



Underweight and Its Predictors Among Patients on Anti Retroviral Therapy at Selected Health Facilities of Addis Ababa, Ethiopia, 2020

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Addisu Tadesse Sahile ¹
Solomon Muluken Ayehu ²
Selamawit Fekadu Fanta³

¹Department of Public Health, Unity University, Addis Ababa, Ethiopia;

²Department of Emergency, Menelik II Referral Hospital, Addis Ababa, Ethiopia;

³Department of ICU, Saint Peter Specialized Hospital, Addis Ababa, Ethiopia

Objective: The study aimed at assessing the prevalence of underweight and its predictors in patients on ART, in health facilities of Addis Ababa, Ethiopia, 2020.

Methods: A multi-center-based cross-sectional study was conducted among 319 patients on ART selected on the basis of stratified sampling method in Addis Ababa from July 01 to August 30, 2020. An interviewer-administered structured questionnaire was used for collection of the data, after which informed consent was obtained from all the included participants. Descriptive statistics for the summarization of the data was used. Binary (Bivariate and multivariate) logistics regression was applied for the identification of predictors of underweight and its strength of association with their respective 95% confidence intervals and less than 5% p-values as statistically significant association.

Findings: The prevalence of underweight among patients on ART was 19.1% (95% CI: 15.0–23.9%), while more than one-tenth (14.4%) of the participants were overweight (95% CI: 10.8–18.8%). A higher level of Educational level, being married, widowed, divorced, a lower family size and poor ART drug adherence level were statistically significantly associated with an increased risk of underweight among patients on ART in the study settings ($p < 0.05$).

Conclusion: Educational level, marital status, family size, and adherence status of the participants were identified predictors of underweight among patients on ART. The lower the educational level, lower family size, being either married, divorced, or widowed, having had of poor ART drug adherence level of the participants, the higher their risk of sustaining underweight. Concerned bodies were suggested to work over the identified determinants of underweight among patients on ART in the study settings.

Keywords: underweight, predictors, ART

Introduction

Acquired Immune Deficiency Syndrome (AIDS) is a disease caused by Human Immunodeficiency Virus (HIV).^{1–6} Globally, the HIV is the top cause of morbidity and mortality, whereby 36.7 million people had AIDS with more than a million AIDS-related deaths by the year 2016.^{7,8} Globally, 38 million people were living with HIV, and the rate of new infection was 1.7 million in 2019.⁹

Combination therapy (ART) had a greater efficacy at suppressing HIV replication, reducing HIV-related death and morbidity, and improving immune function.^{10–12} The issue of access to these drugs could unquestionably be the top priority of the global community, where about 12 million people have been

Correspondence: Addisu Tadesse Sahile
Tel +2519 1209 6667
Email sahdis91@gmail.com

receiving the drugs (ART)¹³ with an increased effort to raise the coverage of the treatment to all individuals who were seropositive. In the effort to decentralize and scale-up the service, there were increased centers delivering the service in most parts of Ethiopian Health institutions.¹³

Globally, more than 800 million people are undernourished,¹⁴ the combination of malnutrition with HIV/AIDS, resulted in a significant crisis throughout the world. In developing countries, the concomitant occurrence of infectious disease with malnutrition accelerated for the morbidities and mortality following the exacerbated HIV/AIDS pandemic.^{15–17}

As reported in different kinds of literature people with HIV are at an increased risk of undernutrition due to poor appetite, and reduced absorption of nutrients.^{18–20} In Ethiopia, the prevalence of undernutrition was reported up to 43%.²¹

Though nutritional services for people living with HIV were advocated in Ethiopia, there is scantiness of information on the level of undernutrition among people on ART.²² To the best of the researcher's knowledge, there is limited knowledge on the burden and determinants of undernutrition (underweight) in Ethiopia. Hence, this study was aimed at assessing the magnitude and determinants of underweight among patients on ART in health facilities in Addis Ababa, Ethiopia, 2020.

Methods

Participants and Study Design

A multicenter-based cross-sectional study design was conducted on 319 participants on ART at the purposively selected health centers from July 01 to August 30, 2020. The study received ethical approval from Addis Ababa Medical and Business College research review ethics committee and applied for the respective health institutions. All participants were provided written informed consent. The source population was all ART patients that had a follow-

up the four selected health facilities, namely Arada Health center, Semien Health Center, Afincho Ber Health Center, and Churchill Health center. The study population was the 319 participants included in the study from those available during the data collection period. The sample was determined based on single population proportion, with the premises that the prevalence of underweight from the study at Butajira was 25.2%,²³ 95% confidence intervals 1.96, and a 5% margin of error, the final sample comes 3019 inclusive of 5% non-response rate. Patients on ART for at least 6 months, older than 18 years old, and not severely ill were included in the study. A stratified sampling technique was applied for the selection of the study participants proportionally (Figure 1).

Data were gathered with a pre-tested interviewer-administered questionnaire. The questionnaire was developed by reviewing related literatures^{10,15,19,20,22} then given to two senior researchers working in academic institutions to incorporate their possible inputs.

Operational Definition

The outcome variable (underweight) was measured by body mass index (BMI), where the variable was grouped as underweight if BMI is less than 18.5kg/m², normal weight if BMI is 18.5–24.9 kg/m², and as overweight if greater than 25kg/m².¹⁰ For the current study, underweight was measured similarly someone with a BMI of less than 18.5kg/m².

Good adherence: if the average adherence is greater than 95% (if missed ≤ 2 doses of 30 doses or ≤ 3 doses of 60 doses).²³

Fair adherence: if the average adherence is 85% to 94% (if missed 2–5 doses of 30 doses or 3–9 doses of 60 doses).²³

Poor adherence: if the average adherence is less than 85% (if missed ≥ 6 doses of 30 doses or > 9 doses of 60 doses).²³

Statistical Analysis

Descriptive statistics were used for the summarization of data. For the identification predictors of underweight

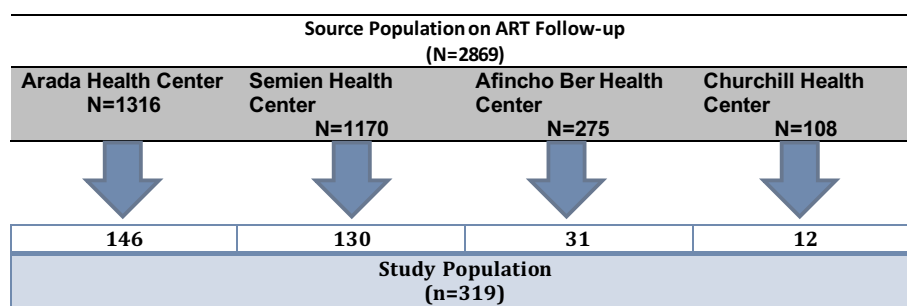


Figure 1 Sampling procedure of the participants for the study, Addis Ababa, Ethiopia, 2020.

Table 1 Socio-Demographic Characteristics of Patients on ART at the Selected Health Facilities in Addis Ababa, Ethiopia, 2020

Characteristics	Options	Underweight N(%)	Normal Weight N(%)	Overweight N(%)
Sex	Male	10(3.13)	55(17.23)	18(5.64)
	Female	51(16.00)	157(49.21)	28(8.77)
Age in years	≤30	27(8.46)	66(20.69)	9(2.81)
	31–40	23(7.21)	112(35.10)	24(7.52)
	≥41	11(3.44)	34(10.66)	13(4.07)
Educational status	No formal education	4(1.25)	35(10.97)	5(1.56)
	Primary school	29(9.09)	86(26.96)	22(6.89)
	Secondary school	14(4.39)	61(19.12)	16(5.02)
	Diploma	13(4.07)	21(6.58)	1(0.31)
	Degree and above	1(0.31)	9(2.82)	2(0.63)
Occupation	Student	5(1.56)	12(3.76)	3(0.94)
	Government employee	15(4.70)	55(17.24)	14(4.39)
	Daily laborer	14(4.39)	64(20.06)	13(4.07)
	Self-employee	14(4.39)	50(15.67)	11(3.44)
	Housewife	3(0.94)	17(5.33)	2(0.63)
	No job	10(3.13)	14(4.39)	3(0.94)
	Marital status	Unmarried	12(3.76)	63(19.75)
Married		25(7.84)	83(26.02)	18(5.64)
Divorced		12(3.76)	33(10.34)	7(2.19)
Widowed		12(3.76)	33(10.34)	12(3.76)
Family size	≤3	38(11.91)	116(36.36)	24(7.52)
	4–5	19(5.96)	76(23.82)	18(5.64)
	≥6	4(1.25)	20(6.27)	4(1.25)

among ART patients, binary (bi-variable and multivariable) logistics regression was used, with their respective 95% confidence interval (CI) and p-value of less than 0.05 as statistically significant level.

Findings

Socio-Demographic Characteristics

A total of 3019 participants enrolled to the study with a response rate of 100%. Half (49.21%) of the female participants had a normal BMI, with more than one-third (35%) of the participants with a normal BMI were those in the age group of 31–40 years. More than one-third (36.36%) of the study participants with a normal BMI were those with a family size of three or fewer (Table 1).

Diet-Related Characteristics

Regarding the dietary-related features of the study participants, more than half (54.9%) had a 24-hour meal frequency of three or more times, most (82.8%) did not receive any food support, and most (63.9%) of the study participants received of dietary counseling. Whereas

91.8% of the study participants reported they consumed of cereals-wheat, rice, sorghum, millet and bread, with 77.1% of the study participants received of vegetables in the last 24 hours (Table 2).

ART Drug and Side Effects

Less than half (41.7%) of the study participants' current CD4 count was greater than 500cells/mm³, with a viral load count of less than 1000 copy cells/mm³ in the 74.3% of the cases. Most (60%) of the study participants started ART drugs within the duration of 2–5 years, where more than half (53.3%) took le(TDF+3TC+EFV) and 71% of the study participants had good drug adherence (Table 3).

Prevalence of Underweight Among Patients on ART

The prevalence of underweight among ART patients on follow-up was 19.1% (95% CI: 15.0–23.9%), while more than one-tenth (14.4%) of the participants were overweight (Table 4).

Table 2 Diet-Related Characteristics of Patients on ART at the Selected Health Facilities in Addis Ababa, Ethiopia, 2020

Characteristics	Categories	Frequency	%
Meal frequency pattern in the last 24 hours	Three meals and above	175	54.9
	Less than three meals	123	38.6
	I do not remember	21	6.6
Ever received food support	Yes	55	17.2
	No	264	82.8
Type of support obtained	Food production	38	11.9
	Money	4	1.3
	Clothing	13	4.1
	No	264	82.8
Duration of food support	≤1 months	2	0.6
	1–3 months	12	3.8
	≥3 months	41	12.9
	No	264	82.8
Ever received a dietary counseling	Yes	204	63.9
	No	115	36.1
Received of the following in the past 24 hours	Cereals, rice, wheat, sorghum, millet, bread, porridge	293	91.8
	White tubers and roots	172	53.9
	Dark green leafy vegetables	135	42.3
	Vegetables (tomato, onion, eggplant)	246	77.1
	Vitamin-rich diet	80	25.1
	Flesh meat	107	33.5
	Eggs	97	30.4
	Fish	26	8.2
	Legumes, nuts and seeds	172	53.9
	Milk products	74	23.2

Predictors of Underweight Among Participants on ART

The age and educational level of the participants were variables that were independently associated with underweight among patients on ART. In multivariable logistics regression, educational level, marital status, family size and adherence status were predictors statistically associated with underweight among patients on ART.

The odds of developing underweight was 97.6%, 91.2%, and 88.1% higher among participants with an educational level of college and above (AOR: 0.024, 95% CI: 0.002, 0.233, $P < 0.001$), primary school (AOR: 0.088, 95% CI: 0.010, 0.744, $P < 0.05$), and secondary school (AOR: 0.119, 95% CI: 0.014, 0.997, $P < 0.05$) compared with illiterate participants, respectively.

The risk of developing underweight was higher by 78.8% (AOR: 0.212, 95% CI: 0.072, 0.619, $P < 0.05$), 71.2% (AOR: 0.288, 95% CI: 0.093, 0.894, $P < 0.05$) and 67.3% (AOR: 0.327, 95% CI: 0.132, 0.813, $P < 0.05$), among divorced, widowed and married participants consecutively.

The odds of developing underweight was almost three times higher among participants with a family size of three and less compared with those with four and more family size (AOR: 2.680, 95% CI: 1.254, 5.727, $P < 0.05$) and the risk of developing underweight was higher at 98% among participants with poor drug adherence compared with those participants with good adherence (AOR: 0.020, 95% CI: 0.001, 0.290, $P < 0.05$). (Table 5)

Discussion

In this study, the prevalence of underweight among patients on ART was 19.1%, this was consistent with the findings of 23.72% in Arba Minch, Southern Ethiopia,²⁴ 23.2% in Gonder, Northwest Ethiopia,¹⁰ 23.6% in West Showa, Central Ethiopia,²⁵ 19.93% in Kathmandu Valley, Nepal,²⁶ 19.2% to 26.3% in Senegal²⁷ and 19.4% in Temeke, Tanzania.²⁸

The prevalence of underweight among patients on ART in this study was lower than the findings 27% in Wollega,

Table 3 ART Drug and Its Side Effects Among Patients on ART at the Selected Health Facilities in Addis Ababa, Ethiopia, 2020

Characteristics	Categories	Number	%
Current CD4 count	<200 cells/mm ³	12	3.8
	200–349 cells/mm ³	65	20.4
	350–499 cells/mm ³	109	34.2
	>500 cells/mm ³	133	41.7
Current viral load count	<1000 copy cells/mm ³	237	74.3
	>1000 copy cells/mm ³	82	25.7
WHO clinical staging	Stage 1	274	85.9
	Stage 2	35	11.0
	Stage 3	10	3.1
Duration since start of ART	≤ 1 year	9	2.8
	2–5 years	190	59.6
	6–10 years	70	21.9
	≥10 years	50	15.7
Current ART regimen	Ic(AZT+3TC+NVP)	61	19.1
	Id(AZT+3TC+EFV)	34	10.7
	Ie(TDF+3TC+EFV)	170	53.3
	If(TDF+3TC+NVP)	24	7.5
	Ij(TDF+3TC+DTG)	30	9.4
Adherence level	Good adherence	228	71.5
	Fair adherence	84	26.3
	Poor adherence	7	2.2
Any side effects in the last six months	Neuropath	31	9.7
	Hepatotoxicity	5	1.6
	Rash	67	21.0
	Other	13	4.1
	No	203	63.6
Opportunistic Infection in the last 6 months	Acute/chronic diarrhea	30	9.4
	Mouth sort and ulcer	54	16.9
	Tuberculosis	8	2.5
	Herpes zoster	10	3.1
	No	217	68.0

Table 4 Prevalence of Underweight Among Patients on ART at the Selected Health Facilities in Addis Ababa, Ethiopia, 2020

Characteristics	Categories	Frequency(Percent)	95% CI
BMI	≤18.49 kg/m ²	61(19.1)	15.0–23.9%
	18.5–24.49 kg/m ²	212(66.5)	61.0–71.6%
	≥24.50 kg/m ²	46(14.4)	10.8–18.8%
Underweight	Yes	61(19.1)	15.0–23.9%
	No	258(80.9)	76.1–85.0%

Western Ethiopia,²² 30% in Harerge, Eastern Ethiopia,²⁹ 27% in Jimma, Southeastern Ethiopia,³⁰ 26.6% in Wolaita Sodo, Southern Ethiopia,³¹ 31.2% in Hosanna, Southern Ethiopia,³² and 43% in Brazil.³³ The variation might be

due to the variability of time of investigation and sample size among the studies.

The prevalence of underweight among participants on ART in Dilla Referral Hospital, Southern Ethiopia was

Table 5 Predictors of Underweight Among Patients on ART at the Selected Health Facilities in Addis Ababa, Ethiopia, 2020

Characteristics	Categories	Underweight		COR(95% CI)	AOR(95% CI)
		Yes	No		
Sex	Male	10	73	1 0.497(0.239,1.031)	1 0.802(0.338,1.907)
	Female	51	185		
Age in years	≤30	27	75	1 2.129(1.141,3.971)* 1.538(0.698, 3390)	1 1.491(0.715,3.112) 1.114(0.378,3.285)
	31–40	23	136		
	≥41	11	47		
Educational level	Illiterate	5	40	1 0.372(0.123,1.126) 0.550(0.170,1.781) 0.169(0.049,0.582)*	1 0.088(0.010,0.744)* 0.119(0.014,0.997)* 0.024(0.002,0.233)**
	Primary	29	108		
	Secondary	14	77		
	College and above	13	22		
Marital status	Un married	12	72	1 0.673(0.317,1.428) 0.556(0.228,1.351) 0.625(0.259,1.511)	1 0.327(0.132,0.813)* 0.212(0.072,0.619)* 0.288(0.093,0.894)*
	Married	25	101		
	Divorced	12	40		
	Widowed	12	45		
Family size	≤3	38	140	1 1.393(0.785,2.469)	1 2.680(1.254,5.727)*
	≥4	23	118		
Received food Support	Yes	14	41	1 1.577(0.796,3.124)	1 1.796(0.811,3.976)
	No	47	217		
Received dietary counseling	Yes	44	160	1 1.585(0.858,2.928)	1 1.500(0.715,3.147)
	No	17	98		
Viral load	<1000 copy cells/mm ³	41	196	1 0.648(0.354,1.189)	1 0.612(0.270,1.387)
	>1000 copy cells/mm ³	20	62		
Adherence status	Good adherence	40	188	1 0.780(0.418,1.455) 0.284(0.061,1.317)	1 0.541(0.238,1.230) 0.020(0.001,0.290)*
	Fair adherence	18	66		
	Poor adherence	3	4		

Notes: *p<0.05, **p<0.001 – statistically significant association.

12.3%,³⁴ which was lower than the findings of the current study. This might be due to variations in the characteristic of the population. And the magnitude of underweight among patients on ART from this study was higher than the findings 10% in Zimbabwe.³⁵ The difference might be associated with differences in the population and sample size between the studies.

In this study, predictors of underweight were educational level, marital status, family size, and adherence status of the participants. Accordingly, the prevalence of underweight was higher among participants with some level of education compared to those of illiterates, whereas in the other study a higher educational level was associated with a reduced risk of underweight.³⁶

In this study, having a fewer number of family size was associated with a higher risk of underweight. But in the other study having had a larger family size was associated

with an increased risk of underweight compared to having less family size.³⁷ In this study, good drug adherence was associated with a lower risk of underweight which was also supported by the other findings.^{38,39}

Conclusion and Recommendation

This study reported a higher prevalence of underweight. As predictors of underweight among patients on ART, educational level, marital status, family size, and adherence status of the participants were identified. The lower the educational level, lower family size, being either married, divorced, or widowed, having had of poor ART drug adherence level of the participants, the higher their risk of sustaining underweight.

Policymakers, health professionals, and key stakeholders were recommended to work on the identified predictors of underweight among patients on ART in the study settings.

Limitation of the Study

The study was a cross-sectional study, that had a nature of point observation and difficult to establish the temporal association between variables. The other limitation was difficulty of inferring to the community at large as it was institution-based study.

Abbreviations

AOR, adjusted odds ratio; ADIS, acquired deficiency immune syndrome; ART, antiretroviral therapy; BMI, body mass index; COR, crude odds ratio; HAART, highly active antiretroviral therapy; HIV, human immune virus; PLWHA, people living with HIV/AIDS; WHO, World Health Organization.

Data Sharing Statement

A finding of this study was generated from the data collected and analyzed on the basis of stated methods and materials hence all data were already available in the manuscript.

Ethics Approval and Consent to Participate

The study protocol was performed in accordance with the ethical principle. Ethical approval was obtained from the ethics review Committee of Addis Ababa Medical and Business College. The ethics approval was given in accordance with the Declaration of Helsinki. The data collectors obtained written informed consent from all participants.

Consent for Publication

Consent for publication of the manuscript was not applicable due to the fact that there were no participant's individual data videos or images.

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Author Contributions

All authors made substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; took part in drafting the article or revising it critically for important intellectual content; agreed to submit to the current journal; gave final approval of the

version to be published; and agree to be accountable for all aspects of the work.

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Disclosure

The authors declare that there is no competing interest.

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