health but is also associated with poor cognitive and motor development and lower school achievement (Grantham-McGregor *et al.*, 2007; Hoddinott *et al.*, 2008). The rapid growth of the adolescent years may be an opportunity to catch up on some lost growth, but it is still unclear when and how much linear growth can be regained (Leroy *et al.*, 2015; Prentice *et al.*, 2013) and whether the cognitive and productivity losses due to undernutrition in early childhood are reversible.

**Thinness-** is used to describe a child or adolescent whose weight is too low for his/her height. It is defined using the sex-specific BMI-for-age index. A child or adolescent with low BMI-for-age has either "severe thinness" or "moderate thinness," depending on the severity.

**HIV/AIDS staging-** is a standardized clinical parameters to direct medical decision making for patients with HIV/AIDS and can be used based solely on patient clinical features, thus accommodating facilities with no or limited access to laboratory testing (WHO,2005).

**CD4 count-** The CD4 count is like a snapshot of how well your immune system is functioning. CD4 cells (also known as CD4+ T cells) are white blood cells that fight infection. The more you

have, the better. These are the cells that the HIV virus kills. As HIV infection progresses, the number of these cells declines. When the CD4 count drops below 200, a person is diagnosed with AIDS. A normal range for CD4 cells is about 500-1,500. Usually, the CD4 cell count increases when the HIV virus is controlled with effective HIV treatment.

**Viral loads-** Viral load is the term used to describe the amount of HIV in your blood. The more HIV there is in your blood (and therefore the higher your viral load), then the faster your CD4 cell count will fall, and the greater your risk of becoming ill because of HIV.

**Opportunistic infection and HIV/AIDS-** are infections that occur more often or are more severe in people with weakened immune systems than in people with healthy immune systems. People with weakened immune systems include people living with HIV/AIDS.

**Individual dietary diversity score (IDDS)** - is used as a proxy measure of the nutritional quality of an individual's diet.

### **2.3. Empirical related review**

This section provides empirical related review on the nutritional status of adolescents and people living with HIV/AIDS.

#### **2.3.1. Prevalence of HIV/AIDS in adolescents**

According to UNICEF, (2018), Adolescents and young people represent a growing share of people living with HIV worldwide. In 2017 alone, 590,000 young people between the ages of 15 to 24 were newly infected with HIV, of whom 250,000 were adolescents between the ages of 15 and 19. To compound this, also the data indicate that only 23 per cent of adolescent girls and 17 per cent of adolescent boys aged 15-19 found in Eastern and Southern Africa.

Additionally, AIDS-related deaths among adolescents have increased over the past decade while decreasing among all other age groups, which can be largely attributed to a generation of children infected with HIV peri - nataly who are growing into adolescence. Latest report by WHO indicated that there are nearly 1.2 million people living with HIV/AIDS, where the adult prevalence rate is estimated at 2.4% and the incidence rate is 0.29% in Ethiopia. The responses to the HIV/AIDS epidemic showed considerable progress and achieved encouraging results. However, the nature of the epidemic and its fueling factors creates a complex challenge to the ability of health and other sectors to meet the targets for HIV/AIDS control in Ethiopia. Antiretroviral treatment coverage

reached 62.3%, which is above the sub-Saharan African regional average (53%). However, prevention of mother-to-child transmission of HIV coverage was only 9.3% (WHO, 2017). In addition, The HIV/AIDS epidemic continues its impact on health, nutrition, food security and overall socioeconomic development of the population affected by the disease.

While many adolescents living with HIV were infected with HIV at birth, others become infected between the ages of 15 and 19 through sexual transmission. Adolescents aged 15 to 19 account for an estimated 16 per cent of new HIV infections worldwide. Globally, in 2017, adolescent girls accounted for two thirds of all new HIV infections among adolescents. In sub-Saharan Africa that year, nearly three times as many adolescent girls were newly infected with HIV than adolescent boys. In North America, East Asia and the Pacific, Latin America and the Caribbean, Middle East and North Africa and Western Europe, more boys are newly infected with HIV each year than girls in adolescence. This reflects differences and dynamics in risk behavior in these regions, which means that interventions must be tailored to the specific nature and dynamic of the epidemic (UNICEF, 2018).

According to UNAIDS (2018), about 36.9 million people are living with HIV/AIDS, among the total 1.8 million are adolescents between the ages of 10 and 19 living with HIV worldwide. It also states that about 5000 new infections occurs each day, among those 66 % are in sub-Saharan Africa and about 500 are among children under 15. The rest around 4400 are adolescent aged 15 and older of whom almost 43% are women, 33% are youth (15-24) and 19 % are young women. Therefore, Adolescents account for about 5 percent of all people living with HIV and about 16 per cent of new HIV infections. Moreover, according to the data regions with the highest numbers of HIV-positive adolescents are sub-Saharan Africa and South Asia. Of the 1.8 million adolescents living with HIV, about 1.5 million (85 per cent) live in sub-Saharan Africa.

### **2.3.2. Malnutrition and its consequences in adolescents**

Trends from 1975 to 2016 in BMI, underweight, overweight and obesity among over 31 million children and adolescents aged 5–19 years in 200 countries showed mean BMI and the prevalence of overweight and obesity in most regions of the world are increasing. Despite this rise, more children and adolescents are moderately or severely underweight than obese. The burden of underweight is increasingly concentrated in south Asia and central, east and west Africa, while

BMI has plateaued at high levels in many high-income countries and is accelerating in parts of Asia (Abarca-Gomez *et al.*, 2017).

Chronic undernutrition among adolescents is commonly associated with poverty, poor maternal health and nutrition, recurring illness, or inappropriate infant and young child feeding and care in early life (WHO, 2017). In some countries, up to half of all adolescents are stunted (Black *et al.*, 2013). In 2015, there were 1.2 million largely preventable adolescent deaths globally. Malnutrition factors into many of the causes of mortality in adolescence, either as a determinant or exacerbating factor. The majority of all adolescent deaths occur in low- and middle income countries in Africa (45%) and Southeast Asia (26%), the regions hosting 19% and 30% of the world's adolescent population, respectively (UNICEF, 2018).

With a mortality rate lower than any other age group and relatively little morbidity, adolescents are typically not prioritized for public health interventions (UNICEF, 2011). As a group, adolescents also have less undernutrition than infants and preschool-aged children, historically making the establishment of standardized anthropometric definitions less of a pressing concern for young people of this age (WHO, 2007). The rapidity of the adolescent growth spurt, differences in the timing of sexual maturation, and genetic factors all impose tremendous variability on adolescent height and weight, making maturational age and chronological age discordant and establishment of international standards or adolescent growth difficult (WHO,2005).

Stunting, or impaired linear growth, in adolescents represents long-term nutritional deficiency. The consequences of stunting in adolescence include greater risk of obstetric complications, including obstructed labor in females, and diminished physical capacity among adolescents of both sexes. studies suggest that stunting remains prevalent in developing countries throughout the world, all of these studies defined stunting as height-for-age less than 2 standard deviations less than the WHO (1995) reference median, a more stringent definition than that used in the International center for research on women (ICRW) studies. In contrast to the findings in the ICRW studies in Nepal and Ecuador, the prevalence of stunting apparently declines with age across the adolescent years in some studies without intervention (Leenstra *et al.*, 2005; Kurtz, 2012). For example, the cross-sectional study in Kenyan schoolgirls revealed that the prevalence of stunting declined from approximately 20% among 12-year-olds to 2% among 16-year-olds, as the mean height-for-age z-score converged toward the US reference median (Leenstra *et al.*, 2005) .

Approximately 20% of adult height is gained during adolescence, with the most gained at a rapid rate during a period of 1 to 2 years preceding the early stages of sexual maturation, typically marked by menarche in females or attainment of adult voice in males, at which time the growth rate slows. In undernourished populations, menarche or the onset of puberty is often delayed, permitting a longer period of growth and perhaps more time for “catch-up growth.” (Kurtz, 2012). Conversely, when the environment of the stunted individual changes, as when families migrate from rural to urban areas or in the case of internationally adopted children, catch-up growth may be so rapid as to hasten the onset of puberty, thus shortening the period of most rapid growth and limiting adult height (Leroy *et al.*, 2015).

Food interventions aimed at alleviating adolescent stunting may not spur height gain beyond increases that occur naturally during the adolescent growth spurt and may in fact promote excess weight gain in populations in which concurrent underweight is not prevalent. Instead, the prevention of adolescent stunting ideally begins with intervention much earlier in development, as stunting among adolescents reflects chronic undernourishment, likely beginning with inadequate nutrition during the first 2 to 3 years of life (Kurtz, 2012). At this age, food scarcity and inadequate nutrient intake limit growth, and frequent infections and diarrhea cause malabsorption of critical nutrients. Young children respond well to food interventions, which serve to optimize not only height, but also permit full cognitive development and attainment of complete physical capacity. Aside from food interventions, promotion of breastfeeding and the intake of nutrient-dense weaning foods and prevention of infectious diseases through the use of clean water are key in optimizing the nutritional status and growth of young children (UNICEF, 2011), with this optimized early growth is critical for the prevention of impaired linear growth in adolescence.

The WHO (2007) expert committee identified BMI-for-age less than -2 SD as the best indicator for thinness in adolescence. Although the term “underweight” is often used to describe thinness in adolescents with low BMI-for-age, the indicator of weight-for-age that is typically used to define underweight in young children is not meaningful in this age group because weight changes dramatically with height during adolescence and height is largely determined by genetic factors. The use of various definitions makes assessment of the public health burden and targeting of interventions challenging. However, patterns of thinness among adolescents in developing countries can be described based on the International center for research on women (ICRW) studies

and other more recent research. These patterns include a declining prevalence of thinness and increasing BMI throughout adolescence in both boys and girls, although boys typically have a greater prevalence of thinness than girls.

### **2.3.3. Determinants of nutritional status among adolescents**

A study conducted in Nigeria to assess prevalence and risk factors for stunting among school children and adolescents identified risk factors associated with stunting were attendance of public schools ( $p < 0.001$ ), polygamous family setting ( $p = 0.001$ ), low maternal education ( $p = 0.001$ ), and low social class ( $p = 0.034$ ). Following multivariate analysis with logistic regression, low maternal education (odds ratio=2.4; 95% confidence interval 1.204.9;  $p = 0.015$ ) was the major contributory factor to stunting (Sebanjo *et al.*, 2011).

A community based cross-sectional survey was conducted in Rakai district of south western Uganda used a questionnaire that focused on demographic and economic characteristics. The results of the study showed that 47% of orphans had malnourished. It also stated nutritional status was an outcome of factors such as environment, economic status, education and culture. In addition widespread lack of resources to meet big family needs contributed to malnourishment. Moreover low level of caretaker education, large household sizes and orphanage also played a major role in nutrition status (Kikafunda *et al.*, 2016).

A study performed to assess socioeconomic factors associated with underweight and stunting among adolescents in Jimma Zone, indicates that age of the adolescents, gender, educational status, employment status, and type of last school attended are associated with underweight; gender, place of residence, household size, household income, educational status, employment status, type of last school attended, and abdominal pain are associated with stunting. The findings reflect socio-economic characteristics are associated with underweight and stunting (Huruy *et al.*, 2013).

A school based cross-sectional survey was conducted to assess determinants of underweight, stunting and wasting among 450 schoolchildren (7-14 years), using multi-stage sampling techniques in Dale *Woreda*, southern Ethiopia. The result showed that household food insecurity, low maternal education and infection with *Trichuris trichura* were some of the major factors contributing to under-nutrition in the study area (Mekides *et al.*, 2015). Also community based cross sectional study performed at Amhara region in 5 major community based nutrition (CBN) implementing *woredas* namely Wogera, Ebnat, Wadla, Chilga and Dembecha to assesses level of

low BMI-for- age and height-for- age and their associated factors among adolescent girls. The result indicated that prevalence of adolescents with low BMI-for-age and low height-for-age Z-score  $< -2$  were high. Dietary diversity score and community based nutrition service utilization were factors affecting low BMI-for-Age in adolescent girls, food insecurity and nutrition and health information were factors affecting low height-for- age in adolescent girls (Molla *et al.*, 2015).

Another study conducted to assess the prevalence and the factors associated with stunting and thinness among in-school adolescents in northern Ethiopia using the 2006 World Health Organization (WHO) standards showed that undernutrition is widely prevalent among adolescents in northern Ethiopia. Sex, age and area of residence significantly associated with adolescent undernutrition. The study underlines the need for nutrition interventions targeting rural and boy adolescents (Yohannes *et al.*, 2015). Related study by Tsegahana *et al.*, (2016) on prevalence of thinness and stunting and associated factors among Adolescent school girls which is conducted in Adwa Town, North Ethiopia indicated that the prevalence of thinness and stunting was 21.4% and 12.2%, respectively. Age of adolescent, mother's educational status, eating less than 3 meals per day, having family size  $>5$  were significantly associated with thinness among the adolescent girls. Family size  $>5$  and unimproved source of drinking water were significantly associated with stunting.

Similarly, the cross sectional study conducted in Adama city puts the adolescent's mother and father education level, occupation of their fathers, their dietary diversity score and pattern of meal diversity to have an influence for under nutrition. The study showed that girls from daily laborer fathers were twice more likely to be malnourished than those whose fathers were merchants. Similarly undernourishment was severe on girls from uneducated mothers (Roba *et al.*, 2016).

A school based cross sectional study was conducted among 535 secondary school adolescent to assess the prevalence and associated factors of stunting in Tehuledere district, Northeast Ethiopia. The result revealed that overall prevalence of stunting among the adolescents (10-19 years) was 15.5% being male, being in the age group 13-16, using unsafe drinking water supply and having no latrine facility were found significantly associated with stunting at P value  $<0.05$  (Abay *et al.*, 2018). Similarly, a study conducted by Amha and Girum (2018), indicate that overall prevalence of thinness among adolescent girls who attend governmental school in Aksum town was 12.6%.

Age of the respondent, education status of mother, menstruation status, individual dietary diversity and wealth index were significantly associated with thinness of adolescent girls.

Yeshalem and Amanu (2018) conducted a cross-sectional study to assess factors associated with under nutrition among school adolescents in Dangila Town, Northwest Ethiopia, analyzed using bivariate and multivariable logistic regression showed that prevalence of stunting and thinness were 24.8 % and 7.1 %, respectively. Male gender, infrequent food intake, unavailability of latrine, and poor hand washing practice were independent predictors of stunting. Factors associated with thinness were being male, illness in the last two weeks and having more than five family members.

#### **2.3.4. Determinants of nutritional status among people living with HIV/AIDS**

A study conducted in two districts of Kerala involved fifty HIV positive participants undergoing ART. By conducting interview information on socio-economic background, dietary profile and clinical patterns were obtained. The results of the study showed that poor socio-economic status was noticed among PLWHA. The results also showed that knowledge of nutrition directly influenced the health and nutritional status of respondents in addition to anthropometric parameters (Aishwarya, 2015).

Another study by Francis *et al.*, (2015) assessed the nutritional status of HIV-infected adolescents enrolled into HIV care program in Uganda showed that the prevalence of stunting was 36.2% (72/199) with 11.1% (22/199) of adolescents being severely stunted. The risk factors for stunting included being male and residence in rural settings. Eighteen percent of the adolescents (36/200) were thin, 8% (16/200) being severely thin.

Cross-sectional study conducted in Nepal to estimate the prevalence of under-nutrition among People living with HIV (PLHIV) and identify risk factors and assess correlations with PLHIVs' quality of life (QoL) and nutritional status. The bivariate and multivariate analysis result showed that one in five PLHIVs was found to be under nourished, Illiteracy, residence in care homes, CD4 cells count <350 cells/mm, OIs, and illness at WHO clinical stages III and IV were found to be significant predictors of under nutrition. BMI was significantly correlated with three domains of QoL (psychological, social and environmental) (Rajshree *et al.*, 2015).

A study by Kabalimu *et al.*, (2018) implemented to determine the prevalence and factors associated with malnutrition among adult PLHIV attending care and treatment center (CTC) in Temeke

District, Tanzania. The finding indicated the prevalence of malnutrition among participants was 19.4%. Those with severe malnutrition comprised of 9%. Significant association was noted between malnutrition and irregular income and also inability to get at least two meals a day. Severe malnutrition was significantly associated with the CD4+ counts of <200 cells/mm.

Institution based cross-sectional study was conducted on 301 HIV positive children aged 6 months to 14 years in the Pediatric ART clinics of Felege Hiwot and Gondar referral hospitals, Northwest Ethiopia. It aimed to determine the prevalence and associated factors of malnutrition among HIV-positive children at the two referral hospitals. The result indicate that there is a high burden of malnutrition among children living with HIV/AIDS. Age of the child, duration of follow-up at HIV clinic, absence of dietary counseling, presence of eating problems, late HIV diagnosis and low monthly income were significantly associated with malnutrition (Berihun *et al.*, 2009). Also, cross-sectional study conducted at ART clinic at Jimma University Specialized Hospital (JUSH) in Ethiopia, to determine the prevalence and correlates of food insecurity among HIV-infected individuals receiving highly active antiretroviral therapy in resource-limited settings. Thus the result showed that Food insecurity is a significant problem among PLWHA on HAART. Lower educational status and low family income were the predictors of food insecurity (Ayele *et al.*, 2012).

Institution based cross sectional study conducted at Dilla University referral hospital to assess the prevalence and factors associated with malnutrition among people living with HIV/AIDS revealed that using binary logistic regression analysis the overall prevalence of malnutrition was 12.3%, unemployment, WHO clinical AIDS stage four, one and more number of previous opportunistic infections and gastrointestinal symptoms were found to be important risk factors for malnutrition among people living with HIV/AIDS (Solomon *et al.*, 2013). Similarly, a study by Sisay, (2014), employed to assess the prevalence of malnutrition (over and under nutrition) and its associated factor among adult PLWHA in Hawassa city health facilities, the data analyzed using bivariate and multivariate logistic regression showed that nutritional support and body weight loss percentage of greater than 10% were predictor of undernutrition while, CD4 count less than 200cell/mm, getting nutritional support, Daily eating pattern of the last six month, eating difficulties and age were predictor of over nutrition.

In the same way, Dereje *et al.*, (2015) performed a study on the prevalence of malnutrition and its associated factors among adult people living with HIV/AIDS and receiving anti-retroviral therapy (ART) at Butajira Hospital, southern Ethiopia using both bivariate and multivariate logistic regression analyses. The result indicate that overall prevalence of malnutrition was 25.2% of which 49, 19, and 9 patients were mildly, moderately, and severely malnourished, respectively. Living in rural area, anemia, and intestinal parasitic co-infection were significantly associated with malnutrition.

Another study conducted to assess nutritional status and associated risk factors of patients living with HIV/AIDS following Anti Retro viral Therapy on 423 ART users at Nekemte Referral Hospital and Nekemte health center, Ethiopia. The result revealed that both HIV/AIDS and malnutrition independently cause progressive damage to the immune system and increased susceptibility to infection. ART interruption and presence of opportunistic infection (tuberculosis) were significantly associated with nutritional statuses of the adults on the ART in the study area. From 19 clients that have TB (75.9%) of them are malnourished and interrupting treatment was seen to contribute to malnutrition for the respondents (Meskerem *et al.*, 2015). According to a study by Habtamu *et al.*, (2016) conducted to assess the prevalence of malnutrition and associated factors among HIV/AIDS patients admitted to Jimma University Specialized Hospital (JUSH), which assessed the nutritional status of 109 HIV/AIDS patients and it concluded that the prevalence of malnutrition was found to be high. WHO Stage 4 disease and CD4 count <200cells/ $\mu$ l were independent predictors of malnutrition.

A cross-sectional study conducted to assess Magnitude of stunting, thinness and associated factors among pediatric age group (<15 years) HIV positive children who are on chronic HIV care and support follows up at Adama Hospital Medical College (AHMC), Ethiopia. The finding discovered that Stunting among children on chronic HIV care and support is low (13.4%) but thinness is very high (21.8%). On Multivariable logistic regression and BMI for age analysis, variables like Male Sex and Problem of eating, Age greater than 10 years and Monthly income of caregiver shows significant association with thinness. Parental status, Presence of opportunistic infection and dietary pattern were significantly associated with stunting (Asiya *et al.*, 2017).

Likewise, another institutional cross-sectional study conducted at Zewditu Memorial Hospital on 395 HIV/AIDS patients taking HAART to investigate the association of nutritional status and CD4 cell counts. It concluded that although there was no statistically significant association between nutritional status and CD4 cell counts, malnutrition is continued as a problem in HIV/AIDS patients taking HAART. So regular follow-up mainly nutritional and opportunistic infections assessment is necessary (Daniel *et al.*, 2017). Additional, institutional based cross sectional study conducted to assess the magnitude of undernutrition and associated factors among adult on highly active antiretroviral therapy (HAART) in Wolaita Sodo University referral Hospital. Multivariable logistic regression analysis revealed that, not having food, low baseline CD4 count, being male, and lack of formal education were significantly associated with under nutrition (Lula *et al.*, 2017).

Similarly, Institutional-based cross-sectional study conducted to assess nutritional status of adults living with HIV/AIDS receiving ART in Dilla University Referral Hospital, Gedio zone, Southern Ethiopia on 389 PLWHA adults taking ART drug at the hospital. In addition to clinical factors, food insecurity and low dietary diversity status were found as important risk factor associated with malnutrition. The study concluded that, since only ART cannot solve the problem of malnutrition, attention needs to be given to improve income, food security, feeding habits and dietary diversity of PLWHA (Mahlet *et al.*, 2017).

Facility based cross-sectional study conducted aiming to assess undernutrition and factors associated with, among people living with human immunodeficiency virus (HIV) and on antiretroviral therapy (ART) in hospitals, East Hararge Zone, Oromia. The finding implied that the undernutrition was found to be high and its problem in HIV-positive patients are interworsen. Diarrhea, severe food insecurity, nutritional care and support, khat chewing, CD4 >200/ $\mu$ l, and duration on ART >12 months were independently associated with undernutrition. Comprehensive nutritional assessment during follow up and routine nutritional supplement therapy for undernutrition in conjunction with early start on ART need to be initiated (Mulgeta *et al.*, 2017).

Another study at Nigest Elleni Mohammed Memorial Hospital in Hosanna Town revealed that among 234 adult HIV/AIDS clients in rolled in ART, 32.5% of them were under nourished ART patients had no nutritional supports, patients who feed less than 3times in a day and had smoking habit were more likely to be under nourished and those patients in WHO clinical stage were less likely to be under nourished (Wondmagegn *et al.*, 2017). Also, a study conducted by Delelegn *et*

*al.*, (2018), to determine food insecurity and nutritional status and contextual determinants of malnutrition among HIV/AIDS patients in West Shewa Zone. Logistic regression analyses were conducted to determine independent factors associated with malnutrition and the result indicate that factors significantly associated with malnutrition among HIV/AIDS patients were unemployment, WHO clinical stages III/IV, CD4 count less than 350 cells/ $\mu$ l, tuberculosis, duration on antiretroviral therapy, and household food insecurity.

### **2.3.5. Research gap**

Thus based on the above literatures there are different determining factors on adolescent nutritional status and also people living with HIV/AIDS, but there is a gap in investigating, identifying and documenting the problem of adolescents who are living with HIV/AIDS. Furthermore, there is no adequate research conducted to quantify the problem of nutrition status in adolescents living with HIV/AIDS. However, the fact that patients of this age group have high risk and vulnerable to malnutrition. Because in this age group adolescents undergo rapid and fast developmental changes physically and physiologically that prepares them for the adulthood and their growth basically depends on nutrition. Therefore, there is a gap of detecting and investigating the problem of nutrition status of adolescents living with HIV/AIDS. Thus, this study tried to fill the gap and come up with new evidences.

### **2.4. Conceptual framework**

The framework below shows how different factors affect the nutrition status of adolescents living with HIV/AIDS. Some of the factors that affect Nutritional status of adolescents such as demographic factors collaborate age of the adolescent, sex of the adolescent, family size, number of children in the house, birth rank of the adolescent; Socio-economic factors which include parental status, primary caregiver of adolescent, education status of the primary caregiver/parent which related with directly or indirectly with the employment status of the parent/primary caregiver as well as average monthly income of the family, adolescent level of education, place of residence and state grant support; health status factors integrates ART duration in months, initial CD4 counts, most recent viral load, clinical stage Pre-ART, current clinical stage, history of opportunistic infection, immunization status, illness during the last 3 months earlier to the data collection, previous weight and height; dietary supplement include feeding support, nutritional counseling, child receiving multivitamins, source of food consumption and Individual Dietary

Diversity Score; environmental factors include source of drinking water ,type of toilet, garbage disposal, methods of cleaning utensils, perishable foods storage and hand washing practice. These all factors shows in a single arrow directly affects the nutritional status of the adolescents.

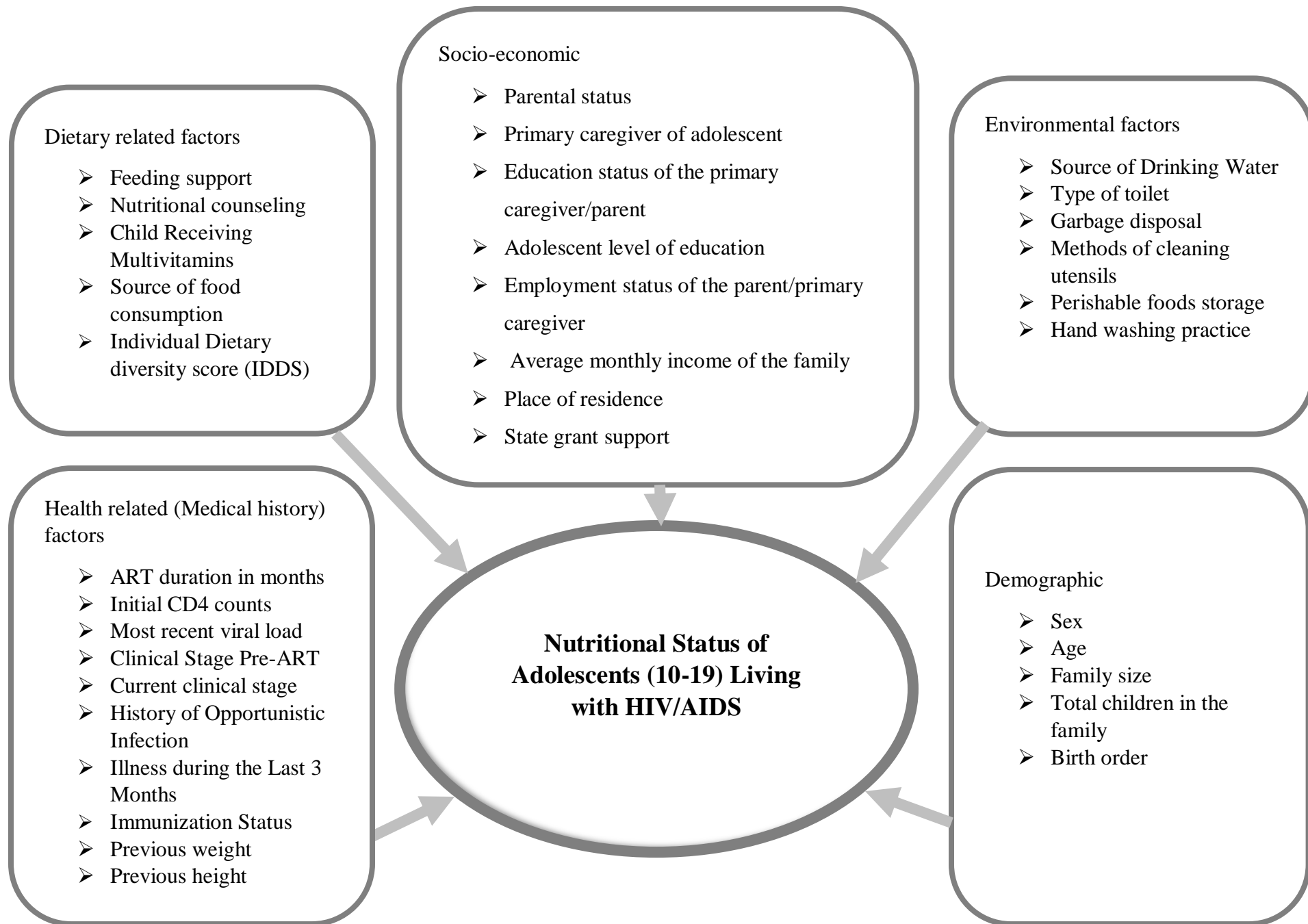


Figure 1: Conceptual framework for determinants of nutrition status of adolescents living with HIV/AIDS, (source: own constructed)

## CHAPTER THREE: DESCRIPTION OF THE STUDY AREA AND THE RESEARCH METHODS

### 3.1. Description of the study area

This research was conducted in Addis Ababa, the capital of Ethiopia, in Zewditu Memorial Hospital (ZMH) which is found in Addis Ababa, Kirkose Sub City *woreda* 7 and lies on estimated 32,946 square meters. The hospital started providing health care service in 1963 E.C by the help of American Missionaries. The hospital provides many health care services like surgical (general surgery, plastic surgery, neurosurgery), internal medicine, gynecology and obstetrics, maternity, emergency, special clinics (dermatology, psychiatric, neurology), pediatrics, pharmacy and diagnostic services including HIV counseling and testing, ART.

ZMH has the first HIV counseling and testing and model ART center in the country, which was launched by CDC-Ethiopia in July 2003 and in March 2005 respectively. It became the largest HIV clinic in Ethiopia; more than 18,000 HIV/AIDS patients are enrolled and following ART to date in its care. Currently, around 661 HIV/AIDS patients attending the ART clinic are under the age of 19 and among them 535 are between the 10-19 years and the rest are 0-9 years. Since, ART programs have been initiated in 12 other hospitals around country, relieving pressure on hospital.

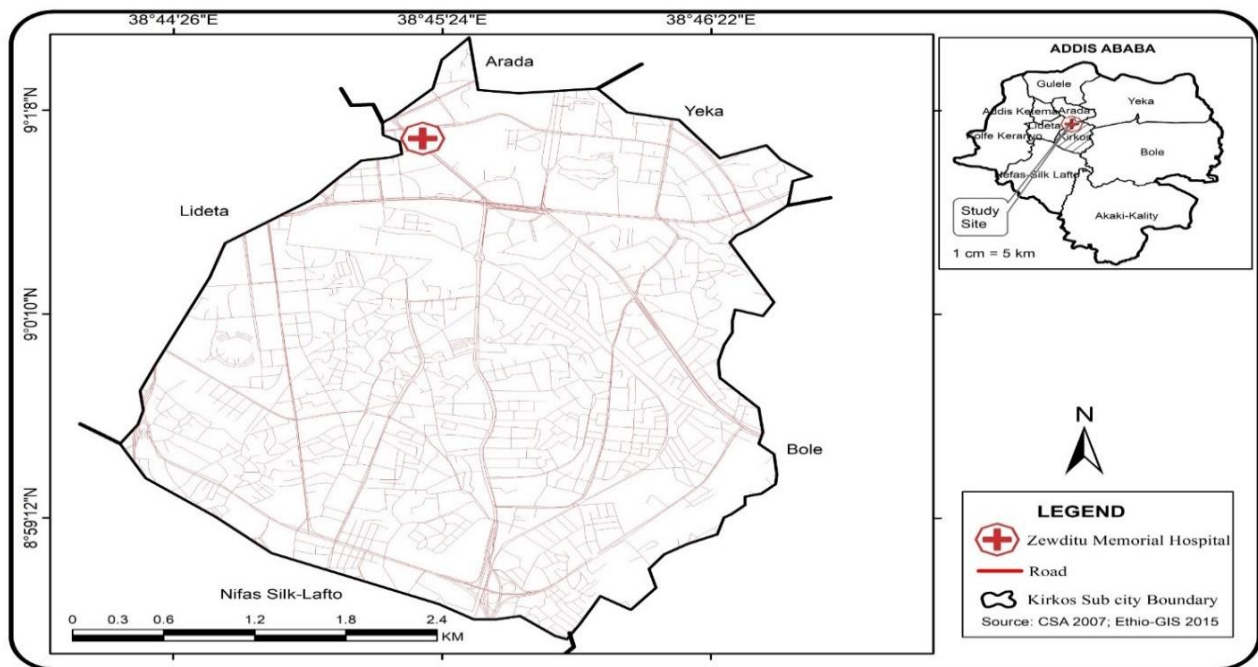


Figure 2: Map of the study area (Source: Central statistics agency (CSA), 2007)

### **3.2. Study design**

Institutional based cross sectional study design was used to assess the determinants of nutritional status among adolescents living with HIV/AIDS attending ART clinic at ZMH. It used both qualitative and quantitative research approach. Qualitative research approach was undertaken to present the data in the form of description through conducting key informant interview to provide more fullness to the data or discussion with the quantitative finding of the study. Moreover, Quantitative research methods was used to provide the major connection between empirical observation and scientific expression of variables under the survey and computed the result through statistically summary or analysis. The survey was conducted from January 26 to February 26, 2019.

### **3.3. Study population**

The study population was all eligible adolescent (10-19 years) receiving ART services in Zewditu memorial hospital (ZMH) by considering inclusion and exclusion criteria. People who were receiving ART services in the ZMH were considered as source population for the study population.

### **3.4. Inclusion and exclusion criteria**

#### **Inclusion criteria**

Adolescents (10-19) living with HIV/AIDS that had ART follow up at the hospital and their parents or caregiver who are living with them were included in the study.

#### **Exclusion criteria**

Adolescents who were not taking or withdraw their medication and who just came to check their HIV status were not included. Due to the unavailability of skin fold measuring tool adolescents with lower extremity problems were excluded, since it is difficult to know their BMI in the absence of their height. Also ethnic groups and religion of adolescents were not assessed since it is a sensitive issue with the subject under study.

### **3.5. Data sources**

The data was collected from primary and secondary data sources. Primary data was collected from the eligible respondents and their parent or caregiver through structured questionnaire and anthropometric measurements. Secondary data patient registration and medical history review/record from the hospital data registry.

### 3.6. Sample size determination, sampling techniques and procedures

#### 3.6.1. Sample size determination

To determine the adolescents to be included in the study, Kothari (2004) sample size determination for finite population formula were applied in order to get representative sample size.

Thus,

$$n = \frac{z^2 pq}{d^2}$$

Where,

**n** = is the desired sample size;

**z** = is standard normal variable at the required confidence level (Z statistics: 1.96);

**d** = is the desired level of precision or level of statistical significance/margin of error the researcher wills to accept (0.05);

**p** = is estimated proportion of an attribute that is present in the population characteristic of target population (expected prevalence)

**q** = is 1-p.

To estimate the sample size the expected prevalence for ZMH is not known the predictability in proportion of prevalence. Therefore, assume  $p = 0.5$  which is the maximum expected prevalence. In view of that, the desired level of confidence 95% and 5% level of precision. Thus, estimated sample size to be:

$$n = \frac{(1.96)^2(0.5 \times 0.5)}{(0.05)^2} \approx 384$$

Using Finite population correction for proportion, was done to produce a sample size that was proportional to the population. Therefore, the sample size (n) was calculated using the formula:

$$n_f = \frac{n}{1 + \frac{(n-1)}{N}}$$

Where,

**n** = the desired sample size

**n<sub>f</sub>** = the final sample size

**N** = the total population size, which is according to the hospital record unit, currently the total number of population of adolescents (10 -19 years) living with HIV/AIDS attending ART clinic at Zewditu Memorial Hospital is 535.

$$n_f = \frac{384}{1 + \frac{(384 - 1)}{535}} \approx 226$$

By adding 10% to the sample size for expected non-response rate, the final sample size of adolescents (10 – 19 years) living with HIV/AIDS attending ART clinic to participate in the study was:

$$n_f = 226 \times 10\% = 226 + 23 = \mathbf{249}$$

### **3.6.2. Sampling techniques and procedures**

The study area was selected purposively from all hospitals in Addis Ababa where ZMH is the first and model organized ART clinic. The populations were Adolescents (10-19 years) living with HIV/AIDS attending ART clinic at Zewditu Memorial hospital and who were volunteer to participate in the study. Each patient was studied only once, on his/ her visit during the study period, if selected. Repeated visits were excluded by recording registration numbers of each client at the time of interview and checking thereafter for avoidance of possible repetition. The study participants were selected randomly. Each respondents get equal chance by using simple random selection based on their availability at the clinic on the days where the questionnaire was conducted.

### **3.7. Data collection instrument and procedure**

Structured questionnaire was administered to eligible respondents (adolescents and their parents or caregivers) to collect quantitative data. The information was collected by 2 BSc nurses who were working in Adolescents ART clinic and nutrition counselors with similar experience. An orientation was given by the researcher on the administration of questionnaire and anthropometric measurement before data collection. Key informant interview was conducted to the health professionals who are working in the clinic with long time rational experience and knowledge to get the Qualitative information on the title under research. In addition expert patient adherence counselors (volunteers) who work with the adolescents were contacted and interviewed.

Moreover, nutrition status evaluation was done using anthropometric measurements. Evaluation includes weight of adolescents which was taken using electronic digital weight scale and it was adjusted at zero before and after each measurement, height was measured using the standard meter, and then BMI for age and height for age was calculated using WHO AnthroPlus version 1.0.4

accordingly. In addition medical history and related factors like past and recent CD4 counts/Viral load, history of opportunistic infections, WHO clinical stages of disease progression, previous weight and height were referred from patient charts and ART follow-up forms of the study participant. Furthermore, the questionnaire was translated from English into Amharic by an expert to maintain its consistency.

According to FANTA (2006), if the research objective is to assess nutrient adequacy of the population, then dietary diversity should be collected using dietary diversity indicators at the individual, not household, level (e.g. MDD-W and MDD ). Dietary diversity scores have been validated for several age/sex groups as proxy measures for macro and/or micronutrient adequacy of the diet. Scores have been positively correlated with adequate micronutrient density of complementary foods for infants and young children (FANTA, 2006), and macronutrient and micronutrient adequacy of the diet for non-breast fed children, adolescents (Mirmiran *et al.*, 2004) and adults (Arimond *et al.*, 2010).

Individual dietary diversity score (IDDS) was collected using standard questionnaire, which consists of 7 food groups in order to construct the dietary diversity measure proposed by Swindale and Bilinski (2006): (i) grains, roots or tubers; (ii) fruits and vegetables; (iii) meat, offal and fish, (iv) eggs; (v) pulses and legumes; (vi) milk and dairy products; (vii) food cooked in oil or fat. The dietary diversity measure accordingly ranges from 0 to 7, which respectively indicates whether has been consumed any or all of the food groups in the past 24 hours. This index was selected as it is specifically validated to provide a proxy of nutritional status of children and adolescents in low- and middle-income countries suggested by Aurino, (2016). Every respondent was asked about the food taken during the last 24 hours inside and outside the home. From 7 food groups who consumed at least 4 food groups in the previous day (24 hours recall) obtain as minimum dietary diversity (MDD).

### **3.8. Data processing and analysis**

Quantitative data obtained through survey questionnaire were edited, coded cleaned and entered in to computer for analysis using Statistical Packages for Social Science (SPSS version 22) software and WHO AnthroPlus software version 1.0.4 was used to convert raw anthropometric data into z-scores based on the WHO (2007) standard for children and adolescents for stunting

(Height-for-Age Z-score) and for Thinness (BMI-for-Age Z-score), then recoded the data of WHO AnthroPlus was imported to STATA version 14 for further analysis.

### **3.8.1. Descriptive statistics analysis**

To analyze mean, percentage, frequencies and the statistical significance difference among dependent and independent variables, different tests were employed. Categorical or dummy variables were analyzed using chi-square test, while for the statistical significance difference of the continuous variables was tested using t-test and result presented by tables. A *P*-value less than 0.1, 0.05 and 0.01 were considered as the level of statistical significance.

### **3.8.2. Statistics analysis**

To estimate the relationship between nutrition status and the determining factors as well as their influence on the outcome variables ordered logit model was employed. The application of the ordinal regression model was dependent, in large part, on the measurement scale of the variables and the underlying assumptions. Ordinal logistic regression model is a type of logistic regression model that are used to analyze ordinal dependent variables. For instance, if the dependent variable (outcome variable) is in ordinal scale (ordered adolescent nutritional status as stunting (severely stunted, moderately stunted, normal) and Thinness (sever thin, moderate thin and normal) as in this study), the ordinal regression model was a preferred modeling tool which does not assume normality or constant variance, but requires the assumption of parallel lines across all levels of the outcome variable (McCullagh and Nelder, 1989).

According to Hill *et al.*, (2018), ignoring the ordinality of the variable and treating it as nominal i.e. use multinomial logit techniques, the key problem here is a loss of efficiency. By ignoring the fact that the categories are ordered, it will fail to use some of the information available and it may estimate many more parameters than is necessary. This increases the risk of getting insignificant results. But, the parameter estimates still should be unbiased.

Therefore, Ordinal logistic regression will be applied to ordinal regression method of analysis to meet the objectives set since the response variable (nutrition status of the Adolescent ) in the study has three ordered categories (Severe, moderate and normal) for both of nutritional status indicator stunting and Thinness and the value of each category has a meaningful sequential order. According to (Stata Corp, 2013), the model can be presented the following equation.

Suppose Y is an ordinal dependent variable, this works for both outcome variables Stunting and Thinness.

$$Y = \begin{cases} 1 & \text{severe} \\ 2 & \text{moderate} \\ 3 & \text{normal} \end{cases}$$

The probability of a given observation for ordered logit:

$$p(y \leq j) = p(y = 1) + p(y = 2) + p(y = 3) + \dots + p(y = j) \quad (1)$$

Where,  $p(y \leq j)$  denotes the probability that the response on (Y) falls in the category (j) or below (i.e. in category 1, 2, 3.....or j) this called cumulative probability.

$$p(y \leq 1) + p(y \leq 2) + p(y \leq 3) + \dots + p(y \leq c) = 1 \quad (2)$$

In ologit model an underlying probability score for an observation of being in the  $i^{th}$  response category is estimated as a linear of independent variables and set of cut points. The probability of observing response category  $i$  corresponds to the probability that the estimated linear function, plus random error, is within the range of the cut points estimated for that response.

$$p_{ij} = p(k_{i-1}) < b_1 x_{1j} + b_2 x_{2j} + b_3 x_{3j} + b_k x_{kj} + u_j < x_j \quad (3)$$

The coefficients and the cut points are estimated using maximum likelihood. It is necessary to estimate the coefficients  $b_1, b_2, b_3 \dots b_k$ , along with cut points  $k_1, k_2, k_3 \dots k_{i-1}$ . Where (i) is the number of possible response categories of dependent variable.

### 3.9. Diagnostic tests

Before analyzing the dependent and independent variables using ologit model analysis all necessary model diagnostic tests have been done. A pair of wise correlation tests were employed to test if there is correlation between independent variables. Multicollinearity is a statistical phenomenon in which there exists a perfect or exact relationship between the predictor variables (Gujarati, 2004). If the correlation of above 0.8 and below -0.8 indicate serious multicollinearity problem (Stock and Watson, 2003). So for the determining factors affecting stunting the correlation coefficients between explanatory variables were below 0.7711 and above -0.0026

(see appendix 5). Although for the determining factors affecting thinness correlation coefficients between explanatory variables found to be below -0.7655 and above -0.0016 (see appendix 5).

Moreover, the link test result for the determining factors affecting stunting the p-value of hatsq is 0.281(see appendix 6) and for the determining factors affecting thinness the p-value of hatsq is 0.533 (see appendix 6). This implies that if the p-value of hatsq is insignificant then conclude that the model is correctly specified.

### **3.10. Hypothesis and definition of variables**

There are two variables in the study:

#### **Outcome Variable**

Nutrition status of adolescents living with HIV/AIDS as indicated by stunting (height for age) and Thinness (BMI for age) was used as dependent variables.

#### **Predictor Variables**

These are the determining factors and influencing factors of nutritional status of adolescents living with HIV/AIDS which composed of demographic, socio-economic, environmental factors, health status (medical history), dietary supplement and dietary diversity habits will be used. Some of the selected independent variables are indicated in the following table.

Table 1: Types of Explanatory Variables, and Expected Sign

<b>Explanatory Variables</b>	<b>Type of Variable</b>	<b>Expected Sign</b>
<b>Demographic Factors</b>		
Sex of the adolescent	dummy	+ or -
Age of the adolescent	continuous	-
Family size	continuous	-
Number of children living in the house	continuous	-
Birth rank	continuous	-
<b>Socio-economic Factors</b>		
Parent status	categorical	+ or -
Primary caregiver of adolescent	categorical	+ or -
Education status of the primary caregiver/parent	categorical	+ or -
Employment status of the parent/primary caregiver	categorical	+ or -
Adolescent level of education	categorical	+ or -
Place of residence	categorical	+ or -
State grant support	Dummy	+
Average household income	categorical	+ or -
<b>Environmental Factors</b>		
Source of drinking water	categorical	+ or -
Type of toilet	categorical	+ or -
Garbage disposal	categorical	+ or -
Methods of cleaning utensils	categorical	+ or -
Perishable foods storage	categorical	+ or -
Hand washing practice	categorical	+ or -
<b>Health Related Factors</b>		
ART duration in months	continuous	+
Initial CD4 counts	continuous	+ or -
Most recent viral load	continuous	+ or -
Clinical stage pre-HAART	continuous	-
Current clinical stage	continuous	+

History of opportunistic infection	Dummy	-
Illness during the last 3 months	categorical	-
Immunization status	categorical	+ or -
<b>Dietary related factors</b>		
Feeding support	dummy	+
Nutritional counseling	Dummy	+
Child receiving multivitamins	Dummy	+
Source of food consumption	categorical	+ or -
Individual dietary diversity score	Dummy	+ or -
<b>Previous anthropometric measurement</b>		
Previous weight	continuous	+ or -
Previous height	continuous	+ or -

NB: (+) sign indicate as the predictor variable increase the probability of being stunted and thinness increases. (-) sign the inverse relationship between the predictors and the nutrition status.

## CHAPTER FOUR: RESULTS AND DISCUSSIONS

This chapter presents the analysis and discussion of the data obtained from the study using structured questionnaire, anthropometric measurement and key informant interview. Descriptive statistics and statistical model analysis were applied to describe the relation between dependent variables with explanatory variables and the effect of explanatory variables on the dependent variables are also presented.

### 4.1. Descriptive Statistics on linkage between Nutritional Status and Determinants

According to WHO (2007), nutrition status as appropriate indicator for adolescent is height-for-age (stunting) and BMI-for-age (thinness). Comparison between nutrition status and demographic characteristics has been done by using the two indicators and the variables also classified as continuous and categorical.

The values with statistically significant result of t test and chi-square test are described below, where as the result of t-test for continues variables and chi-square test for categorical variables which were found to be not significant compared to the dependent variables are presented in the annex part (see annexes 1-4).

#### 4.1.1. Nutrition status and demographic characteristics of the respondents

As it is shown in the table 2, there is statistically significant mean difference on age of adolescent and birth order with being stunted and normal. The average adolescent age of stunting is 15.25 years and 16.54 among adolescents with normal group at 1% significance level. Also an average birth order among stunted and normal adolescents were 1.83 and 1.55 respectively with P-value of 0.0438.

Table 2: Demographic characteristics and Stunting for Continuous Variables

Variables	Stunted		Normal		Total		P-value	T-value
	Mean	SD	Mean	SD	Mean	SD		
Age	15.25	2.49	16.54	2.75	16.06	2.72	0.0005***	-3.5509
Birth order	1.83	1.01	1.55	0.97	1.65	0.99	0.0438**	2.0273

Source: Analyzed based on own data set (2019)

NB: \*\* and \*\*\* show significance at 5% and 1% respectively; Standard deviation (SD)

As it is presented in the table 3 below, from the total of 226 respondents, 124 were female adolescents and the rest 102 were male. The sex difference observed was also found to be statistically significant for stunting with a Chi-square value of 0.042 which is significant at (P<0.05) level of significance.

Table 3: Demographic characteristics and Stunting for Categorical/ Dummy Variables

Variables	Category	Stunting				Normal		Total		Chi-square
		Severe		Moderate		N	%	N	%	
		N	%	N	%					
Sex	Female	12	44.44	25	43.86	87	61.27	124	54.87	0.042**
	Male	15	55.56	32	56.14	55	38.73	102	45.13	

Source: Analyzed based on own data set (2019)

NB: \*\* significance at 5%; Number (N)

The result presented in the table 4, indicates the average age among thin and normal adolescents has shown statistically significant difference with 15.19 years and 16.93 years respectively, at 1% significance level.

Table 4: Demographic characteristics and Thinness for Continuous Variables

Variables	Thin		Normal		Total		P-value	T-value
	Mean	SD	Mean	SD	Mean	SD		
Age	15.19	2.67	16.93	2.50	16.06	2.73	0.0000***	-5.0635

Source: Analyzed based on own data set (2019)

NB: \*\*\* show significance at 1%; Standard deviation (SD)

#### 4.1.2. Nutrition status and socio-economic characteristics of the respondents

Most of the severely stunted adolescents 18(66.67%) and moderately stunted 28(49.12%) had primary level education. Whereas adolescents who were in secondary educational level and above were having normal height for age measurements. Therefore, for stunting the increase in educational level had a significant positive influence with P-value of 0.032.

In addition, the chi-square test shows that there is relationship between place of residence and stunting, and it is found to be statistically significant with a value of 0.032. Urban resident adolescents were found to be severely 23(85.19%) and 45(78.95%) were moderately stunted. The study also revealed that adolescents who were found to be normal resides in urban place. This implies that majority of the respondents were from urban place, (see table 5 below).

Table 5: Socio-economic characteristics and Stunting for Categorical/Dummy Variables

Variables	Category	Stunting				Normal		Total		Chi-square
		Severe		Moderate		N	%	N	%	
		N	%	N	%					
Adolescent level of education	Primary edu.	18	66.67	28	49.12	50	35.21	96	42.48	0.030**
	Secondary edu.	8	29.63	22	38.60	57	40.14	87	38.50	
	Polytechnic/Vocational	0	0	1	1.75	7	4.93	8	3.54	
	College/University	1	3.70	6	10.53	28	19.72	35	15.49	
Place of Residence	Rural area	0	0	4	7.02	3	2.11	7	3.10	0.032**
	Urban area	23	85.19	45	78.95	132	92.96	200	88.50	
	Peri-urban area	4	14.81	8	14.04	7	4.93	19	8.41	

Source: Analyzed based on own data set (2019)

NB: \*\* probability at 5%; Number (N)

The result shows in the table below, that the mean average of monthly income of a family was 2492.7 for thin adolescent and 3514.6 for normal adolescents and it has shown statistically significance difference among thin and normal adolescents with a P-value 0.0014.

Table 6: Socio-economic characteristics and Thinness for Continuous Variables

Variables	Thin		Normal		Total		P-value	T-value
	Mean	SD	Mean	SD	Mean	SD		
Average monthly income of the family	2492.7	1705.9	3514.6	2890.5	3003.7	2422.8	0.0014***	-3.2364

Source: Analyzed based on own data set (2019)

NB: \*\*\* show significance at 1%; Standard deviation (SD)

Table 7: Socio-economic Characteristics and Thinness for Categorical Variables

Variables	Category	Thinness				Normal		Total		Chi-square
		Severe		Moderate		N	%	N	%	
		N	%	N	%					
Parent status	Both parents alive	3	17.65	36	37.89	45	39.47	84	37.17	0.022**
	Both parents alive but only one parent support	1	5.88	10	10.53	10	8.77	21	9.29	
	Widowed mother	7	41.18	22	23.16	14	12.28	43	19.03	
	Widowed father	4	23.53	15	15.79	14	12.28	33	14.60	
	Both parents deceased	2	11.76	12	12.63	31	27.19	45	19.91	
Mother employment status	Deceased/doesn't live with them	6	35.29	26	27.37	45	39.47	77	34.07	0.021**
	Unemployed	2	11.76	6	6.32	1	0.88	9	3.98	
	Employed	4	23.53	20	21.05	38	33.33	62	27.43	
	Self-employed	1	5.88	14	14.74	13	11.40	28	12.39	
	Others	0	0	3	3.16	0	0	3	1.33	
	Housewife	4	23.53	26	27.37	17	14.91	47	20.80	
Primary Caregiver level of education	Doesn't have caregiver/living with their biological parents	15	88.24	80	84.21	83	72.81	178	78.76	0.039**
	None	0	0	5	5.26	2	1.75	7	3.10	
	Primary education	0	0	0	0	7	6.14	7	3.10	
	Secondary education	2	11.76	3	3.16	11	9.65	16	7.08	
	Technical/Vocational	0	0	2	2.11	5	4.39	7	3.10	
	College/University	0	0	2	2.11	6	5.26	8	3.54	
	Don't know	0	0	3	3.16	0	0	3	1.33	
	First caregiver employment status	Doesn't have caregiver/living with their biological parents	15	88.24	80	84.21	83	72.81	178	
Unemployed		1	5.88	5	5.26	1	0.88	7	3.10	
Employed		0	0	5	5.26	16	14.04	21	9.29	
Self-employed		1	5.88	2	2.11	11	9.65	14	6.19	
Others		0	0	3	3.16	3	2.63	6	2.65	
Adolescent level of education		Primary education	12	70.59	45	47.37	39	34.21	96	42.48
	Secondary education	5	29.41	44	46.32	38	33.33	87	38.50	
	Polytechnic/Vocational	0	0	1	1.02	7	6.14	8	3.54	
	College/University	0	0	5	5.26	30	26.32	35	15.49	

Source: Analyzed based on own data set (2019)

NB: \*\* and \*\*\* probability at 5% and 1%, respectively; Number (N)

As it is seen in the table 7, regarding thinness and socio-economic characteristics the chi square test showed that parent status statistically significant with a value of 0.022, mother employment status statistically significant with a value of 0.021, primary caregiver level of education and primary caregiver employment status statistically significant at 5%. Whereas adolescent level of education statistically significant with a value of 0.000.

Adolescents with widowed mothers account for 7(41.18%) and those with widowed fathers are 4(23.53%) found to be severely thin. From moderately thin adolescents 36(37.89%) live with both their parents and 22(23.16%) were their father deceased and mother alive. Regarding mother's employment status adolescents who live with both employed and housewife mothers accounted equal number 4(23.53%) for severely thin, and the majority adolescents 26(27.37%) who found to be moderately thin live with house wife mothers. While adolescents who found to be normal 38(33.33%) live with employed mothers. To conclude the result showed 77(34.07%) of the adolescents did not live with their mothers (see table 7 above).

Furthermore, as it can be seen in table 7, majority of adolescents from the study population 178(76.76%) lived with their biological parents. Adolescents whose caregivers attended secondary level of education account the higher number 2(11.76%) for severely thin, whereas, the majority of moderately thin adolescents 5(5.26%) live with primary caregivers without any formal education. While 11(9.65%) of adolescent who found to be normal were living with caregivers who attended secondary level of education.

Employment of primary caregiver seems to be less influential regarding to thinness as it is observed from the study and presented in the above table. Accordingly, adolescents who found to be severely thin accounts equal number 1(5.88%) for unemployed caregivers and self-employed once, as well as adolescents who were moderately thin also the majority accounts the same number 5(5.26%) for both employed and unemployed caregivers. Those who found to be normal adolescents the majority of them 16(14.04%) were lives with employed caregivers and 11(9.65%) were lives with self-employed caregivers (see table 7 above).

Moreover, 12(70.59%) who found to be severely thin were adolescents who attended primary education, while the majority of adolescents who found to be moderately thin 45(47.37%) attended primary level education and 44(46.32%) were attended secondary education. From adolescents

who were normal 39(34.21%) and 38(33.33%) were attended primary education and secondary education, respectively (see table 7).

#### 4.1.3. Nutrition status and environmental factors

As it is shown in the table 8, the majority of severely stunted adolescent 23(85.19%) used pipe water, for moderately stunting were uses pipe water and public water supply accounts the majority, 46(80.70%) and 9(15.79%) respectively. 126(88.73%) were found to be have normal height for age and uses pipe water. Also, the chi-square statistic showed that there is statistically significant among the source of drinking water and stunting at 10%.

Table 8: Environmental characteristics and Stunting for Categorical Variables

Variables	Category	Stunting				Normal		Total		Chi-square
		Severe		Moderate		N	%	N	%	
		N	%	N	%					
Source of drinking water	Pipe water	23	85.19	46	80.70	126	88.73	195	86.28	0.089*
	Public water supply	4	14.81	9	15.79	12	8.45	25	11.06	
	Protected well/spring	0	0	0	0	4	2.82	4	1.77	
	Unprotected well/spring	0	0	2	3.51	0	0	2	0.88	
Garbage disposal	Open filed disposal	0	0	0	0	6	4.23	6	2.65	0.008***
	Segregated and dispose into disposal site	10	37.04	14	24.56	69	48.59	93	41.15	
	Disposed into disposal site without segregation	12	44.44	33	57.89	39	27.46	84	37.17	
	Segregated and burn	4	14.81	8	14.04	25	17.61	37	16.37	
	Burn without segregation	1	3.70	2	3.51	3	2.11	6	2.65	

Source: Analyzed based on own data set (2019)

NB: \*, \*\* and \*\*\* show significance at 10%, 5% and 1% respectively; Number (N)

From the households that severely stunted adolescents lives the majority 12 (44.4%) and 10 (37.04%) of them dispose garbage into disposal site without segregation and segregate and dispose into disposal site, respectively. Whereas, adolescents who are grouped in moderate stunting 14(24.56%) of them segregate the garbage and dispose in to disposal site and 33(57.89%) were dispose garbage in to the disposal site without segregating. The rest 142(62.8%) from the total of respondents were found to be normal even though they use different waste disposal methods, from

adolescents grouped in normal, the majority of them 69(48.59%) segregate the garbage and dispose in to disposal site and 39(27.46%) of them dispose the garbage into disposal site without segregation. Garbage disposal has shown a statistically significant relationship with stunting of adolescent with a chi-square value of 0.008 (see table 8).

The table 9 indicates, concerning environmental characteristics and thinness the chi square test showed that type of toilet were significant at 10% level of significance, perishable food storage were statistically significant with a value of 0.036, garbage disposal were statistically significant with a value 0.0009 and handwashing practice were significant at 10% level of significance. From the severely thin adolescents 9(52.94%) and 7(41.18%) were uses pit latrine and bucket, respectively. Respondents who founded to be moderately thin 64(67.37%) were uses pit latrine and 17(17.89%) were who use bucket toilets. While 60(52.63%) who use pit latrine and 25(21.93%) who use bucket toilet found to be normal.

Also, storing perishable foods in refrigerator and covering until cooked were accounts equal 7(41.18%) for severely thin adolescents, while for those who found to be moderately thin 48(50.53%) store perishable foods in refrigerator and 29(30.53%) of them covered perishable foods until cooked. Of the respondents who had normal BMI for age 71(62.28%) stored perishable foods in refrigerator and 26(22.81%) put perishable foods separately from already cooked food (see table 9).

As it is shown in table 9, Out of 226 respondents 6(2.65%) disposed garbage in an open field and among them 3(17.65%) were severely thin, 1(1.05%) was moderately thin and 2(1.75%) were normal. Respondents who segregate the garbage and dispose into disposal site hold the majority 93(41.15%) of which, 5(29.41%) were severely thin, 40(42.11%) were moderate thin and 48(42.11%) were normal. The number of study subjects who dispose into disposal site without segregation holds for 84(37.15%). Whereas, respondents who segregate and burn the garbage were 37(16.37%) of them 1(5.88%) were severely thin, 19(20%) moderate thin and 17(14.91%) were normal but 6 (2.05%) from the total respondents burn the garbage without segregation, of which 1(5.88%) were severely thin, moderately thin were 1(1.05%) and 4(3.51%) were normal.

Table 9: Environmental Characteristics and Thinness for Categorical Variables

Variables	Category	Thinness				Normal		Total		Chi-square
		Severe		Moderate		N	%	N	%	
		N	%	N	%					
Type of toilet	Flushable toilet	0	0	12	12.63	21	18.42	33	14.60	0.072*
	Pit Latrine	9	52.94	64	67.37	60	52.63	133	58.85	
	Bucket Toilet	7	41.18	17	17.89	25	21.93	49	21.68	
	Absolute toilet	0	0	2	2.11	4	3.51	6	2.65	
	No facilities or bush/field	1	5.88	0	0	4	3.51	5	2.21	
Perishable food storage	In the refrigerator (below 5 °C)/cool box	7	41.18	48	50.53	71	62.28	126	55.75	0.036**
	Covered (protected from insects, rodents, pests and dust)	7	41.18	29	30.53	17	14.91	53	23.45	
	Separated from cooked or ready-to-eat foods	3	17.65	18	18.95	26	22.81	47	20.80	
Garbage disposal	Open filed disposal	3	17.65	1	1.05	2	1.75	6	2.65	0.009***
	Segregated and dispose into disposal site	5	29.41	40	42.11	48	42.11	93	41.15	
	Disposed into disposal site without segregation	7	41.18	34	35.79	43	37.72	84	37.15	
	Segregated and burn	1	5.88	19	20.00	17	14.91	37	16.37	
	Burn without segregation	1	5.88	1	1.05	4	3.51	6	2.65	
Hand washing practice	Washes hands in a bowl of water	1	5.88	2	2.11	7	6.14	10	4.42	0.060*
	With someone pouring a little clean water from a jug onto one's hands	8	47.06	28	29.47	32	28.07	68	30.09	
	Wash under running water	2	11.76	20	21.05	39	34.21	61	26.99	
	Wash using soap/ashes and water	6	35.29	45	47.37	36	31.58	87	38.50	

Source: Analyzed based on own data set (2019): NB: \* and \*\* show significance at 10% and 5% respectively; Number (N)

The result also revealed that hand washing practice has shown a significant association with being thin or normal among adolescents. From severely thin class 1(5.88%) adolescents practiced poor handwashing, 8(47.06%) and 2(11.76%) of them apply the appropriate method of hand washing and 6(35.29%) wash using soap or ashes and water. Those who are found to be moderate thin 2(2.11%) wash their hand in a bowl of water, 28(29.47%) were responded that they wash their hand by the help of someone pouring a clean water from a jug while 20(21.05%) were said they wash under running water and 45(47.37%) were responded that they wash their hand by using water and soap or ashes. Although 7(6.14%) adolescents practiced poor hand washing, 32(28.07%) were practicing appropriate way, 39(34.21%) washes under running water and 36(31.58%) were wash their hand by water and soap found to be in normal BMI - for - age group. From the study result we can say that adolescents who use proper hand washing practice are less likely to be severely thin due to the reduction of disease causing organisms, by doing so they minimize their risk of getting infections.

#### 4.1.4. Health status (medical history)

Table 10: Health status (medical history) and Stunting for Continuous Variables

Variables	Stunted		Normal		Total		P-value	T-value
	Mean	SD	Mean	SD	Mean	SD		
Initial CD4 Count	415.8	248.3	338.1	258.4	367.0	256.9	0.0275**	2.2190
ART duration in month	87.73	46.72	101.3	43.25	96.27	44.95	0.0277**	-2.2156

Source: Analyzed based on own data set (2019)

NB: \*\* probability at 5%; Standard deviation (SD)

According to the result observed from the above table, there is statistically significant mean difference both in initial CD4 count and after taking ART for some duration of time in months regarding to being stunted and normal. Mean of initial CD4 count were 415.8 and 338.1 for stunted and normal respectively at 5% level of significance. Also a difference is observed in the mean of HAART as 101.3 for normal and stunted 87.73 with P-value 0.0277 through time in month is higher among normal adolescent.

According to the finding of the research adolescents who are severely stunted 25(92.59%) were among the fully immunized and 2(7.41%) were partially immunized. For those who found to be moderately stunted 45(78.95%) of them were fully immunized, 10(17.54%) of them were partially immunized and only 2(3.51%) were never got any immunization. However, adolescents who are in normal 124(87.32%) were fully immunized and 18(12.68%) were partially immunized. Furthermore, the chi-square test shows statistically significant with a value of 0.094.

Table 11: Health status (medical history) and Stunting for Categorical Variables

Variables	Category	Stunting				Normal		Total		Chi-square
		Severe		Moderate		N	%	N	%	
		N	%	N	%					
Immunization status	Fully immunized	25	92.59	45	78.95	124	87.32	194	85.84	0.094*
	Partially immunized, missed any vaccine	2	7.41	10	17.54	18	12.68	30	13.27	
	Not immunized	0	0	2	3.51	0	0	2	0.88	

Source: Analyzed based on own data set (2019)

NB: \* probability at 10%; Number (N)

As shown in Table 12 below, the average of most recent viral load among thin and normal adolescents were 5814.8 and 11092.7 respectively at 5% significant level. Adolescents who are thin and normal have an average of pre-ART clinical stage 1.99 and 2.22 respectively with a p-value of 0.0539.

Table 12: Health status (medical history) and Thinness for Continuous Variables

Variables	Thin		Normal		Total		P-value	T-value
	Mean	SD	Mean	SD	Mean	SD		
Most recent Viral load	5814.8	15170.9	11092.7	23390.3	8453.8	5852.2	0.0454**	-2.0124
Clinical stage Pre-ART	1.99	0.88	2.22	0.90	2.10	0.89	0.0539*	-1.9376

Source: Analyzed based on own data set (2019)

NB: \* and \*\* show significance at 10% and 5% respectively; Standard deviation (SD)

#### 4.1.5. Nutrition status and dietary supplement

As the finding presented in the table 13 below, from the total adolescents who participated in the study 170 (75.22%) of them said they did not get any feeding support from the clinic, and among them 4(23.53) were severely thin, 70(73.68) moderately thin and 96(84.21) were normal, whereas number of respondents who said yes to feeding support accounts for 56(24.78%) and among them 13(76.47) were severely thin, 25(26.32) were moderate thin and 18(15.79) were normal. Besides, the chi-square test also shows there is significance difference between feeding support and thinness with P-value 0.000.

Table 13: Dietary supplement and Thinness for Categorical Variables

Variables	Category	Thinness				Normal		Total		Chi-square
		Severe		Moderate		N	%	N	%	
		N	%	N	%					
Feeding support	Yes	13	76.47	25	26.32	18	15.79	56	24.78	0.000***
	No	4	23.53	70	73.68	96	84.21	170	75.22	
Nutritional counseling	Yes	17	100	86	90.53	86	75.44	189	83.63	0.002***
	No	0	0	9	9.47	28	24.56	37	16.37	

Source: Analyzed based on own data set (2019)

NB: \*\*\* show significance at 1%; Number (N)

As presented in the above table 13, getting nutritional counseling has shown a statistical significance difference with adolescent thinness with the chi-square value of 0.002. The majority of respondents 189(83.63%) said they got nutrition counseling from the professionals when they came for their follow-up and among them 17(100%) were severely thin, 86(90.53%) were moderate thin and 86(75.44%) were normal. For those who said who do not have the counseling were 37(16.47%) and among them 9(9.47%) were moderate thin and 28(24.56%) were normal.

One of the key informants stated that ‘‘Getting the counseling on nutrition only cannot determine the nutrition status of the adolescents. Giving the counseling may provide them the information and knowledge about the importance of nutrition, but if they do not have the capacity to invest on their diet, they might not practice it.’’

#### 4.1.6. Nutrition status and IDDS calculated from food group

Table 14: IDDS and Thinness for Categorical Variables

Variables	Category	Thinness				Normal		Total		Chi-square
		Severe		Moderate		N	%	N	%	
		N	%	N	%					
Individual	< 4 food groups	14	82.35	76	80.00	77	67.54	167	59	0.088*
Dietary diversity score (IDDS)	≥ 4 food groups	3	17.65	19	20.00	37	32.46	73.89	26.11	

Source: Analyzed based on own data set (2019)

NB: \* show significance at 10%

As shown in the Table 14, the result from IDDS has grouped in to two, as one group is consuming less than four food groups per day out of the seven food groups, which implies that they are not getting sufficient diversified food, whereas, the study population in the second group were consuming greater than or equal to four food groups per day and assumed to have diversified food. With this among adolescents who found to be severely thin 14 (82.35%) respondents were consuming less than four food groups, 76(80%) of them were in moderate thin and 77(67.54) were normal but still consuming less than four food groups during 24 hours. While adolescents who consumed equal or more than four food groups in 24 hours were found to be 3 (17.65%) severely thin, 19(20%) moderate thin and 37(32.46%) normal. Additionally, the chi-square test in cross tabulation shows that the variation between being severe thin, moderate and normal with respect to individual dietary diversity score found to be statistically significant at 10% level of significance. From the observation we can say consuming more diversified food will decrease the occurrence of thinness.

#### 4.1.7. Nutrition status and previous anthropometric measurement

As shown in table 15 below, the mean of previous height among stunted and normal adolescents were 111.38 and 121.13 respectively at 1% significant level. While, Adolescents who are stunted and normal have an average of previous weight 18.63 and 21.95 respectively with a p-value of 0.0016.

Table 15: Previous anthropometric measurement and Stunting for Continuous Variables

Variables	Stunted		Normal		Total		P-value	T-value
	Mean	SD	Mean	SD	Mean	SD		
Previous height	111.38	24.57	121.13	22.31	117.50	23.60	0.0025***	-3.0539
Previous weight	18.63	6.34	21.95	8.19	20.71	7.71	0.0016***	-3.1908

Source: Analyzed based on own data set (2019)

NB: \*\*\* show significance at 1%; Standard deviation (SD)

As shown in table 16 below, the mean of previous weight among thin and normal adolescents has shown statistically significant difference at 1%, with the mean of 18.64 and 22.79, respectively.

Table 16: Previous anthropometric measurement and Thinness for Continuous Variables

Variables	Thin		Normal		Total		P-value	T-value
	Mean	SD	Mean	SD	Mean	SD		
Previous weight	18.64	6.05	22.79	8.62	20.71	7.71	0.0000***	-4.1959

Source: Analyzed based on own data set (2019)

NB: \*\*\* show significance at 1%; Standard deviation (SD)

#### 4.2. Adolescent's nutritional status

To assess nutritional status of adolescents living with HIV/AIDS attending ART clinic at Zewditu Memorial Hospital, the anthropometric measurement of 226 adolescents were collected. The most widely used anthropometric indicators like height for age is applied to assess stunting and BMI for age which implies thinness among adolescents who are on ART.

The anthropometric measurement was calculated using WHO AnthroPlus version 1.0.4 software according to the WHO (2007) international growth standard for children and adolescent (5-19). Thus, adolescents whose height-for-age between than standard deviation of -2 and +1 are normal, this also applied for BMI-for-age. Results between minus two standard deviation (-2 SD) and minus three standard deviation (-3 SD) for both indicators considered to have moderate stunting and moderate thinness. Also, adolescents whose height-for-age and BMI-for-age is below minus three standard deviation (-3 SD) from the median are considered to be severely stunted and severe thinness respectively.

Table 17: Overall Prevalence of Stunting and Thinness among Adolescents living with HIV/AIDS attending ART clinic at Zewditu Memorial Hospital

Indicators	%< -3SD	%< -2SD	% < +1SD	% < +2SD	Mean	SD
Length/height for age (Stunting)	12.1	37.5	0	0	-1.68	1.14
BMI for age (Thinness)	7.2	49.8	2.7	0.9	-1.74	1.11

Source: Analyzed based on own data set (2019)

NB: Standard deviation (SD), Body mass index (BMI)

The above table indicates that from the total of 226 sampled adolescents 85 (37.5%) were stunted and 27 (12.1%) were severely stunted. While 2 (0.9%) of the adolescent were overweight and 6 (2.7%) were normal. However, 113 (49.8%) were having moderate thinness and 16 (7.2%) were severely thin.

According to WHO, 2007 definition stunting refers to impaired growth and development that children experience from poor nutrition, repeated infection and inadequate psychosocial stimulation, which associate with an underdeveloped brain, with long lasting harmful consequences including diminished mental ability and learning capacity, poor school performance in childhood, reduced earnings and increased risks of nutrition-related chronic diseases. Furthermore, thinness refer to undernutrition which implies also poor nutrition status. Both stunting and thinness refers to chronic malnutrition.

As shown in the table 18 below, the proportion of male and female adolescents who were under a state of moderate stunting and sever stunting has shown that .male adolescents are more stunted compared to female adolescents. Prevalence of stunting among male adolescents 47(46.5%) and female 37 (30.1%) with the mean value -1.96 and -1.44 respectively. While sever stunting also higher among male adolescents 15 (14.9%) than female 12 (9.8%).

Table 18: Prevalence of Stunting (height-for-age) by Sex and Age in Zewditu Memorial Hospital (ART clinic), 2019

		%<-3SD	%<-2SD	Mean	SD
<b>Sex</b>	Total Number				
Male	102	14.9	46.5	-1.96	1.15
Female	124	9.8	30.1	-1.44	1.09
<b>Age group in year</b>					
10-14		22.7	51.5	-2.07	1.17
15-19		7.6	31.6	-1.51	1.1

Source: Analyzed based on own data set (2019)

NB: Standard deviation (SD)

Also the result showed that the prevalence of stunting was found higher in adolescents with the age group from 10-14 years 116 (51.5%) and lower at age group 15-19 years 71 (31.6%). Severity of stunting is also increases at age of 10-14 years 51 (22.7%) and decreases at the age of 15-19 years 17 (7.6%). Based on the study result, adolescents in the age groups 10-14 years were affected by stunting.

This result was also supported by key informant's interview as they stated that, *“Adolescents in this age group (10-14) undergo fast and rapid growth due to the initiation of puberty which need more energy. As it is well known these children were not diagnosed and did not start treatment early, and already had stunting which will be continued during their infancy and childhood and more aggravated at this period.”*

As indicated in the table 19 below, the result showed that prevalence of thinness in the study population among male adolescents is 56 (55%) moderately thin and 5 (5%) found to be severely thin, while 1 (1%) found to be in normal weight. However number of female adolescents who have moderate thinness were the same as the male adolescents, however, the prevalence is different, 56 (45.5%). The prevalence of severe thinness for female adolescents was found to be 11 (8.9%), although 5 (4.1%) and 2 (1.6) among them were found to be in normal and overweight category, respectively.

Whereas, the finding of the study as it shown in the table for the age group 10-14 the prevalence of moderate thinness were 146 (64.6%) and 38 (16.9%) were in severely thin, similarly 7 (3.1%)

found in normal category and 3 (1.5%) in overweight category. However 99 (43.7%) found to be moderately thin and 7 (3.2%) severely thin within the age group 15-19, the rest 6 (2.5%) and 1 (0.6%) of them were in normal and overweight category correspondingly.

Table 19: Prevalence of Thinness by Sex and Age group in Zewditu Memorial Hospital (ART clinic), 2019

		%<-3SD	%<-2SD	% < +1SD	% < +2SD	Mean	SD
<b>Sex</b>	Total Number						
Male	102	5	55	1	0	-1.81	1.04
Female	124	8.9	45.5	4.1	1.6	-1.68	1.17
<b>Age group in year</b>							
10-14		16.9	64.6	3.1	1.5	-1.99	1.34
15-19		3.2	43.7	2.5	0.6	-1.63	0.99

Source: Analyzed based on own data set (2019)

NB: Standard deviation (SD)

### 4.3. Statistical Analysis and Discussion

#### 4.3.1. Determinants of stunting among adolescents living with HIV/AIDS

Ordered logistic regression was used to compute the dependent variable and independent variables. WHO (2007) international growth standard for children and adolescent (5-19) dependent variable was derived by measuring height-for-age for adolescents living with HIV/AIDS and it sorted out in three classes; severely stunted, moderately stunted and normal.

The 19 explanatory variables computed to determine if they have an effect on adolescent being severely stunted, moderately stunted and normal on the study area. According to the study result total 9 explanatory variables determines adolescents being stunted and normal as discussed below.

**Sex of adolescent:** the marginal effect reveals that being male decreases the probability of being normal by 15.02%. The same result obtained from the nutrition status being male will also increase the chance of being severely and moderately stunted by 7.97% and 7.04% respectively with 1% level of significance. This might be because of the increased requirement of calorie intake for muscular development, additionally as observed from the study the male adolescents are engaged

in labor works to support their family and themselves economically as they are living standards which also requires more calorie intake, thus they may not be able to fulfill the daily nutritional requirements of the body. This finding is consistent with previous studies of Huruy *et al.*, (2013) which is found sex was determinant associated with stunting and a study by Francis *et al.*, (2015), Abay *et al.*, (2018) and Yeshalem and Amanu, (2018), stated also that being male were one of determining factor for stunting.

**Age of adolescent:** is also one of the factors that stated positive effect on stunting and negative effect on being normal at 5% level of significance. This implies as age increases being likelihood of normal will decrease by 3.12% in other word being severely stunted and moderately stunted will increase by 1.66% and 1.47% as age increases. The age variable also revealed that comparing to nutritional status age group 10-14 were more stunted than age group 15-19. It might be the time that puberty starts during the early adolescent which will require more energy. This findings supported by previous studies conducted in northern Ethiopia among adolescents by Yohannes *et al.*, (2015) and Berihun *et al.*, (2009) implemented to determine the prevalence and associated factors of malnutrition among HIV- positive children at Gondar showed that age is one of the factors that determine the nutritional status.

**No of children in the family-** is significant for stunting at 5% level of significance. The probability of being normal will decrease by 7.13% if number of children under 19 years in the family increases, being severely stunted and moderately stunted will increase by 3.79% and 3.44% respectively with 5% level of significance. This might be the care and treatment decrease as the number of children in the family increases. This in line with the previous study by Kikafunda *et al.*, (2016) stated that having large household and other sibling played a major role in nutrition status.

**Mother level of education-** as indicated in the table mother level education is one of determining factor for stunting at 5% level of significance. It means that as the mother level of education increases the chance of being severely stunted and moderately stunted will decrease whereas the potential of being normal will increase. This implies that a mother who have a better level of education will have a great opportunity to be employ and to have a better income to take care of their family. This study has conformity with Sebanjo *et al.*, (2011) and Mekides *et al.*, (2015) stated mother level of education has significantly associated factor with stunting.

**Place of residence-** as it shown in table 20, place of residence has negative effect on the probability of being normal this implies that living in urban area will have the potential to associate with the being stunted, in other way living in rural will increase the chance of being normal. As it shown and described from the chi-square test on the descriptive statistics the majority of adolescents were living in urban area and found to be severely and moderately stunted whereas, the number of respondents who lives in rural area were small and they found to be on moderately stunted and normal, with this finding it can be said that having majority of the respondents from urban area affects the result. Yet, this finding supported by Huruy *et al.*, (2013) stated that place of residence is among the factors that determine the nutrition status.

**Initial CD4 count-** as shown in the table initial CD4 count has positive effect on being severely stunted and stunted, having < 500 cell/mm initial CD4 count will increase the chance of being stunted, in reverse being normal is related with having >500 cell/mm initial CD4 counts with 10% level of significance. Most of the studies conducted on nutritional status of PLWHA revealed that CD4 counts are associated with malnutrition, thus as the CD4 counts decline there will be a bigger chance of having opportunistic infections that will aggravate to the progression of the disease condition that will produce a suitable condition for malnutrition this assumption of the study finding supported by Sisay, (2014), Rajshree *et al.*, (2015), Habtamu *et al.*, (2016), Lula *et al.*, (2017) and Kabalimu *et al.*, (2018).

**ART duration in months-** result from marginal effect shows that having longer months duration of HAART will decrease the probability of being severely stunted by 0.26% and moderately stunted by 0.23%, whereas longer months duration of ART will increase the chance of being normal by 0.49% with 1% of significance level. This might be because taking ART for longer time will boost immunity of the patient and the chance of having opportunistic infections will decline therefore, it will enhance a chance being normal. Similar finding was stated by Mulgeta *et al.*, (2017) and Delelegne *et al.*, (2018).

**Previous weight-** previous weight of adolescent has shown a significant relationship with adolescents being severely stunted, moderately stunted and normal. It has a negative relationship with adolescent being severely stunted and moderately stunted and positive relationship with being normal at 1% level of significance. This indicate that having normal and high previous weight will

decrease the chance being stunted in adolescent phase while will increase the likelihood of being normal.

**Previous height-** according to the finding of the research previous height of the adolescent also one of the determining factors of stunting. The positive value shows that adolescent with normal previous height (childhood height) with reference to their age and had good care during their infancy and early childhood, that is the first 1000 days, will have a probability of being normal on his/her adolescent period. This finding supported by Kurtz, (2012) stated that the prevention of adolescent stunting ideally begins with intervention much earlier in development, as stunting among adolescents reflects chronic undernourishment, likely beginning with inadequate nutrition during the first 2 to 3 years of life. This finding also works for previous weight.

Table 20: Ordered Logit Model for Stunting

Variables	Marginal effect (dy/dx) Severe Stunting	Marginal effect (dy/dx) Moderate Stunting	Marginal effect (dy/dx) Normal
Sex of the adolescent	0.0797 (0.0304)***	0.0704 (0.0256)***	-0.1502 (0.0524)***
Age of the adolescent	0.0165 (0.0082)**	0.0146 (0.0074)**	-0.0312 (0.0151)**
Total family size	-0.0153 (0.0135)	-0.0135 (0.0119)	0.0288 (0.0252)
Total children in the family	0.0378 (0.0184)**	0.0334 (0.0168)**	-0.0713 (0.0339)**
Parent status	-0.0204 (0.0195)	-0.0180 (0.0169)	0.0384 (0.0361)
Mother level education	-0.0335 (0.0143)**	-0.0296 (0.0122)**	0.0632 (0.0252)**
Mothers employment status	0.0140 (0.0126)	0.0124 (0.0114)	-0.0265 (0.0238)
Fathers employment status	-0.0017 (0.0136)	-0.0015 (0.0120)	0.0033 (0.0256)
Place of residence	0.0719 (0.0401)*	0.0635 (0.0349)*	-0.1354 (0.0729)*
Average monthly income of family	-3.09e-06 (7.70e-06)	-2.72e-06 (6.78e-06)	5.81e-06 (0.00001)
Hand washing practice	-0.0029 (0.0159)	-0.0026 (0.0140)	0.0056 (0.0300)
Initial CD4 count	0.0001 (0.00009)*	0.00009 (0.00005)*	-0.0002 (0.0001)*
Stage before ART	-0.0021 (0.0225)	-0.0018 (0.0198)	0.0040 (0.0423)
OI history	0.0168 (0.0409)	0.0148 (0.0361)	-0.0316 (0.0769)
Vaccination status	0.0430 (0.0343)	0.0380 (0.0306)	-0.0811 (0.0641)
Food source	-0.0399 (0.0497)	-0.0352 (0.0437)	0.0751 (0.0928)
ART duration in months	-0.0026 (0.0006)***	-0.0023 (0.0005)***	0.0049 (0.0009)***
Previous weight	-0.0131 (0.0041)***	-0.0116 (0.0036)***	0.0247 (0.0070)***
Previous height	-0.0021 (0.0009)**	-0.0019 (0.0007)**	0.0041 (0.0015)***
Dietary Diversity Score	0.0187 (0.0397)	0.0165 (0.0353)	-0.0353 (0.0749)

Source: Analyzed based on own data set (2019)

NB: \*, \*\* and \*\*\* show significance at 10%, 5% and 1% respectively;

Numbers in bracket are Standard errors

#### **4.3.2. Determinants of thinness among adolescents living with HIV/AIDS**

The relationship between dependent and independent variables were analyzed using ordered logit model. In other words the influence of independent variables on the probability being severely thin, moderately thin and normal. The result shows that from a total of 19 independent variables 7 of them identified to be the determining factors of being thin and normal among adolescents living with HIV/AIDS.

**Age of adolescent-** according to the result of this study, age of adolescent renders a positive effect was observed at normal adolescent at 1% level of significance, while it put a negative influence on severely thin and moderate thin adolescent at 5% and 1% level of significance respectively. Moreover, this implies that with the increase of age of adolescent the likelihood of being normal will also increases, whereas the probability of being severely thin and moderately thin will decrease. . This might be due to the decrease in development as they are reaching the maximum age for adolescence age group and beginning of adulthood and take care of themselves better than during their adolescence period. Similar results were found by which, Molla *et al.*, (2015), Tsegahana *et al.*, (2016) and Berihun *et al.*, (2009) indicate that age influence the nutritional status of adolescent.

**Parent status-** the marginal effect reveals that parent status has negative effect on being normal. As it is observed on Chi square test to see the difference between parent status and thinness, adolescents who live with single parents were more prone to severe thinness than those who had both parents alive. More over adolescents with single mother were affected more than those who lived with their father. This might be mothers involve in activities which earn low salary which in turn has an influence in the living standard of the family. A study conducted by Kikafunda *et al.*, (2016) and Asiya *et al.*, (2017) revealed that being orphanage plays a major role on the nutritional status.

**Mother employment status-** as the shown in the marginal effect result mother employment status has shown statistically significant at 10% with being severely thin, this indicate if the mother of the adolescent is unemployed there will be a great chance of to be severely thin, this might be because working mothers have better care for their families especially their children. This result supported by Huruy *et al.*, (2013) indicate that mother employment will influence nutritional status.

Table 21: Ordered Logit Model for Thinness

Variables	Marginal effect (dy/dx) Severe Thin	Marginal effect (dy/dx) Moderate Thin	Marginal effect (dy/dx) Normal
Sex of the adolescent	0.0181 (0.0190)	0.0359 (0.0386)	-0.0541 (0.0572)
Age of the adolescent	-0.0124 (0.0052)**	-0.0245 (0.0087)***	0.0369 (0.0130)***
Total family size	-0.0074 (0.0050)	-0.0147 (0.0093)	0.0222 (0.0140)
Parent Status	0.0219 (0.0123)*	0.0434 (0.0235)*	-0.0654 (0.0346)*
Mothers employment Status	0.0135 (0.0081)*	0.0267 (0.0169)	-0.0403 (0.0245)
Fathers employment Status	0.0086 (0.0090)	0.0170 (0.0174)	-0.0256 (0.0262)
Place of residence	3.11e-06 (0.0311)	6.16e-06 (0.0615)	-9.27e-06 (0.0927)
Average monthly income of family	-0.00001 (7.51e-06)	-0.00002 (0.00001)*	0.00003 (0.00002)*
Source of drinking water	-0.0013 (0.0200)	-0.0026 (0.0397)	0.0040 (0.0598)
Hand Washing Practice	0.0120 (0.0098)	0.0237 (0.0213)	-0.0358 (0.0309)
Recent Viral Load	-1.23e-06 (7.36e-07)*	-2.44e-06 (1.33e-06)*	3.67e-06(2.00e-06)*
ART duration in month	0.000066 (0.0002)	0.00013 (0.0004)	-0.00019 (0.0006)
OI History	-0.0188 (0.0216)	-0.0372 (0.0409)	0.0560 (0.0621)
Recent Illness	0.0285 (0.0204)	0.0565 (0.0405)	-0.0850 (0.0598)
Vaccination Status	-0.00038 (0.0293)	-0.00075 (0.0581)	0.0011 (0.0875)
Feeding Support	0.0638 (0.0293)**	0.1262 (0.0463)***	-0.1900 (0.0716)***
Counseling on Nutrition	0.0556 (0.0307)*	0.1101 (0.0547)**	-0.1658 (0.0825)**
Vitamin Supplement	0.0113 (0.0250)	0.0225 (0.0483)	-0.0339 (0.0733)
Dietary Diversity Score	-0.0158 (0.0283)	-0.0312 (0.0566)	0.0470 (0.0847)

Source: Analyzed based on own data set (2019)

NB: \*, \*\* and \*\*\* show significance at 10%, 5% and 1% respectively;

Numbers in bracket are Standard errors

**Average monthly income of the family-** similarly, the marginal effect result showed that average monthly income of the family has shown positive effect on potential of being normal and negative effect on sever thinness and thinness. This indicate that if there is high monthly income the probability of being normal at 10% significance level. Whereas the chance of being severely thin and thin will decrease. This might be due to the direct relationship between income and living standard. Moreover, this finding supported by many literatures since income is related with many thing, thus Berihun *et al.*, (2009) stated that low monthly income were significantly associated with malnutrition whereas Ayele *et al.*, (2012) and Asiya *et al.*, (2017) showed that monthly income of the family shows significant association with thinness

**Recent viral load-** the result from the ologit marginal effect indicate that recent viral load has negative value on the likelihood of being normal and in reverse it has a positive value on being thin and severely thin. This implies that having greater than 1000 recent viral load will weaken the immunity and will expose to frequent morbidity (OI) this will have great contribution to lose weight and to be thin. In other way having a viral load of <1000 will increase the potential of being normal. This statement related with CD4 count having more viral loads means will have low CD4 count and vice versa.

**Feeding support-** as it seen in the table 21 getting feeding support has shown statistically significant with thinness. Not having feeding support like plump nut, milk and porridge will increase the probability of being severely thin and moderately thin by 6.38% and 12.62% respectively, while the chance of being normal will decrease. The result corroborates the fact that plumpy nuts and other feeding support will improve nutritional status since this feeding supports purposely made for malnourished people. Other studies by Mulgeta *et al.*, (2017) and Wondmagegn *et al.*, (2017) also revealed that ART patients who had no feeding supports has been found to be thin.

**Counseling on nutrition-** as it is shown in the result getting nutritional counseling is one of the determining factors of nutritional status of adolescents living with HIV/AIDS. This might be due to a repeated and continuous they will get more information about how they get nutrition out of the food they eat as they are coming to the clinic their medication every month to every quarter. Therefore, getting counseling will increase the probability of being normal. This finding is consistent with (Sisay, 2014).

#### 4.4. Individual Dietary Diversity Score (IDDS)

Dietary diversity was defined as the number of food groups eaten by the adolescent during the past 24 hours from a predefined list of food groups (Swindale *et al.*, 2006). Individual dietary diversity is considered a proxy for the macro- and micro-nutrient adequacy of the diet for different age groups including adolescents, and is associated with individual nutrient adequacy (Mirmiran *et al.*, 2004), except for women of reproductive age and infants and young children, there are no definite guidelines on which food groups should be included in the score for different sex/age groups (Arimond *et al.*, 2010).

Table 22: Overall Individual Dietary Diversity Score (IDDS)

Variables	Category	N	%
IDDS	≥4	59	26.11
	<4	167	73.89
Total		226	100

Source: Analyzed based on own data set (2019)

NB: Number (N)

According to the finding of the research from the total respondents only 59 (26.11%) were consumed at least or above four food groups which is considered as consumed diversified food. However, the majority of the respondents 167(73.89%) consumed less than four food groups indicating that they were not getting diversified diet.

Table 23: Individual Dietary Diversity Score (IDDS) by Sex

Variables	Category	IDDS				Total		Chi-square
		≥4		<4		N	%	
		N	%	N	%			
Sex of Adolescents	Female	40	67.80	84	50.30	124	54.87	0.020**
	Male	19	32.20	83	49.70	102	45.13	

Source: Analyzed based on own data set (2019)

NB: \*\* show significance at 5%; Number (N)

The result also revealed that sex of adolescent and IDDS has statistically significant association at 5%. From respondents who consumed diversified food during the last 24 hours female respondents were 40(67.80%) and 19(32.30%) were male adolescents. Whereas, of the adolescents who

consumed less than four group, 84(50.30%) of them were female and 83(49.70%) were male adolescents. Therefore, male adolescents consume less diversified food compared to the females. IDDS found to be not statistically significant for both stunting and thinness of the adolescent or it's not among the determining factors for the nutritional status but there is statistically significant difference with thinness and still men adolescents have high prevalence of stunting and thinness.

As one of the key informants stated, *'As male adolescents are growing they are expected to increase in muscular tone which is more under the influence of getting adequate and diversified food. But the reality is most of their patients were from very poor families, they could not able to get the required nutrition as needed and male adolescents are engaged in labour work to support their family which also contribute for being stunted'*.

## **CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS**

### **5.1. Conclusion**

The study examined the prevalence and determinants of malnutrition among 226 adolescents who are living with HIV/AIDS and attending ART clinic at Zewditu Memorial Hospital. Thus, 12.1% and 7.2 % were severely stunted and thin respectively. Whereas, 37.5% were stunted and 49.8% were moderately thin. The finding also indicate that male adolescents are more vulnerable for malnutrition compared to female adolescents.

The result from ordered logistic regression shows that the possible determinants for malnutrition were sex of adolescent (male), age of adolescent (10-14 years), number of children in the family, parent status, mother level of education, mother employment status, average monthly income of the family, place of residence, initial CD4 count, recent viral loads, duration of ART in months, feeding support, nutrition counseling, previous weight and previous height at 10%, 5% and 1% significance level.

Additionally, findings from individual dietary diversity score indicated that 73.89 % of them consume less than the standard (four) food groups within the last 24 hours during the time of research period.

## 5.2. Recommendations

Based on the study findings the following recommendations are forwarded:

- The government, non-governmental organizations and community based associations should work to support income generation activities for care givers of the children in order to secure food supply of the family and strengthen the chronic HIV care and support.
- The family, care givers and the community should care for adolescent as they are undergoing fast and rapid physical growth, development and psychological changes which requires more nutritional care and feeding. And the community should give due attention for dietary pattern of adolescents as for infants and children.
- Adolescents and their caregivers should receive a comprehensive and continuous information and education on nutrition by emphasizing the importance of dietary diversity, adequate feeding support along with ART and vitamin supplement. Health care providers should improve and strengthen identifying and providing care and treatment for children and adolescent having low CD4 count or high viral load.
- However, as HIV infected children and adolescents are at higher risk of developing metabolic alterations, need to assess their dietary practices, nutrient intake and nutritional status in different context in order to advocate for interventions promoting a healthy life style as a complement to their pharmacological therapy. Further research will help to understand and identify the most effective strategies for reducing adolescent malnutrition.

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# Appendixes

## Appendix 1: Multicollinearity test for Stunting and Thinness

### Multicollinearity test for Stunting

```
. corr Sexoftheadolescent Ageoftheadolescent Totalfamilysize Totalchildreninthefamily Parentstatus Motherleveledu Mothersemployments
> tatus Fathersemploymentstatus Placeofresidence Averageincomefamil Handwashingpactice Initilacd4viral StagebeforeHAART OIhistory Va
> ccinationstatus Foodsource HAARTdurationinmonth Previousweight Previousheight dietaerydiversityscore
(obs=226)
```

	Sexofthead-t	Ageofthead-t	Totalf-e	Totalc-y	Parent~s	Mother~u	Mother~s	Father~s	Placeo-e	Averag-l	Handwa-e	Initil-l	Stageb-T
Sexofthead-t	1.0000												
Ageofthead-t	-0.0516	1.0000											
Totalfamil-e	0.1293	0.0032	1.0000										
Totalchild-y	0.0374	0.0539	0.7711	1.0000									
Parentstatus	-0.0411	0.2505	-0.1982	-0.1126	1.0000								
Motherleve-u	-0.0622	-0.0817	0.0986	0.0809	-0.6257	1.0000							
Mothersemp-s	0.1129	-0.2985	0.1575	0.1166	-0.7655	0.5434	1.0000						
Fathersemp-s	-0.0794	-0.0958	0.0912	0.0422	-0.5578	0.2043	0.2701	1.0000					
Placeofres-e	0.0686	-0.0136	0.0709	0.0443	-0.0888	-0.0364	0.0950	0.2138	1.0000				
Averageinc-l	-0.1264	0.0856	0.0254	-0.0329	-0.1561	0.1341	0.0059	0.1757	0.0451	1.0000			
Handwashin-e	-0.0818	0.0264	-0.0389	-0.1410	0.0144	0.0450	-0.1256	0.0716	0.0150	0.0836	1.0000		
Initilacd4-l	-0.0714	-0.2167	-0.1048	-0.0477	-0.0621	0.0672	0.1376	0.0191	-0.0883	0.0559	-0.0720	1.0000	
Stagebefor-T	-0.0281	0.2858	-0.0026	0.0220	0.1107	-0.0745	-0.1204	-0.1324	-0.0630	0.0623	-0.0951	-0.3406	1.0000
OIhistory	-0.0117	0.1298	-0.0242	-0.0275	0.0830	-0.1580	-0.1106	-0.1100	-0.0678	0.0583	-0.1709	-0.2839	0.6731
Vaccinatio-s	-0.1246	0.1055	-0.0252	0.0278	0.1258	-0.1195	-0.2112	0.1152	-0.0625	0.0100	-0.0606	-0.0043	0.0698
Foodsource	0.1165	0.0499	-0.0717	-0.0385	0.1461	-0.1162	-0.1638	-0.0709	0.0858	-0.1310	0.1718	-0.0360	0.0196
HAARTdurat-h	0.0820	0.2937	-0.0200	-0.0409	0.0283	-0.0081	-0.0147	0.0286	-0.1662	-0.0024	-0.0056	-0.1210	0.1307
Previouswe-t	-0.0398	0.4541	0.0731	0.0576	0.0970	-0.0471	-0.1706	-0.0308	0.1542	0.1788	0.0378	-0.0776	0.0378
Previoushe-t	-0.0833	0.3876	0.0318	0.0355	0.1442	-0.0991	-0.1911	-0.0630	0.1306	0.0811	0.0731	-0.0967	0.0875
dietaerydi-e	-0.1544	0.0485	-0.2064	-0.2121	-0.0114	0.0768	-0.0821	0.1643	0.0862	0.4888	0.0788	-0.0095	0.0420

	OIhist-y	Vaccin-s	Foodso-e	HAART-d-h	P-weight	P-height	dietae-e
OIhistory	1.0000						
Vaccinatio-s	0.0668	1.0000					
Foodsource	-0.0035	-0.1239	1.0000				
HAARTdurat-h	0.0732	0.0281	0.0035	1.0000			
Previouswe-t	-0.0371	0.0649	0.0158	-0.4911	1.0000		
Previoushe-t	0.0512	0.0536	0.0184	-0.4866	0.7891	1.0000	
dietaerydi-e	-0.0168	0.0825	0.0541	-0.0219	0.1179	0.0365	1.0000

### Multicollinearity test for Thinness

```
. corr Sexoftheadolescent Ageoftheadolescent Totalfamilysize Parentstatus Mothersemploymentstatus Fathersemploymentstatus Placeofres
> idence Averageincomefamil Sourceofdrinkingwater Handwashingpactice recent4viral HAARTdurationinmonth OIhistory Recentillness Vacci
> nationstatus Feedingsupport Councilonnutrition Vitaminsupplement dietaerydiversityscore
(obs=226)
```

	Sexofthead-t	Ageofthead-t	Totalf-e	Parent~s	Mother~s	Father~s	Placeo-e	Averag-l	Source-r	Handwa-e	recent-l	HAART-d-h	OIhist-y
Sexofthead-t	1.0000												
Ageofthead-t	-0.0516	1.0000											
Totalfamil-e	0.1293	0.0032	1.0000										
Parentstatus	-0.0411	0.2505	-0.1982	1.0000									
Mothersemp-s	0.1129	-0.2985	0.1575	-0.7655	1.0000								
Fathersemp-s	-0.0794	-0.0958	0.0912	-0.5578	0.2701	1.0000							
Placeofres-e	0.0686	-0.0136	0.0709	-0.0888	0.0950	0.2138	1.0000						
Averageinc-l	-0.1264	0.0856	0.0254	-0.1561	0.0059	0.1757	0.0451	1.0000					
Sourceofdr-r	-0.1036	0.0318	0.0535	-0.0684	0.1681	0.0587	-0.0843	-0.0573	1.0000				
Handwashin-e	-0.0818	0.0264	-0.0389	0.0144	-0.1256	0.0716	0.0150	0.0836	-0.2162	1.0000			
recent4viral	0.0594	0.1831	-0.0355	0.0924	-0.0949	-0.0775	0.0884	-0.0695	0.0324	-0.0237	1.0000		
HAARTdurat-h	0.0820	0.2937	-0.0200	0.0283	-0.0147	0.0286	-0.1662	-0.0024	0.0337	-0.0056	-0.0665	1.0000	
OIhistory	-0.0117	0.1298	-0.0242	0.0830	-0.1106	-0.1100	-0.0678	0.0583	0.0697	-0.1709	0.1178	0.0732	1.0000
Recentilln-s	0.0758	0.0781	0.0426	-0.0016	0.0730	-0.0455	0.0919	-0.0324	0.0346	-0.1815	0.3332	-0.0095	0.1319
Vaccinatio-s	-0.1246	0.1055	-0.0252	0.1258	-0.2112	0.1152	-0.0625	0.0100	0.0756	-0.0606	0.1248	0.0281	0.0668
Feedingsup-t	-0.0262	-0.3607	0.0611	-0.1487	0.1105	0.0751	-0.0298	-0.1219	0.0498	-0.0635	-0.0416	-0.0068	0.1071
Councilonn-n	-0.0553	-0.2310	0.0260	-0.0675	0.0770	-0.0164	0.0701	-0.0288	0.0842	0.0494	0.0326	-0.1972	-0.1707
Vitaminsup-t	-0.0443	-0.0404	0.0769	0.1099	-0.0223	-0.1340	0.0278	-0.0353	-0.1055	-0.0190	0.2654	-0.0615	0.0379
dietaerydi-e	-0.1544	0.0485	-0.2064	-0.0114	-0.0821	0.1643	0.0862	0.4888	-0.0666	0.0788	0.1220	-0.0219	-0.0168

	Recent-s	Vaccin-s	Feedin-t	Counci-n	Vitami-t	dietae-e
Recentilln-s	1.0000					
Vaccinatio-s	0.0579	1.0000				
Feedingsup-t	0.0090	0.1229	1.0000			
Councilonn-n	0.0676	-0.0763	0.1708	1.0000		
Vitaminsup-t	0.1698	0.1401	-0.0087	0.1231	1.0000	
dietaerydi-e	0.0318	0.0825	-0.0611	-0.0093	0.0198	1.0000



### Appendix 3: Ordered Logit Model Result for Stunting and its Marginal Effects

```
. ologit stunting Sexoftheadolescent Ageoftheadolescent Totalfamilysize Totalchildreninthefamily Parentstatus Motherleveledu Mothers
> employmentstatus Fathersemploymentstatus Placeofresidence Averageincomefamil Handwashingpactice Initilacd4viral StagebeforeHAART O
> Ihistory Vaccinationstatus Foodsourc HAARTdurationinmonth Previousweight Previousheight dietaerydiversityscore
```

```
Iteration 0: log likelihood = -201.87195
Iteration 1: log likelihood = -163.88997
Iteration 2: log likelihood = -161.22104
Iteration 3: log likelihood = -161.20233
Iteration 4: log likelihood = -161.20233
```

```
Ordered logistic regression          Number of obs   =      226
                                   LR chi2(20)        =      81.34
                                   Prob > chi2         =      0.0000
                                   Pseudo R2          =      0.2015

Log likelihood = -161.20233
```

stunting	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
Sexoftheadolescent	-.9068603	.3331298	-2.72	0.006	-1.559783	-.2539379
Ageoftheadolescent	-.1886616	.0929865	-2.03	0.042	-.3709117	-.0064114
Totalfamilysize	.1744628	.1535496	1.14	0.256	-.1264888	.4754145
Totalchildreninthefamily	-.4305483	.2094972	-2.06	0.040	-.8411552	-.0199415
Parentstatus	.2321143	.2202727	1.05	0.292	-.1996122	.6638408
Motherleveledu	.3816026	.1584126	2.41	0.016	.0711195	.6920857
Mothersemploymentstatus	-.1602897	.1442483	-1.11	0.266	-.4430111	.1224317
Fathersemploymentstatus	.0199768	.1550173	0.13	0.897	-.2838515	.3238051
Placeofresidence	-.8177015	.4502273	-1.82	0.069	-1.700131	.0647279
Averageincomefamil	.0000351	.0000874	0.40	0.688	-.0001362	.0002064
Handwashingpactice	.0339278	.1815497	0.19	0.852	-.3219031	.3897588
Initilacd4viral	-.0012128	.0006621	-1.83	0.067	-.0025105	.000085
StagebeforeHAART	.0244281	.2558725	0.10	0.924	-.4770728	.525929
OIhistory	-.1911709	.4651759	-0.41	0.681	-1.102899	.7205572
Vaccinationstatus	-.4897836	.3907732	-1.25	0.210	-1.255685	.2761178
Foodsourc	.4538401	.5629491	0.81	0.420	-.6495199	1.5572
HAARTdurationinmonth	.030098	.0066152	4.55	0.000	.0171324	.0430636
Previousweight	.1496885	.0455188	3.29	0.001	.0604733	.2389038
Previousheight	.0249764	.0100207	2.49	0.013	.0053362	.0446166
dietaerydiversityscore	-.2136639	.4528027	-0.47	0.637	-1.101141	.6738132
/cut1	1.865814	2.229299			-2.503531	6.23516
/cut2	3.787745	2.235545			-.5938432	8.169333

### Marginal effect for Severe Stunting

```
. margins, dydx(*) predict(outcome(1))
```

```
Average marginal effects          Number of obs   =      226
Model VCE      : OIM
```

```
Expression      : Pr(stunting==1), predict(outcome(1))
dy/dx w.r.t.   : Sexoftheadolescent Ageoftheadolescent Totalfamilysize Totalchildreninthefamily Parentstatus Motherleveledu
Mothersemploymentstatus Fathersemploymentstatus Placeofresidence Averageincomefamil Handwashingpactice
Initilacd4viral StagebeforeHAART OIhistory Vaccinationstatus Foodsourc HAARTdurationinmonth Previousweight
Previousheight dietaerydiversityscore
```

	Delta-method				
	dy/dx	Std. Err.	z	P> z	[95% Conf. Interval]
Sexoftheadolescent	.0797578	.03046	2.62	0.009	.0200574 .1394582
Ageoftheadolescent	.0165927	.0082033	2.02	0.043	.0005145 .0326709
Totalfamilysize	-.0153439	.0135743	-1.13	0.258	-.041949 .0112612
Totalchildreninthefamily	.0378665	.0184609	2.05	0.040	.0016838 .0740492
Parentstatus	-.0204143	.0195873	-1.04	0.297	-.0588046 .017976
Motherleveledu	-.0335617	.0143486	-2.34	0.019	-.0616844 -.005439
Mothersemploymentstatus	.0140974	.0126356	1.12	0.265	-.0106678 .0388626
Fathersemploymentstatus	-.001757	.0136341	-0.13	0.897	-.0284794 .0249655
Placeofresidence	.0719163	.0401962	1.79	0.074	-.0068667 .1506994
Averageincomefamil	-3.09e-06	7.70e-06	-0.40	0.689	-.0000182 .000012
Handwashingpactice	-.0029839	.0159872	-0.19	0.852	-.0343182 .0283503
Initilacd4viral	.0001067	.0000599	1.78	0.075	-.0000108 .0002241
StagebeforeHAART	-.0021484	.0225027	-0.10	0.924	-.046253 .0419561
OIhistory	.0168134	.0409851	0.41	0.682	-.063516 .0971427
Vaccinationstatus	.0430762	.0343575	1.25	0.210	-.0242633 .1104156
Foodsourc	-.039915	.049713	-0.80	0.422	-.1373506 .0575207
HAARTdurationinmonth	-.0026471	.0006146	-4.31	0.000	-.0038517 -.0014425
Previousweight	-.013165	.0041225	-3.19	0.001	-.0212449 -.0050851
Previousheight	-.0021967	.0009023	-2.43	0.015	-.0039651 -.0004282
dietaerydiversityscore	.0187916	.0397489	0.47	0.636	-.0591147 .0966979



## Appendix 4: Ordered Logit Model Result for Thinness and its Marginal Effects

```
. ologit BMI Sexoftheadolescent Ageoftheadolescent Totalfamilysize Parentstatus Motheremploymentstatus Fatheremploymentstatus Placeofresidence Averageincomefamil Sourceofdrinkingwater Handwashingpactice recent4viral HAARTdurationinmonth OIhistory Recentillness Vaccinationstatus Feedingsupport Councilonnutrition Vitaminsupplement dietaerydiversityscore,r
```

```
Iteration 0: log pseudolikelihood = -204.33136
Iteration 1: log pseudolikelihood = -171.22236
Iteration 2: log pseudolikelihood = -169.89843
Iteration 3: log pseudolikelihood = -169.89422
Iteration 4: log pseudolikelihood = -169.89422
```

```
Ordered logistic regression      Number of obs   =      226
                                Wald chi2(19)    =      58.18
                                Prob > chi2         =      0.0000
                                Pseudo R2           =      0.1685

Log pseudolikelihood = -169.89422
```

BMI	Robust		z	P> z	[95% Conf. Interval]	
	Coef.	Std. Err.				
Sexoftheadolescent	-.2890003	.3054747	-0.95	0.344	-.8877198	.3097191
Ageoftheadolescent	.1974346	.07476	2.64	0.008	.0509077	.3439614
Totalfamilysize	.1188517	.076442	1.55	0.120	-.0309718	.2686752
Parentstatus	-.3494446	.1870604	-1.87	0.062	-.7160762	.017187
Motheremploymentstatus	-.2151652	.1325639	-1.62	0.105	-.4749856	.0446553
Fatheremploymentstatus	-.1369637	.1399417	-0.98	0.328	-.4112444	.1373169
Placeofresidence	-.0000495	.4949287	-0.00	1.000	-.970092	.969993
Averageincomefamil	.0001931	.0001148	1.68	0.093	-.0000319	.000418
Sourceofdrinkingwater	.0215547	.3194249	0.07	0.946	-.6045065	.6476159
Handwashingpactice	-.1912188	.1632866	-1.17	0.242	-.5112548	.1288171
recent4viral	.0000196	.000011	1.78	0.076	-2.01e-06	.0000412
HAARTdurationinmonth	-.0010504	.0033118	-0.32	0.751	-.0075414	.0054407
OIhistory	.2992312	.3334393	0.90	0.370	-.3542978	.9527602
Recentillness	-.4541446	.323239	-1.40	0.160	-1.087682	.1793922
Vaccinationstatus	.0061023	.4673598	0.01	0.990	-.9099061	.9221106
Feedingsupport	-1.014864	.392836	-2.58	0.010	-1.784808	-.2449196
Councilonnutrition	-.8855646	.4545002	-1.95	0.051	-1.776369	.0052394
Vitaminsupplement	-.1809904	.3924173	-0.46	0.645	-.9501142	.5881333
dietaerydiversityscore	.2513975	.4517388	0.56	0.578	-.6339943	1.136789
/cut1	-1.987097	1.917564			-5.745454	1.77126
/cut2	1.110086	1.912824			-2.63898	4.859153

## Marginal effect for Severe Thin

```
. margins, dydx(*) predict(outcome(1))
```

```
Average marginal effects      Number of obs   =      226
Model VCE      : Robust
```

```
Expression      : Pr(BMI==1), predict(outcome(1))
```

```
dy/dx w.r.t. : Sexoftheadolescent Ageoftheadolescent Totalfamilysize Parentstatus Motheremploymentstatus Fatheremploymentstatus
              Averageincomefamil Sourceofdrinkingwater Handwashingpactice recent4viral HAARTdurationinmonth
              OIhistory Recentillness Vaccinationstatus Feedingsupport Councilonnutrition Vitaminsupplement
              dietaerydiversityscore
```

	Delta-method		z	P> z	[95% Conf. Interval]	
	dy/dx	Std. Err.				
Sexoftheadolescent	.0181688	.0190312	0.95	0.340	-.0191316	.0554692
Ageoftheadolescent	-.0124123	.0052219	-2.38	0.017	-.022647	-.0021775
Totalfamilysize	-.0074719	.0050053	-1.49	0.135	-.0172822	.0023383
Parentstatus	.0219688	.0123001	1.79	0.074	-.002139	.0460766
Motheremploymentstatus	.0135269	.0081664	1.66	0.098	-.0024789	.0295328
Fatheremploymentstatus	.0086106	.0090674	0.95	0.342	-.0091611	.0263823
Placeofresidence	3.11e-06	.031115	0.00	1.000	-.0609812	.0609874
Averageincomefamil	-.0000121	7.51e-06	-1.62	0.106	-.0000268	2.57e-06
Sourceofdrinkingwater	-.0013551	.0200887	-0.07	0.946	-.0407282	.038018
Handwashingpactice	.0120215	.0098915	1.22	0.224	-.0073654	.0314084
recent4viral	-1.23e-06	7.36e-07	-1.67	0.095	-2.67e-06	2.12e-07
HAARTdurationinmonth	.000066	.0002099	0.31	0.753	-.0003454	.0004775
OIhistory	-.018812	.0216687	-0.87	0.385	-.0612818	.0236579
Recentillness	.028551	.0204142	1.40	0.162	-.0114601	.0685622
Vaccinationstatus	-.0003836	.0293849	-0.01	0.990	-.057977	.0572097
Feedingsupport	.0638022	.029363	2.17	0.030	.0062517	.1213526
Councilonnutrition	.0556734	.0307546	1.81	0.070	-.0046045	.1159513
Vitaminsupplement	.0113785	.0250983	0.45	0.650	-.0378133	.0605702
dietaerydiversityscore	-.0158048	.0283776	-0.56	0.578	-.0714238	.0398143



## Appendix 5: Questionnaire (English version)

### Hospital Survey Questionnaire

Date \_\_\_\_\_

Dear respondents

My name is Habil Adamu. I am a graduate student of Addis Ababa University, Center for Food Security Studies. I am conducting a graduate research on determinants of nutritional status among Adolescents (10-19 years) living with HIV/AIDS attending ART clinic at Zewditu Memorial hospital. The purpose of the study is to assess their nutritional status and identifying the determinants. This interview and all of the answers you will be giving will be confidential and will not be shared to anyone. If I ask you any question that you don't want to answer, just let me know and I will go on to the next question or you can stop the interview at any time. I hope you will agree to answer the questions since your opinions are important.

Yes

No

If yes, continue to the next question; if no, do not conduct the interview.

#### **Instruction**

1. Encircle if the answer is from given option; unless write clearly what the respondent tell in specification part
2. If the questions answered in numbers put the response on the provided space.
3. The question should be administered to only for parents or caregiver of the adolescents and adolescents.
4. Follow the appropriate skip pattern

**SECTION 1: Identification Information**

Patient code: \_\_\_\_\_

**SECTION 2: Demographic Characteristics**

No	Questions	Response
1	What is the sex of the adolescent?	[1] Male [2] Female
2	What is the age of the adolescent?	
3	Family Size	
4	Number of children living in the same house	
5	What is the birth order of your child?	

**SECTION 3: Socio-economic Factors**

<b>No</b>	<b>Questions</b>	<b>Response</b>
<b>6</b>	Parents Status	[1] Both parents alive and supporting the child together [2] Both parents alive but only one parent supporting the child [3] Mother alive/ Father deceased [4] Father alive/ Mother deceased [5] Both parents deceased [6] Other, specify _____
<b>7</b>	Who is the Primary Caregiver for the adolescent?	[1] Mother and Father together [2] Mother only [3] Father only [4] Other family relatives [5] Forster care [6] Other, specify _____
If the answer for question number 7 is among 4-6, you have to skip question number 8-11		
<b>8</b>	What is the highest level education for the adolescent mother?	[1] None [2] Primary education [3] Secondary education [4] Technical/Vocational [5] College/University [6] Other, specify _____ [7] Don't know
<b>9</b>	What is the highest level education for the adolescent father?	[1] None [2] Primary education [3] Secondary education 4] Technical/Vocational [5] College/University [6] Other, specify _____

		[7] Don't know
<b>10</b>	Mother employment status (more than one answer is possible)	[1] Unemployed [2] Employed (formal employment) [3] Self employed [4] Other, specify _____ [5] House wife
<b>11</b>	Father employment status (more than one answer is possible)	[1] Unemployed [2] Employed (formal employment) [3] Self employed [4] Other, specify _____
<b>12</b>	If both parents are deceased and the adolescent is living with other family relatives, then what is the highest level of education for the primary caregiver?	[1] None [2] Primary education [3] Secondary education [4] Technical/Vocational [5] College/University [6] Other, specify _____ [7] Don't know
<b>13</b>	If both parents are deceased and the adolescent is living with other family relatives, then what is the employment status of the primary caregiver?	[1] Unemployed [2] Employed (formal employment) [3] Self employed [4] Other, specify _____
<b>14</b>	What is the level of education for the adolescent?	[1] None [2] Primary education [3] Secondary education [4] Technical/Vocational [5] College/University [6] Other, specify _____
<b>15</b>	Where do you live?	[1] Rural area [2] Urban area [3] Peri-urban area

<b>16</b>	Is child receiving a state support grant?	[1] Yes [0] No
<b>17</b>	Average Household Income/ Month (Ethiopian Birr)	[1] _____ [2] N/A if in foster care

#### SECTION 4: Environmental Factors

<b>No</b>	<b>Questions</b>	<b>Response</b>
<b>18</b>	What is the main water source for drinking?	[1] Pipe water [2] Public tap [3] Unprotected dug well/Spring [4] Protected dug well/Spring [5] Rain water [6] Other, specify _____
<b>19</b>	What type of toilet do you have?	[1] Flush [2] Pit Latrine [3] Bucket Toilet [4] Absolute Toilets [5] No facilities or bush/field [6] Other, specify _____
<b>20</b>	Where is your household dispose waste?	[1] Field [2] Segregate the trash and throw it in deep pit/dirt trash [3] Throw it in deep pit/dirt trash without segregating [4] Segregate the trash and burn, throw the rest [5] Burn it without segregating [6] Other, specify _____
<b>21</b>	After you have prepared dinner, kitchen surfaces, pots, pans, plates and utensils are dirty. Can you	[1] Scrape excess food into rubbish bin [2] Wash with hot water [3] Wash with detergent [4] Other, specify _____

	describe how you clean them usually?	
22	How do you store perishable fresh foods such as raw meat, poultry and seafood?	[1] In the refrigerator (below 5 °C)/cool box [2] Covered (protected from insects, rodents, pests and dust) [3] Separated from cooked or ready-to-eat foods [4] Other, specify _____
23	Could you please describe step by step how you wash your hands?	[1] Washes hands in a bowl of water (sharing with other people) — poor practice [2] With someone pouring a little clean water from a jug onto one's hands (appropriate practice) [3] Under running water (appropriate practice) [4] Washes hands with soap or ashes [5] Other, specify _____

**SECTION 5: Health Status (Medical history)**

No	Questions	Response
24	Date of HIV test	/ /
25	Previous CD4 Count	
26	Most recent Viral load	
27	Clinical stage Pre-HAART	
28	Current clinical Stage	
29	Duration of HAART	
30	History of Opportunistic infection (OI) (TB, Warts, Herpes, oral trash)	[1] Yes [0] No If yes, specify _____
31	Has the child been ill in the last 3 months?	[1] Yes [0] No If yes, which one (more than one answer is possible) [1] Diarrhea [2] Respiratory Tract Infection [3] Helminthic infections

		[4] Other, specify _____
<b>32</b>	Immunization status	[1] Fully immunized [2] Partially immunized, missed any vaccine [3] Not immunized

### SECTION 6: Dietary Supplements

No	Questions	Response
<b>33</b>	Is the child receiving any other medicinally feeding support? (plumpynut, formula milk....etc)	[1] Yes [0] No
<b>34</b>	Parent/Caregiver received nutritional counseling?	[1] Yes [0] No
<b>35</b>	Is the child receiving multivitamins?	[1] Yes [0] No
<b>36</b>	The food consumed at home comes from which of the following sources	[1] Home production (Locally produced) [2] Purchased in the shops [3] Borrowed from other people [4] Food aid [5] Other, specify _____

## SECTION 7: Individual Dietary Diversity Score

### 24 Hours Diet History

Now I would like to ask you about liquids and foods that consumed yesterday during the day or at night. Please include liquids and foods that consumed outside your home.			
STEP 1:		Step 2:	
Food/Drink eaten/drank during the day	content	Forgotten Foods(Prompted)	Content
Breakfast			
Snack			
Lunch			
Snack			
Dinner			
Snack			
No	Questions	Response	
37	Grains,Root or Tuber (bread, biscuits, cookies or any other foods made from sorghum, maize, pasta, rice, wheat, porridge or pastes or other locally available grains, white potatoes, white yams, cassava, carrots, pumpkin and kocho)	[1] Yes [0] No	
38	Fruits and Vegetables (pumpkin, spinach, cabbages, cassava leaves, indigenous green vegetables, carrot, broccoli, Tomato, onion, green pepper, passion fruit, banana, oranges, avocado, papaya, watermelon, mango)	[1] Yes [0] No	

<b>39</b>	Meat, poultry, offal and Fish (beef, pork, goat, sheep, ox, chicken, fish or dried fish)	[1] Yes [0] No
<b>40</b>	Eggs (eggs)	[1] Yes [0] No
<b>41</b>	Pulses, Legumes, nuts and seeds (beans, peas, lentils, and groundnuts)	[1] Yes [0] No
<b>42</b>	Milk and milk products (milk, cheese, yogurt or other milk products)	[1] Yes [0] No
<b>43</b>	Food cooked Oils and Fats (oil, fats or butter added to food or used for cooking)	[1] Yes [0] No

### SECTION 8: Anthropometry Measurement

No	Questions	Response
<b>44</b>	Previous Weight of child	Kg
	Previous Height of the child	Cm
	Previous BMI	
<b>45</b>	Weight of Adolescent	Kg
	Height of the Adolescent	Cm
	Current BMI	

**Appendix 6: Questionnaire (Amharic version)**  
**መጠይቅ (አማርኛ)**

የሆስፒታል መጠይቅ

ቀን: \_\_\_\_\_

ውድ ምላሽ ሰጪዎች

ሐብል አዳሙ እባላለሁ። በአዲስ አበባ ዩኒቨርሲቲ ስር ከሚገኘው፤ በምግብ ዋስትና እና የሃገር ልማት ጥናቶች ማዕከል የድህረ-የምረቃ ተማሪ ነኝ። በዘውዲቱ መታሰቢያ ሆስፒታል ባለው የፀረ-ኤች አይ ቪ / ኤድስ ሕክምና ክሊኒክ ውስጥ የኤች አይ ቪ / ኤድስ ቫይረስ በደማቸው የሚገኙ ታዳጊዎች (10-19 እድሜ) ስላላቸው የስነ-ምግብ እና የአመጋገብ ሁኔታ ጥናት እያካሄድኩ ነው። ይህ የመመረቂያ ጽሁፍ ወይም ምርምር ወይም ጥናት አላማው የእነዚህ ታዳጊዎችን የአመጋገብ ሁኔታ ገምግሞ፤ ወሳኝ የሆኑትን ማመላከት ነው። ይህ ቃለ-መጠይቅ እና ሁሉም የሚሰጧቸው መልሶች በምስጢር ይጠበቃሉ። ለማንም አይካፈሉም። ለመመለስ የማይፈልጉትን ጥያቄ ከጠየቅሁኝ ያሳውቁኝ እና ወደ ሚቀጥለው ጥያቄ እሄዳለሁ። ቃለ መጠይቁን በማንኛውም ጊዜ የማቆም መብት አሎት። የእርስዎ አስተያየት ለዚህ ጥናት እጅግ አስፈላጊ ግብአት ስለሆነ፤ ለእነዚህ ጥያቄዎች መልስ ለመስጠት እንደሚስማሙ ተስፋ አደርጋለሁ።

አዎ' ፈቃደኛ ነኝ።

አይ' ፈቃደኛ አይደለሁም።

መልሱ አዎ ከሆነ ወደሚቀጥለው ጥያቄ ይለፉ & መልሱ አይ ከሆነ መጠይቁን ያቋርጡ።

**መመሪያ**

1. መልሱ ከተሰጠው አማራጭ ውስጥ ይያዙ እና መልስ ሰጪው በተጠቀሰው ክፍል ውስጥ የሚናገረውን በግልጽ ይጻፉ።
2. በቁጥሮች ውስጥ ያሉት ጥያቄዎች በተሰጠው ቦታ ላይ ምላሽ ይስጡ።
3. ጥያቄው የሚሰራው ለታዳጊዎች ወላጆች ወይም ተንከባካቢዎች እና ለታዳጊዎች ብቻ ነው።
4. ትክክለኛውን የመዝለል ስርዓት ይከተሉ

**ክፍል 1: የመለያ መረጃ**

የታካሚ ኮድ(የሆስፒታል ህክምና ቁጥር) : \_\_\_\_\_

**ክፍል 2: የስነ-ሕዝብ አወቃቀር ምክንያቶች**

ተራ ቁ.	ጥያቄዎች	መልስ
1	የታዳጊው/ዋ ጾታ	[1] ወንድ [2] ሴት
2	የታዳጊው/ዋ ዕድሜ ስንት ነው?	
3	አጠቃላይ የቤተሰብ ብዛት	
4	በቤተሰቡ ውስጥ የሚኖሩ ልጆች ብዛት ስንት ነው?	
5	የልጅዎ የልደት ደረጃ ቅደም ተከተል ምንድን ነው?	

**ክፍል 3: ማህበረ-ኢኮኖሚያዊ ምክንያቶች**

ተራ ቁ.	ጥያቄዎች	መልስ
6	የወላጆች ሁኔታ	[1] ሁለቱም ወላጆች በሕይወት ያሉ እና ልጁን አንድ ላይ የሚደግፉ ናቸው። [2] ሁለቱም ወላጆች በህይወት ያሉ እና አንድ ወላጅ ልጁን ይደግፋል። [3] እናት በሕይወት አለች/ አባት በሕይወት የለም። [4] አባት በሕይወት አለ / እናት በሕይወት የለችም። [5] ሁለቱም ወላጆች በሕይወት የሉም። [6] ሌላ ካለ ይግለጹ _____
7	የታዳጊው/ዋ ዋና ተንከባካቢ ማን ነው?	[1] እናት እና አባት በጋራ [2] እናት ለብቻ [3] አባት ለብቻ [4] ሌሎች የቤተሰብ ዘመዶች

		[5] የማይገ አሳዳጊ/ተንከባካቢ [6] ሌላ ካለ ይግለጹ _____
የጥያቄ ቁጥር 7 መልስ 4 – 6 አማራጭ ውስጥ ከሆነ ከ 8 – 11 ያሉትን ጥያቄዎች ይዘለሉ።		
<b>8</b>	የወላጅ እናት ከፍተኛ የትምህርት ደረጃ ስንት ነው?	[1] የለም [2] የመጀመሪያ ደረጃ _____ [3] የሁለተኛ ደረጃ _____ [4] የሙያ ስልጠና _____ [5] ኮሌጅ / ዩኒቨርሲቲ [6] ሌላ ካለ ይግለጹ _____ [7] አላውቅም
<b>9</b>	የወላጅ አባት ከፍተኛ የትምህርት ደረጃ ስንት ነው?	[1] የለም [2] የመጀመሪያ ደረጃ _____ [3] የሁለተኛ ደረጃ _____ [4] የሙያ ስልጠና _____ [5] ኮሌጅ / ዩኒቨርሲቲ [6] ሌላ ካለ ይግለጹ _____ [7] አላውቅም
<b>10</b>	ወላጅ እናት የስራ ሁኔታ (ከአንድ በላይ መልስ ይቻላል)	[1] ስራ አጥ [2] ተቀጥራለች (መደበኛ ሥራ) [3] የራስ ሥራ [4] ሌላ ካለ ይግለጹ _____ [5] የ ቤት እመቤት
<b>11</b>	ወላጅ አባት የስራ ሁኔታ (ከአንድ በላይ መልስ ይቻላል)	[1] ስራ አጥ [2] ተቀጥሯል (መደበኛ ሥራ) [3] የራስ ሥራ

		[4] ሌላ ካለ ይግለጹ _____
<b>12</b>	እናት እና አባት በህይወት ከሌሉ እና ታዳጊው ከዘመድ ጋር የሚኖር ከሆነ የመጀመሪያ ደረጃ ተንከባካቢ የትምህርት ሁኔታ	[1] የለም [2] የመጀመሪያ ደረጃ _____ [3] የሁለተኛ ደረጃ _____ [4] የሙያ ስልጠና _____ [5] ኮሌጅ / ዩኒቨርሲቲ [6] ሌላ ካለ ይግለጹ _____ [7] አላውቅም
<b>13</b>	እናት እና አባት በህይወት ከሌሉ እና ታዳጊው ከዘመድ ጋር የሚኖር ከሆነ የመጀመሪያ ደረጃ ተንከባካቢ የስራ ሁኔታ (ከአንድ በላይ መልስ ይቻላል)	[1] ስራ አጥ [2] ተቀጥሯል/ተቀጥራለች (መደበኛ ሥራ) [3] የራስ ሥራ [4] ሌላ ካለ ይግለጹ _____
<b>14</b>	የታዳጊው የትምህርት ደረጃ	[1] የለም [2] የመጀመሪያ ደረጃ _____ [3] የሁለተኛ ደረጃ _____ [4] የሙያ ስልጠና _____ [5] ኮሌጅ / ዩኒቨርሲቲ [6] ሌላ ካለ ይግለጹ _____
<b>15</b>	መኖሪያቸው የት ነው?	[1] ገጠር [2] ከተማ [3] ከፊል ከተማ [4] ሌላ ካለ ይግለጹ _____
<b>16</b>	ልጅ የመንግስት ድጋፍ/ድጎማ ያገኛል / ታገኛለች?	[1] አዎ [0] አይ

17	አማካይ የቤተሰብ ገቢ/በወር (የኢትዮጵያ ብር) ስንት ነው	[1] _____ [2] (የለም) በማደግ ውስጥ ከሆነ
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**ክፍል 4: የአካባቢያዊ ሁኔታዎች**

ተራ ቁ.	ጥያቄዎች	መልስ
18	ለመጠጥ የሚሆን ውኃ የምታገኙት ከየትነው?	[1] የቧንቧ ውሃ [2] የህዝብ ቧንቧ (በኖ ውሃ) [3] የተከለለ የውኃ ጉድጓድ/ምንጭ [4] ጥበቃ ያልተደረገለት ጉድጓድ/ ምንጭ [5] የዝናብ ውሃ [6] ሌላ ካለ ይግለጹ _____
19	በቤትዎ ውስጥ ምን ዓይነት መጠጫ አለዎት?	[1] ውሃ ያለው መጠጫ [2] የጉድጓድ መጠጫ [3] መቀመጫ ያለው መጠጫ [4] ማስተንፈሻ ያለው መጠጫ [5] ምንም መጠጫ የሉም (ቁጥቋጥ ውስጥ) [6] ሌላ ካለ ይግለጹ _____
20	የቤቶችን ቁሻሻ እንዴት ነው የሚያሰግዱት?	[1] መስክ ላይ ነው የሚጥሉት [2] ቆሻሻውን በአይነት ለይቼ ጥልቅ ጉድጓድ/ቁሻሻ መጣዎ በታ ላይ እጥላለሁ :: [3] ቆሻሻውን ሳልለይ ጥልቅ ጉድጓድ/ቁሻሻ መጣዎ በታ ላይ እጥላለሁ :: [4] ቆሻሻውን በአይነት ለይቼ አቃጥላለሁ የማይቃጠለውን ደግሞ እጥላለሁ:: [5] ቆሻሻውን ሳልለይ አቃጥላለሁ::

		[6] ሌላ ካለ ይግለጹ _____
<b>21</b>	ምግብ ካዘጋጁ በኋላ የማብሰያ አካባቢው ፣ ድስቶች መጠቀሻዎች ሰሃኖች እና ሌሎች መገልገያዎች መጽዳት ይኖርባቸዋል አብዛኛውን ጊዜ እንዴት እንደሚያጸዷቸው ሊነግሩኝ ይችላሉ?  (ከአንድ በላይ መልስ ይቻላል)	[1] ጠራርጌ ጥራጊውን ወደ ቆሻሻ ማጠራቀሚያው [2] በሞቀ ውሃ አጥባቀለሁ። [3] በሰሙና (አጃክስ) ወይም በፈሰሽ ሰሙና አጥባቀለሁ [4] ሌላ ካለ ይግለጹ _____
<b>22</b>	ቶሎ ሊበላሹ የሚችሉ ምግቦችን (እንደ ስጋ ያልተሰራ ዶሮ ወይም አሳ) እስኪሰሩ ድረስ እንዴት ያቆዩባቸዋል?	[1] ፍሪጅ ውስጥ [2] እስኪሰሩ ተሸፍነው ይቆያሉ [3] ከበሰሉ ምግቦች ወይም ለመመገብ ከተዘጋጁ ምግቦች ጋር እንዳይነካካ ተለይቶ ይቆያሉ [4] ሌላ ካለ ይግለጹ _____
<b>23</b>	እጆችዎን እንዴት እንደሚታጠቡ በቅደም ተከተል ሊነግሩኝ ይችላሉ?	[1] እጆችን ሰሃን ውስጥ ባለውሃ ውስጥ እየነከሩ ከሌሎች ሰዎች ጋር አብሮ መታጠብ (መጥፎ ልምድ) [2] ሌላ ሰው ትንሽ ንጹህ ውሃ አያንቆረቆረ መታጠብ (ትክክለኛ ልምድ) [3] ከቧንቧ በሚወርድ ውሃ መታጠብ (ትክክለኛ ልምድ) [4] እጆችን በሰሙና እና ውሃ መታጠብ [5] ሌላ ካለ ይግለጹ _____

**ክፍል 5: የጤና ሁኔታ (የህክምና ታሪክ)**

ተራ ቁ.	ጥያቄዎች	መልስ
24	የኤች አይ ቪ ምርመራ ቀን	/ /
25	የመነሻ CD4 ቆጠራ	
26	በጣም የቅርብ ጊዜ የሻይረስ ቆጠራ	
27	የአለም ጤና ድርጅት ክሊኒካዊ ደረጃ ከፀረ-ኤች አይ ቪ መድሃኒት በፊት (HAART)	
28	ወቅታዊ ክሊኒካል ደረጃ	
29	አጠቃላይ የፀረ-ኤች አይ ቪ (HAART) መድሃኒት የወሰደበት ጊዜ በወራት	
30	ከዚህ በፊት የኦፕርቴይቲቭ ኢንፎክሽን (OI) ታሪክ አለው/ላት (ቲቢ, ኪንታሮት, ሄርፕስ, )	[1] አዎ [0] አይ አዎ ከሆነ ይግለጹ, _____
31	ልጁ/ቷ ባለፉት 3 ወራት ውስጥ ታምሞ/ማ ያውቃል/ታውቃለች?	[1] አዎ [0] አይ መልሱ አዎ ከሆነ ከሚከተሉት ውስጥ የትኛው ነው (ከአንድ በላይ መልስ መስጠት ይቻላል) [1] ተቅማጥ [2] የመተንፈሻ አካላት ኢንፎክሽን [3] የሆደውስጥ ትላትል (ሄልሚኒቲክ ኢንፎክሽኖች [4] ሌላ ካለ ይግለጹ _____
32	የክትባት ሁኔታ	[1] ሙሉ ክትባት የተከተሉ [2] በከፊል የተከተሉ/የተወሰኑ አይነት ክትባት ያልተከተሉ

	[3] ምንም ዓይነት ክትባት ያልተከተሉ
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**ክፍል 6: ስነ ምግብ እገዛ**

ተራ ቁ.	ጥያቄዎች	መልስ
33	ልጁ/ቷ ሌላ ለህክምና የምግብ ድጋፍ እያገኘ/ች ነው ወይ? (ፕላንፕነት፣ ወተት፣ የመሳሰሉት)	[1] አዎ [0] አይ
34	ተንከባካቢው የስነ-አመጋገብ ምክርን ተቀብሏል?	[1] አዎ [0] አይ
35	ልጁ/ቷ አጋዥ የሽይታሚን መድሃኒቶች እየወሰደ ነው ወይ?	[1] አዎ [0] አይ
36	ለቤት ውስጥ ፍጆታ የሚጠቀሙት ምግብ ከሚከተሉት ምንጮች ያገኛል	[1] በቤት ውስጥ የተመረተ (በአካባቢው የተመረተ) [2] ከሱቆች ውስጥ የተገዛ [3] ከሌሎች ሰዎች መዋጀት [4] የምግብ እርዳታ [5] ሌላ ካለ ይግለጹ _____

**ክፍል 7: የ 24 ሰዓታዊ የአመጋገብ ታሪክ**

አሁን ደግሞ ባለፈው 24 ሰዓት ውስጥ ቀን ወይም ማታ ስለተወሰዱ ምግቦች እና መጠጦች ልጠይቅዎ እፈልጋለሁ። እባክዎን ከቤትዎ ውጭ የተመገቡትን ምግቦች እና መጠጦች ያካትቱ።

የመጀመሪያ ደረጃ		ሁለተኛ ደረጃ	
ምግብ እና መጠጦች በቀን ውስጥ የተወሰዱ	ይዘት	የተረሱ ምግቦች እና መጠጦች	ይዘት
ቁርስ			
መክሰስ			
ምሳ			
መክሰስ			
ራት			
ተጭማሪ			

ተራ ቁ.	ጥያቄዎች	መልስ
37	<p>ሰብሎች, ሥር እና ሀረጎች (ዳቦ፣ ብስኩት፣ ኩኪስ ወይም ከማሸላ፣ በቆሎ፣ ፓስታ፣ ፍዝ፣ ስንዴ፣ ገንፎ ወይም ሌሎች በአካባቢው የሚገኙ እህል፣ ስኳር ድንች ፣ ካሳሻ፣ ካሮት፣ ዱባ እና ቆጮ)</p>	[1] አዎ [0] አይ
38	<p>አትክልቶች እና ፍራፍሬዎች (ዱባ, ቆስጣ፣ ጎመን, ብሮክሊ፣ ጥቅል ጎመን፣ አበባ ጎመን፣ አረንጓዴ አትክልቶች ፣ ካሮት፣ ቲማቲም፣ ቀይ ስር፣ ሙዝ፣ ብርቱካን፣ አሸካዶ፣ ፓፓያ፣ ሀብሃብ ፣ ማንጎ )</p>	[1] አዎ [0] አይ
39	<p>ስጋ, እና ዓሳ (የዶሮ ስጋ፣ ጥጃ ስጋ፣ አሳማ፣ ፍየል፣ በግ፣ በሬ፣ ዓሳ)</p>	[1] አዎ [0] አይ
40	<p>እንቁላል (እንቁላል)</p>	[1] አዎ [0] አይ
41	<p>ጥራጥሬዎች እና ዘሮች (ባቄላ, አተር, ምስር እና ሽምብራ የመሳሰሉት)</p>	[1] አዎ [0] አይ
42	<p>ወተት እና የወተት ምርቶች (ወተት, አይብ, ወይም ሌሎች የወተት ምርቶች)</p>	[1] አዎ [0] አይ
43	<p>ቅባት እና ዘይት (ለምግብነት የተጨመሩ ወይም ለማብሰል ጥቅም ላይ የሚውሉ ቅቤ ወይም ቅባት)</p>	[1] አዎ [0] አይ

**ክፍል 8: የሰውነት ልኬት**

ተራ ቁ.	ጥያቄዎች	መልስ
44	የበፊት የልጁ ክብደት	ኪ.ግ
	የበፊት የልጁ ቁመት	ሴ.ሜ
	የ መጀመሪያው BMI	
45	የአሁን የልጁ ክብደት	ኪ.ግ
	የአሁን የልጁ ቁመት	ሴ.ሜ
	አሁን ያለው BMI	