



Under-nutrition and Associated Factors among Young Patients on Anti-Retroviral Therapy in North Shoa, Oromia, Ethiopia, 2022: A Facility-Based Cross-Sectional Study

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ABSTRACT

Background: Undernutrition and the Human Immunodeficiency Virus (HIV) are related in a complex and harmful way and are both exceedingly prevalent throughout the world, particularly in sub-Saharan Africa. In Ethiopia, the prevalence of undernutrition ranged from 12.3% to 43% and the prevalence of stunting and thinness among HIV-infected adolescents were 39% and 14% respectively. There is no study among young patients living with Human Immunodeficiency Virus and ART. Therefore, this study aims to assess the prevalence of undernutrition and its associated factor among young infected with HIV and following ART clinics at the north Shoa health facilities in Oromia, Ethiopia. **Method:** A facility-based cross-sectional study was conducted. A probability-proportional sampling method was used to select 387 participants and pretested, interview-administered questionnaires were used to collect the data. The information was entered into EpiData and analyzed with SPSS. A 95% confidence interval and a p-value less than 0.05 were used to identify predictor variables, and Adjusted Odds Ratio (AOR) was used to assess the strength of the association. **Result:** The prevalence of stunting and thinness in the study was 37% (95% CI: 32.0, 41.9) and 13.4% (95% CI: 10.3, 16.9) respectively. Being male (AOR=1.5, 95% CI: 1.0, 2.4), educational level of caregiver (AOR=7.8, 95% CI: 3.5, 17.2), and having a family income <1500 ETB (AOR=7.8, 95% CI: 3.5, 17.2) were significantly associated with stunting while being male (AOR=2.59, 95% CI: 1.25, 5.40), nutritional counseling (AOR=4.05, 95% CI: 1.64, 10.02), Skipping meal (AOR=4.97, 95% CI: 2.08, 11.9) and educational level of caregiver (AOR=4.18, 95% CI: 1.82, 9.60) were significantly associated with thinness. **Conclusion:** The prevalence of stunting and thinness among HIV-infected adolescents and youth in the study area was consistent with EDHS and higher than the EDHS report respectively. Sex, skipping a meal, nutritional counseling, and family size were significantly associated with thinness and Sex, educational level of the caregiver, and family income was significantly associated with stunting.

Keywords: HIV/AIDS, Undernutrition, Young, Oromia, Ethiopia

INTRODUCTION

Undernutrition is defined by conditions that are low weight for height (wasting), low height for age (stunting), low weight for age (underweight), and low Body Mass Index (BMI) for age (thinness) [1]. Undernutrition and the Human Immunodeficiency Virus (HIV) are related in a complex and harmful way and are both exceedingly prevalent throughout the world, particularly in the sub-Saharan African region [2]. The immune response to HIV infection is influenced by nutritional status, which has an impact on overall clinical outcomes. The relationship between nutrition and HIV/AIDS exacerbates HIV infection's detrimental impacts on human development at the

individual, home, community, and national levels [3]. Undernutrition inflicts long-lasting damage to adolescents and young including delayed physical and cognitive development, increased future vulnerability to chronic diseases, and unfavourable future birth outcomes in girls, resulting in decreased learning ability, poor concentration, and impaired school performance. Specifically, in adolescents and youth living with HIV, undernutrition leads to fast disease progression, increasing susceptibility to opportunistic infections and mortality [4]. HIV infections can reduce appetite, decrease the body's absorption of nutrients, and make the body use nutrients faster than usual to repair the immune system. HIV can cause or aggravate malnutrition through reduced food intake, increased energy needs, and poor nutrient absorption [4,5]. In turn, malnutrition can fasten the progression of HIV and worsen its impact by weakening the immune system. In resource-limited settings, undernutrition is a significant factor affecting HIV care and treatment. Due to the cyclic nature of HIV and poor nutritional status, failing to achieve nutritional demands may result in lowered immunity and increased vulnerability to Opportunistic Infections (OIs), both of which can lead to severe nutritional deficiency [6]. More than 1.5 million adolescents 10 years to 19 years of age are living with HIV worldwide. Each year 200,000 new adolescents are infected and 33,000 die due to AIDS-related causes.

HIV cases are overwhelmingly concentrated in low- and middle-income nations [7,8]. East and Southern Africa was the most severely affected region of Africa, with 20.6 million HIV-positive individuals and 670,000 new HIV infections in 2020 [8]. Around four-fifths of HIV-infected adolescents and young people live in sub-Saharan Africa [9]. A body of evidence showed that globally, adolescent and youth undernutrition is a serious public health problem in both developed and developing countries, but is disproportionately keeping severe in developing countries, especially in Asia (32% to 65%) and Africa (4% to 30%), making them more vulnerable to low productivity, poor health, and early deaths. In Sub-Saharan Africa, the prevalence of adolescent and youth undernutrition is 15% to 58%, which is higher from other African countries [10].

Ethiopia has a high population of adolescents (15 years old to 19 years old) and youth (20 years old to 24 years old), accounting for about 22% of the total population this young population is a huge intellectual and economic resource for Ethiopia, and their requirements have ramifications for the country's social, economic, and political agenda, as it puts pressure on health care, education, water and sanitation, housing, and jobs. However, adolescents and youth in Ethiopia did not productive because of many problems including HIV and nutritional problems [11,12]. In Ethiopia, the prevalence of undernutrition ranged from 12.3% to 43% and the prevalence of stunting and thinness among HIV-infected adolescents were (39%) and 14% respectively [10,13,14]. Even though several local studies have been done on the nutritional status of adults and children. But limited research was done to determine the level of undernutrition and associated factors among young people (10 years old to 24 years old) who attended an anti-retroviral therapy in the study area. Therefore, this study tried to assess the prevalence of undernutrition and its associated factor among young infected with HIV and following ART clinics at the North Shoa health facility.

MATERIALS AND METHOD

Study Design, Area, and Period

A facility-based cross-sectional study was conducted among young living with HIV/AIDS and attending the ART clinic at the North Shoa Zone public health facility from August 21 to October 2021/2022. The capital city of the Zone, Fitcha, is located about 114 km away from Addis Ababa, the capital city of Ethiopia. The Zone had a total of 14 woredas and 291 kebeles. The zone has a total population of 1,768,678 of whom 875,495 (49.5%) are men and 893,182 (50.5%) are women. The zone has 5 Hospitals and 64 Health centres. From this health facility, 5 hospitals and 16 health centres provide ART services to HIV/AIDS clients. North Shoa provides ART care and support for 5,418 clients per year.

Population

- **Source population:** All young people living with HIV, who were receiving ART services in North Shoa public health facility, were considered as the source population for the study.
- **Study population:** The study population was all young living with HIV, who received ART services and was selected randomly in a selected health facility.

Eligibility Criteria

Inclusion and Exclusion criteria: Young people within the age group (10 years to 24 years) living with HIV who visited the health facilities for ART service during the study period will be included in the study and pregnant were excluded.

Sample Size Determination

The total sample size was calculated by using the single population proportion formula [$n=(Z\alpha/2)^2 p(1-p)/d^2$] by considering the assumption; the prevalence of stunting is (33%) according to study done in southern parts of Ethiopia by Hailegariel Shiferaw in 2020 which gives the larger sample size, 95% confidence interval, 5% margin of error, the Sample size was found to be 387 after considering 10% non-response rate [8].

Sampling Technique

The study sample was proportionally allocated to all study health facilities based on their six months delivery report before the study. The study was carried out in the eight selected public health facilities (2 hospitals and 6 health centres). The detail of the sampling procedure is described in Figure 1 below.

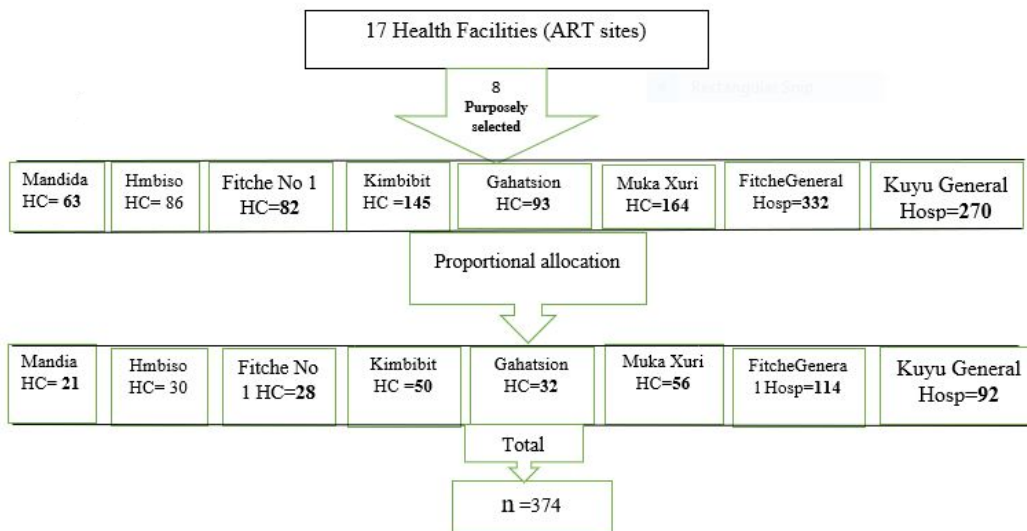


Figure 1 Sampling procedure of study participants to assess undernutrition and associated factors among young patients on ART in North Shoa, Oromia, Ethiopia, 2022

Data Collection Tools and Procedure

Data was collected by the interview method using a structured and pretested questionnaire. The questionnaire was prepared based on studies conducted in Ethiopia previously [6,8,13-16]. The questionnaire is first prepared in English, and then translated into Affan Oromo, then translated back to English by another person to check its consistency (attached as supplementary material separately). Information was collected by 6 BSc. nurses who was work in the ART clinic and a nutrition counsellor with similar experience. Moreover, the nutritional evaluation was done using anthropometric measurements. Measurement of weight for the young who had taken by an electronic digital weight scale and it will be 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 (World Health Organization) Anthroplus version 3.2.2 accordingly. In addition, medical history and related factors past and recent CD4 counts/viral load, history of opportunistic infection, WHO clinical stage diseases progression, previous weight, and height were referred from the patient chart and follow-up form of the study participants.

Data Quality Control

The questionnaire was prepared in English and translated into Affan Oromo to increase the understanding of the respondents and translated back to English to the keep consistency of the question. The questionnaire was pre-tested on 5% of the sample size out of the study area. The pre-test was done to ensure clarity and logical sequence and skip the pattern of the questionnaire. The essential amendment was taken. The training was given to the data collector and supervisor on the objective of the study, technique, and procedure that they followed during the interview. Close supervision was done by the supervisor and principal investigator.

Study Variable

The dependent variable was the nutrition status of young living with HIV/AIDS as indicated by stunting (height for age) and Thinness (BMI for age) while the independent variables were Socio-demographic factors (Age, Sex, Residence, Educational status of caregiver, Parental status, Relationship to a caregiver, Family size and Family incomes), Environmental factors (Source of drinking water, Types of toilet and Garbage disposal), Health-related factors (CD4 counts, Most recent viral load, Clinical stages, Illness lasts three months), Dietary related factors (Feeding supports, Nutritional counselling, Source of food consumption and Individual dietary diversity scores), Previous Anthropometric factors (Previous weight and Previous height).

Data Management and Analysis

The collected data was entered using Epi-Data version 4.6 and exported to SPSS 24 software for cleaning, recording, categorizing, and analyzing. Anthroplus Software was used to determine the magnitude of malnutrition using the indicators of Weight For Age (WFA), Height-For-Age (HFA), for BMI for age analysis. To determine undernutrition, World Health Organization (WHO) reference standards taking -2SD as the cut-off point indicating malnutrition (between -2SD and -3SD for moderate malnutrition and less than the -3SD for severe malnutrition). A bivariate analysis was done to see the association between independent and outcome variables. Those variables with a p-value less than 0.25 during the bivariate analysis were included in the multivariate logistic regression analysis to assess the relative effect of confounding variables. Since the outcome variable is categorical, the adjusted odds ratio was calculated through a multiple logistic regression model. After multivariate analysis had been done, the adjusted odds ratio was used to measure the strength of the association between the dependent variable and the independent variable, while the 95% CI and p-value were used to assess whether the association was significant.

RESULT

Socio-Demographic Characteristics

A total of 387 young people on ART participated in the study making a response rate of 91.4% and 223 (57.6%) of them were females. Three hundred twenty-four (83.7%) of the young people were orthodox Christians in religion. As to the family size, two hundred twenty-three (60.7%) participants had >4 family members. Furthermore, two hundred forty-six (63.6%) of young people's caregiver has no formal education, with 52.5% of young caregiver income falling below 1,500 ETB. Concerning educational level (45.0%) of respondents attended secondary and concerning primary caregivers (74.7%) of the participant lived with their parents (Table 1).

Table 1 Socio-demographic characteristics of adolescents and youth on ART in the North Shoa public health facility, North Shoa, Oromia, Ethiopia (October 2022)

Variables	Variable category	Frequency	Percent (%)
Sex of respondents	Male	180	46.5
	Female	207	53.5
Religion of Respondents	Orthodox	324	83.7
	Muslim	25	6.5
	Protestant	38	9.8
Education level of the caregiver	No formal	246	63.6

	Primary education	79	20.4
	Secondary and above	62	16
The educational level of the participants	No formal	89	23
	Primary education	124	32
	Secondary and above	174	45
Family size	≤ 4 family size	184	47.5
	>4 family size	203	52.5
Income level	≤ 1500	203	52.5
	1500 to 4000	150	38.8
	≥ 40000	34	8.8
Relationship to caregiver	Parent	289	74.7
	Other family members	89	23
	Relative	9	2.3
Residence	Urban	244	63
	Rural	143	37
Relationship of caregiver with participants	Parent	289	74.7
	Other family members	89	23.3
	Relatives	9	2.3

Medical Related Characteristics

As regards to clinical characteristics of study participants, about two third (65.1%) of participants had CD4 count >500 cells/ μ l and 336 of them had >12 mg/dl hemoglobin level. Concerning the WHO clinical stage of the respondents shows 274 (70.8%) were in the first stage (Table 2).

Table 2 Medical-related characteristics of adolescents and youth living with HIV on ART in the North Shoa public health facility, North Shoa, Oromia, Ethiopia, 2022

Variables	Variable category	Frequency	Percent (%)
Previous CD4 count	≤ 500 cell/ μ l	135	34.9
	>500 cell/ μ l	252	65.1
Hemoglobin level	≤ 12 mg/dl	51	13.2
	>12 mg/dl	336	86.8
WHO Clinical stage	One	274	70.8
	Two	61	15.8
	Three	38	9.8
	Four	14	3.6
Diarrhea for two weeks	Yes	42	10.9
	No	345	89.1
Pneumonia	Yes	47	7.5
	No	340	92.5
Intestinal parasite	Yes	29	7.5
	No	358	92.5
	Yes	20	5.2
Skin infection	No	367	94.4

Eating problem	Yes	11	2.8
	No	376	97.2
Difficulty of swallowing	Yes	11	2.8
	No	376	97.2

Prevalence of Stunting

The prevalence of stunting among respondents was 37 % (95% CI: 32-41.9). Among those using WHO cut-off point height for age (<-3SD) 57 (14.7%) were severely stunted and (-3SD to -2SD) 86 (22.2%) were moderately stunted. (n=387) (Figure 2).

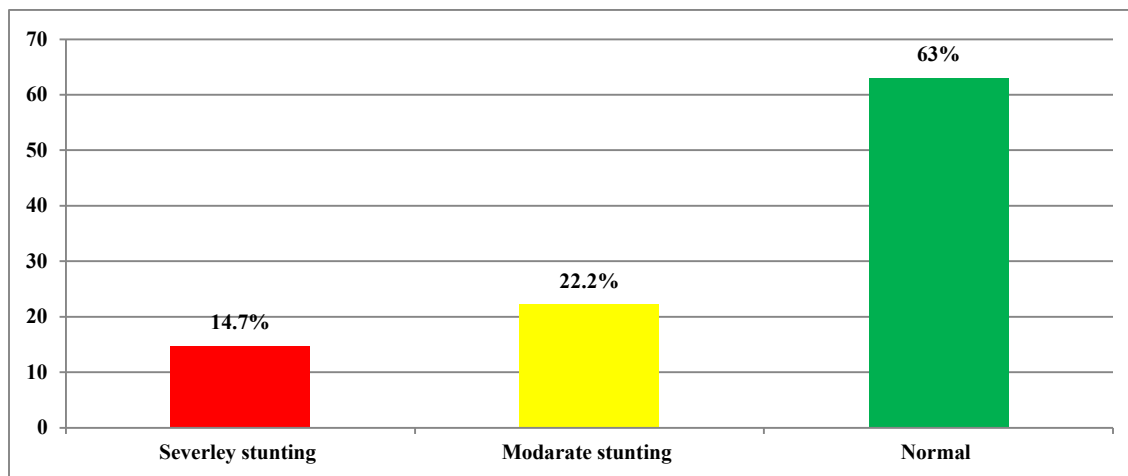


Figure 2 Prevalence of stunting among young patients living with HIV on ART in North Shoa public health facility, Oromia, Ethiopia, 2022

Factor Associated with Stunting

Variables with a p-value less than 0.25 such as sex, educational status of caregivers, source of drinking water, family income, state support, hand washing practice, and WHO clinical stage were fitted into multivariable logistic regression. Then sex, educational status of the caregiver, and family income were statistically significantly associated with stunting. Being male was 1.5 times more likely to be stunted AOR 1.5 (1.0 to 2.4). Young people whose caregiver has no formal education were 7.8 times more likely to be stunted compared with those who have formal education AOR 7.8 (3.5 to 17.2). A participant’s family who has <1500 ETB income per month has 7.8 times more likely to be stunted compared with those who have >1500 ETB AOR 7.8 (3.5 to 17.2) (Table 3).

Table 3 Multivariate analysis for thinness and associated factors among young patients on ART in North Shoa, Oromia, Ethiopia, 2022

Characteristics		Thinness		COR (95% CI)	AOR (95% CI)	p-value
		Thin	Normal			
Sex	Male	13	167	0.65 (0.43-0.99)	2.59 (1.25-5.4)	0.011
	Female	39	168	1		
The educational level of the caregiver	No formal	19	227	4.2 (1.99,8.68)	4.18 (1.82-9.6)	0.001
	Primary education	17	62	1.3 (0.58,2.77)	1.32 (0.54-3.22)	0.54
	Secondary and above	16	46	1		
Place of residence	Urban	24	220	1		
	Rural	28	115	0.45 (0.25,0.81)	1.19 (0.24-5.9)	0.83

Family Income	≤ 1500	8	195	7.5 (2.59,21.69)	10.5 (3.16-34.9)	0
	1500-4000	36	114	0.97 (0.41,2.34)	1.24 (0.44-3.52)	0.68
	>4000	8	26	1		
Main water source	Pipe water	22	223	1		
	Public tap	24	72	0.29 (0.16,0.56)	2.2 (0.72-6.7)	0.16
	Protected dug well/Spring	6	40	0.66 (0.25,1.72)	0.46 (0.15-1.48)	0.19
Hand washing practice	Always	28	232	1		
	Some times	11	72	3.48 (1.63-7.41)	1.5 (0.56-4.0)	0.41
	Never at all	13	31	2.75 (1.11-6.9)	1.37 (0.46-4.42)	
Skipping of meal	Yes	24	186	1.46 (0.81-2.61)	4.97 (2.08-11.9)	0
	No	28	149	1		
Family size	<4	18	166	1		
	>4	34	169	0.54 (0.29-0.99)	1.92 (0.94-3.95)	0.9
Nutritional counseling	Yes	14	143	1		
	No	38	192	0.49 (0.26-0.95)	4.05 (1.64-10.02)	0.003

AOR: Adjusted Odd Ratio, CI: Confidence Interval, COR: Crude Odd Ratio

Prevalence of Thinness

The prevalence of thinness was 13.4 with a 95% CI; (10.3 to 16.9). Among those using the WHO cut-off point BMI for age (<-3SD) 14 (3.6%) were severely stunted and (-3SD-<-2SD) 38 (9.8%) were moderately stunted (n=387) (Figure 3).

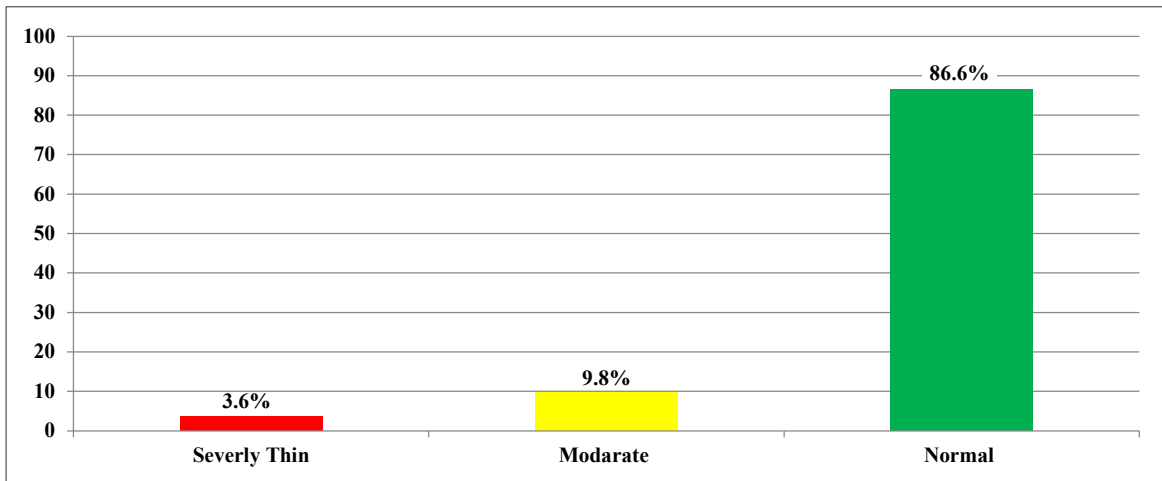


Figure 3 Prevalence of thinness among young people living with HIV on ART in North Shoa zone, Oromia, Ethiopia, 2022

Factor Associated with Thinness

In the bivariate analysis variable such as sex, educational level of caregiver, nutritional counseling, place of residence, family income, main water source, hand washing practice, skipping meals, family size and CD4 count with p-value less than 0.25 were fitted into the multivariable logistic regression model. In multivariable logistic regression analysis Sex, Skipping a meal, nutritional counseling, and educational level of the caregiver were significantly associated with thinness, and Sex, educational level of the caregiver, and family income was significantly associated with stunting (Table 4).

Table 4 Multivariate analysis for stunting and associated factors among young patients on ART in North Shoa Zone, Oromia Ethiopia, 2022

Characteristics		Stunting		COR (95% CI)	AOR (95% CI)	p-value
		Stunted	Normal			
Sex	Male	57	123	1.53 (1.01-2.33)	1.5 (1.0-2.4)	0.04
	Female	86	121	1		
The educational level of the caregiver	No formal	84	162	1.59 (1.0-2.79)	7.8 (3.5-17.2)	0
	Primary education	31	48	1.28 (0.7-2.5)	1.35 (0.62-2.9)	0.44
	Secondary and above	28	34	1		
Hand Washing practice	Always	86	174	1		
	Sometimes	33	50	0.75 (0.45-1.25)	0.74 (0.4-1.3)	0.33
	Never at all	24	20	0.42 (0.26-0.79)	0.57 (0.25-1.3)	0.17
Family Income	≤ 1500	38	165	6.2 (2.88-13.38)	7.8 (3.5-17.2)	0
	1500-4000	81	65	1.09 (0.51-2.36)	1.35 (0.6-2.9)	0.44
	>4000	20	14	1		
Main water source	Pipe water	79	166	1		
	Public tap	48	48	0.48 (0.29-0.77)	0.46 (0.27-0.8)	0.06
	protected dug well/Spring	16	30	0.89 (0.46-1.73)	0.67 (0.32-1.4)	0.29
WHO clinical stage	One	95	179	1		
	Two	30	31	0.55 (0.31-0.96)	0.49 (0.26-0.91)	0.24
	Three	13	25	1.02 (0.5-2.1)	0.75 (0.33-1.7)	0.49
	Four	5	9	0.95 (0.31-0.93)	1.36 (0.37-5.03)	0.64
State supports	yes	23	24	1		
	no	120	220	1.76 (1.0-3.25)	1.8 (0.91-3.50)	0.09

AOR: Adjusted Odd Ratio, CI: Confidence Interval, COR: Crude Odd Ratio

DISCUSSION

This study aimed to identify the prevalence of undernutrition and its associated factors among adolescents and youth people in the North Shoa Zone. In this study, the prevalence of stunting in adolescents and youth living with HIV (ADLHIV) who attend chronic care was 37% (95% CI: 32.0, 41.9). This finding was consistent with the cross-sectional study conducted in Uganda on the nutritional status of HIV-infected adolescents which was 36.2% [17].

The prevalence of stunting in this study was higher than a study finding in Eastern Ethiopia among pediatrics-age children attending antiretroviral therapy which was 24.7% [15], and a study in Dangila Town, Northwest Ethiopia which was 24.8% [16]. It was also higher than a cross-sectional study conducted among adult HIV/AIDS patients in Jimma Hospital 27.2% [18], and Dilla Hospital 25.2% [19]. The difference may be due study setting difference this study area is more rural compared with the other and the study period may contribute to the high prevalence of stunting because in recent times more crises are happening in the country which case social, economic, and health impact on the society. This discrepancy might be also due to the difference in socioeconomic status, sample size difference, and cultural variation between the study subjects.

In the present study, the prevalence of thinness among adolescents and youth living with HIV was 13.4% (95%, CI: 10.3 to 16.9), which was almost comparable with the study done in Uganda at 18% [17], and Arba Minch 18.2% [20]. The prevalence of thinness was lower than a study finding in Saudi Arabia (19.2%) [21], Eastern Ethiopia (28.2%) [15], and Jimma University Hospital (27.2%) [18]. The difference is caused by variations in the

socioeconomic and demographic traits of the study participants as well as variations in sample sizes. Moreover, the current WHO 90-90-90 test and treatment strategy, which has seen many more HIV-infected children placed on HAART early, may be responsible for the study's lower magnitude of undernutrition. This policy has changed the comorbidity of undernutrition.

Thinness in this study was higher than a study finding in Dangla which was 7.1%, [16]. The differences seen between this study and other studies could be attributed to differences in sample size, healthcare service utilization, and community healthcare awareness. Also, it could be a result of the study participants' varied socioeconomic and lifestyle variables.

From Multivariable Logistic Regression output nutritional counseling, sex, skipping meals, and educational status of caregivers were significantly associated with thinness whereas sex, educational status of caregivers, and family incomes were significantly associated with stunting.

Those who did not get nutritional counseling were about four-time thinner than those who get nutritional counseling. This was similar to the research conducted among Children on Follow up in Amhara Region Referral Hospitals, Ethiopia [13], and among adult HIV/AIDS patients receiving ART in Dilla University Referral Hospital, Dilla, Southern Ethiopia [19], and among pediatric HIV-positive patients initiating antiretroviral therapy in Johannesburg, South Africa [22]. This shows nutritional counseling help ART patient to select the appropriate diet and nutritional problem can aggravate the disease and decrease immunity.

The likelihood of thinness and stunting was higher among boys when compared to girls. Young boys were about 2.6 times more likely at risk for thinness and 1.5 more stunts than female participants. This result was in line with the study findings in Uganda [17], among HIV-infected children in Central and West-Africa [23], and different parts of Ethiopia [15,16]. The reason for the high prevalence of stunting and thinnest among males than females might be related to biological, behavioral, and socio-cultural mechanisms.

According to this study participants who Skip a meal were five-time thinner than their counterparts. This result was in line with the study findings in Dangila Town, Northwest Ethiopia [16], and the study done in Saudi Arabia [24]. The participants may skip meals for a variety of reasons, such as food insecurity at home, a lack of awareness of the risks, or the mistaken belief that doing so will help them lose weight. If adolescents and youth feed infrequently and limited meal patterns, it will interfere with the distribution of nutrients they receive over the course of a day, resulting in low energy intake and insufficient micronutrient intake and leading to being thin.

The educational level of the caregiver was among the factors significantly associated with stunting and thinness. Those who have no formal education were about eight times more stunt and four times thinner compared with study participants who have Secondary and above educational levels. There was a similar finding with studies in Sub-Saharan Africa [2], among Adolescent School Girls in Adwa Town, North Ethiopia [14], and among school adolescent girls in Abuna Gindeberet district, Central Ethiopia [4]. The possible reason for this was that school attending helped to get more information about a balanced diet and the mechanism of disease prevention and health promotion compared with their counterparts.

Study participants whose family income was less than 1500 Ethiopian birr were nearly eight times more stunt compared with those who got more than 4000 Ethiopian birr. This is in line with the study among adult HIV/AIDS patients receiving ART in Dilla University Referral Hospital, Dilla, Southern Ethiopia [19] and Among HIV-Positive Adolescents on Antiretroviral Therapy in Southern Ethiopia [8] and HIV infected adults in Tanzania [25]. HIV infection may have an indirect impact on a child's nutritional status by affecting the social environment in which the youngster grows up. Evidence suggests that in some situations when the family's most productive members have HIV, agricultural productivity and household economic capability are diminished, which can result in a condition of food insecurity and undernutrition.

CONCLUSION

The prevalence of stunting and thinness among HIV-infected adolescents and youth in the study area was (37%) which was consistent with EDHS 2019 (37%) and 13.4% which was higher than the EDHS report 2019 (7%) respectively. Sex, Skipping a meal, nutritional counseling, and educational level of the caregiver were significantly

associated with thinness and sex, educational level of the caregiver, and family income was significantly associated with stunting.

As nutritional problems are very common among adolescents and youth living with HIV, there is a need for specific adolescent and youth nutrition intervention in the national nutrition program. The clinicians and other health professionals working on HIV/AIDS prevention and control programs more attention should be given in promoting nutritional education for HIV-positive adolescents and youth including dietary counseling and feeding practices to strengthen the nutritional status and the immune system. Further research needs to better define the factors of malnutrition and larger studies to fully ascertain predictors and interventions to mitigate the problem of malnutrition in HIV-infected adolescents and youth with better study design.

LIMITATIONS

The data are cross-sectional, making it impossible to draw judgments regarding the direction of relationships between research variables. As study subjects presented at health facilities during the study period were included in the study, the generalizability of the findings to all HIV-positive adolescents in the community could theoretically be affected.

DECLARATIONS

Ethical Approval

A legal ethical clearance letter was obtained from the institutional ethical review committee of Salale University with the Ethical Approval number SIU 112/2022.

Consent to Participate

The study participant confidentiality was maintained by excluding their name and personal identifiers. Even, if they got any data that expose their confidentiality, they have the right to interrupt the interview. Finally, participants were asked for their willingness to participate, and based on their willingness they can be interviewed after filling written informed consent form.

Consent for Publication

All authors read the manuscript and have provided their consent to publish.

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