

# Magnitude of Under Nutrition and Associated Factors Among Adolescent Street Children at Jimma Town, South West Ethiopia

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**Background:** Undernutrition is the major health problem in developing countries especially among underprivileged populations. In Ethiopia there is no clear information regarding the magnitude and forms of undernutrition and their associated factors among adolescent street children. This study assessed the magnitude of undernutrition and its associated factors among adolescent street children at Jimma town from March 1–31, 2019.

**Methods:** A community based cross-sectional study was conducted among 312 street children. Pretested self-administered structured questions were used for data collection. Data were entered to EpiData version 3.1 and exported to SPSS version 20 for statistical analysis. WHO AnthroPlus software version 1.0.4 was used for computing standardized indicators of nutritional status. Independent variables with  $P$ -value  $\leq 0.25$  in bivariate analysis were included in multivariable logistic regression and variables with  $P$ -value  $< 0.05$  in multivariable logistic regression were declared as statistically significant.

**Results:** A community based cross-sectional study was conducted among 312 street children from March 1–31, 2019. The study found 29.2% (95%CI: 24–34.0) and 30.4% (95%CI: 24.6–35.3) magnitude of thinness and stunting respectively. Being female (AOR: 2.55; 95%CI: 1.16–5.63), Ever skipped one or more daily meal per day (AOR: 6.56; 95%CI: 2.25–19.15), low dietary diversity score (AOR: 1.86; 95%CI: 1.05–3.27) and using unprotected water source (AOR: 1.78; 95%CI: 1.03–3.05) were statistically significant factors for thinness whereas being in age group 15–18 (AOR: 5.78; 95%CI: 3.20–10.40) and ever used substance (AOR: 3.01; 95%CI: 1.17–7.77) were statistically significant factors for stunting.

**Conclusion:** This study found that the magnitude of thinness and stunting was high among adolescent street children and a range of factors were observed that result in thinness and stunting. Service provisions targeting nutritional supply, personal and environmental sanitation should be given to these street children through intersectoral collaboration.

**Keywords:** adolescent, street children, stunting, thinness, undernutrition

## Introduction

The term street children has many definitions in different settings.<sup>1</sup> The United Nations defines street children as children under 18 years of age who spend all or part of their time on the street, lack supervision, or protection which makes them vulnerable to different problems.<sup>2</sup> The United Nations' children's fund (UNICEF) strengthens this definition.<sup>3</sup> Street children can be of two types: child of the streets; those who have no family members left alive, or the family may have abandoned him/her so that the child struggles to survive on the streets. And a child on the street; those who spend most of the day on the streets due to poverty, overcrowding,

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sexual, or physical abuse at home. This group has the chance to visit family members some days and even live under a good shelter.<sup>3–5</sup>

Adolescence is a concept encompassing physical, physiological and emotional stages of transition from childhood to adulthood and the age ranges from 10 through 19.<sup>6</sup> Adolescents who gain adequate dietary demand and emotional support at this stage gain 15–20% of adult height, up to 60% of skeletal mass and 50% of adult body weight.<sup>7</sup> On the contrary, poor quality or quantity dietary intake during adolescence may lead to undernutrition that could resonate throughout generations.<sup>6</sup> Such problems can be worst among adolescent street inhabitants.<sup>8</sup>

Undernutrition is common among underprivileged populations like women, children and adolescents, especially street dwellers.<sup>9,10</sup> It is the single threat to global public health and by far the greatest contributing factor for child morbidity and mortality.<sup>11</sup> It is a significant public health problem described as the silent killer.<sup>11,12</sup> This public health problem can touch any segment of the population like children, adolescents, pregnant women, children of the street and so on.<sup>12,13</sup>

Adolescents, who comprise 20% of world's population and 80% of the developing countries, are the most affected group of the population due to undernutrition, although over nutrition is an emerging problem.<sup>6</sup> Even though prevalence of undernutrition among adolescents was not declared in the past three decades,<sup>14</sup> it is estimated that the global burden of undernutrition, especially thinness, was found to be 8.4% for girls and 12.4% for boys.<sup>7</sup> The global estimate for stunting among adolescents' data varied from 52% in Guatemala and 44% in Bangladesh to 8% in Kenya and 6% in Brazil.<sup>15</sup> However, there is a scarcity of data on the nutritional status of adolescents who are street dwellers in the global and local context.

In Ethiopia, child malnutrition has become a concern since the late 1950s when the first nutrition survey showed that protein and calorie malnutrition was rampant.<sup>16</sup> However, there were no supporting policies and strategies related to nutrition until the formation and launching of national nutrition strategy (NNS) in February 2008.<sup>17</sup> In addition, the country committed to improve food, nutrition security and reduce, then end, undernutrition. Some of the commitments the country hold are: the growth and transformation plan-II (GTP-II) (2015/16 to 2019/20),<sup>18</sup> second national nutrition program II (NNP II) (2016–2020),<sup>19</sup> Seqota declaration (2015)<sup>20</sup> and national school health and nutrition strategy<sup>21</sup> can be mentioned. Even though Ethiopia

has many initiatives, programs and strategies, almost none of them are specifically targeted and with regard street children. The reason might be due limited information regarding the magnitude of undernutrition and the associated factors among adolescent street children since few qualitative studies exist and do not show the depth of the problem. Thus, this research aimed at filling the information gap by investigating the prevalence of undernutrition and its associated factors among street children in Ethiopia, specifically in the study area so that policy makers, aid organizations and others will gain information on the existing problem.

## Methods

### Study Design and Setting

Community based cross-sectional study design was employed among 312 adolescent street children at Jimma town, Oromia regional state, South West Ethiopia from March 1–31, 2019. The town is found 345 km from Addis Ababa, the capital city of Ethiopia. According to the 2015 National Urban System Study, the population of the city was 199,576, of which 100,347 are male, and 99,229 are female. The town has 13 urban Kebeles (kebele refers the lowest administrative unit) in which all street children were considered for the study (data from Jimma Town Municipality, unpublished source).

### Sample Size Determination and Sampling Procedures

The total enumeration of all adolescent street children aged 12–18 years were made in the study setting. Children less than 12 years were excluded because of ethical issues explained elsewhere.<sup>22</sup> Single population proportion formula was used to obtain a sample size of 296 with the following assumptions: 95%CI, 5% marginal error and 26% prevalence of thinness taken from studies conducted elsewhere.<sup>23</sup> However, due to absence of recorded data about the number of street children, preliminary assessment was made to quantify the number of street children in the study area resulting in a total count of 365 adolescent street children. Then a total of 312 participants who fulfill the inclusion criteria were enumerated after intensive search throughout the 13 Kebeles in the town.

### Data Collection methods and Procedures

Data were collected using pretested interviewer-administered structured questionnaires and anthropometric measurements. The questionnaire was prepared after reviewing different published literature and related studies.<sup>24–29</sup> Questions

related to sociodemographic, socioeconomic, sanitation, behavior, infection, physical and sexual violence, and health care access were prepared originally in English language and then translated to Amharic for easy management, then translated back to English to maintain the quality of data and consistent information. The translated version was pretested on 10% of the study sample in a nearby town through five trained data collectors and two supervisors.

## Measurements and Tools

Dietary behavior was assessed using a qualitative food frequency questionnaire (FFQ) containing 29 food items, accessed elsewhere.<sup>24</sup> Local food items were categorized into nine groups based on food and agriculture (FAO) recommendations in order to assess individual dietary adequacy.<sup>25</sup> The total scores were calculated and those with a dietary diversity score (DDS) <5 were categorized as having inadequate dietary diversity and those with  $\geq 5$  adequate dietary diversity.<sup>26</sup> Individual level food insecurity was assessed using an individual food insecurity assessment scale (IFIAS) that was previously validated in the study area.<sup>28</sup> Street adolescents were asked whether they (1) had ever worried about having enough food; (2) had to reduce food intake because of shortages of food or money to buy food; (3) had to go without having eaten because of shortage of food or money to buy food and (4) had to ask outside the home for food because of shortage of food or money to buy food. “Yes” responses were coded “1” and “No” responses were coded “0” and the scores were summed. Adolescents who had a food insecurity score of 1 and above were labeled as food insecure (one or more “Yes” responses) or else food secure. Stool specimens were collected using clean and labeled plastic vials. The collected stool samples were properly mixed with 10 mL of 10% formalin for preservation and processed using formalin-ether concentration. All the different developmental stages (eggs, cyst, oocyst, larvae, adult and segments of adult worm) of the parasitic organism were recorded by a senior laboratory technician. Furthermore, weight was measured using digital scales (SECA) with the subjects shoeless and in light clothes and recorded to the nearest 0.1 kg. Height was measured in a standing position using a height meter mounted against a plastic board and recorded to the nearest 0.1 cm with a detachable sliding head piece.<sup>30</sup> In this research, adolescent street children were considered as children of either sex who were within the age group of 12–18 years and who were both economically and socially engaged in street life.<sup>31</sup> According to World Health Organization (WHO) 2007 standard reference values,

height for age Z-score below  $-2$  SD and BMI for age Z-score below  $-2$  SD was used to identify stunting and thinness respectively in the study population.<sup>32</sup> Ever substance use was defined based on use of at least one of the substances (alcohol, khat, cigarettes, or illicit drugs) to alter mood or behavior at any time in life.<sup>29</sup> For physical violence, a principal component (PCA) analysis was made based on 21 items taken from elsewhere<sup>27</sup> and two components, namely low and high physical violence created following all steps of PCA using SPSS version 20 (IBM Corporation, Armonk, NY, USA) statistical software.

## Data Processing and Analysis Procedures

The collected data were entered using EpiData version 3.1 (the EpiData Association, Odense, Denmark, Europe) then exported to SPSS version 20 (Armonk, NY, USA)). Entered data were checked for completeness and errors, described and checked for outliers. For anthropometric data analysis, standard deviation (Z scores) was obtained by WHO AnthroPlus software version 1.0.4 (WHO, Geneva, Switzerland). Descriptive analysis was done to determine means, frequencies and percentage distributions for the variables. Bivariate and multivariable logistic regressions were performed. Independent variables with  $P$ -value <0.25 in bivariate logistic regression were included for multivariable logistic regression after checking their collinearity effect and normality of data using stepwise backward elimination procedure. The fitness of the model was tested by Hosmer–Lemeshow goodness of fit test. Variables were considered as statistically significant at  $P$ -value <0.05 in multivariable logistic regression with respective 95%CI.

## Ethical Approval and Consent to Participate

After reviewing study procedures in detail, Jimma University Institute of Health, Faculty of Public Health Research Ethics Review Board issued ethical approval on February 25, 2019, with reference no. IHRP GO/757/2019. The official letter of support was submitted to Jimma town administrators, Jimma town health office and respective 13 kebele administrations, child and womens' affairs bureau and Jimma town police department to get permission for the study. The nature of the study was explained to the study participants to obtain assent prior to participation in the study. Since this study was conducted on children less than 18 years, it is recommended to obtain written consent from guardian or parents. Nevertheless obtaining written consent from parents of street children was problematic. Thus written informed consent was waived as indicated on Ethiopian national research ethics review

guideline (page 38 sections 6.14 and page 56 sections 8.3.5.3 of national research ethics review guideline, <https://www.ccgpr.ca/wp-content/uploads/2013/11/national-research-ethics-review-guideline.pdf>).

Finally Privacy and confidentiality of collected information was ensured at all levels.

## Results

### Sociodemographic Characteristics of the Respondents

A total of 312 street children were enrolled from March 1 through 31, 2019 with a response rate of 100%. The median age of study participants was 14 (IQR=2) years and the median duration of being street inhabitant was 12 (IQR=17) months. The majority of these children were born in rural areas 229 (73.4%) and came to Jimma for different reasons whereas 81 (26.0%) were born in urban areas, but 2 (0.6%) do not know their place of birth. Nearly half of the respondents mentioned that their biological parents (both father and mother) were alive whereas 130 (41.7%) mentioned one or both of their parents were not alive but 26 (8.3%) did not know about current family existence. These street children were involved in different income generating activities in order to cover their daily needs in which the median income of the respondents was 35 (IQR=20) birr/day (Table 1).

Based on the seven days dietary recall, mean dietary diversity score was 5.35 ( $\pm 1.33$ ) so that 230 (73.7%) children had adequate daily diet consumption (one score for at least five food groups out of nine) but 82 (26.3%) had low dietary diversity (scored less or equal to four food groups). Furthermore, 55.4% of the respondents were using unprotected water sources and, 38.8% had poor hand washing habits during a meal. The study also found that 124 (39.9%) of children had ever used substances whereas 96 (30.8%) were currently using substances at the time of study; khat, cigarette and mastish (glue) were the most commonly used substances (Table 2)

### Prevalence of Thinness and Stunting Among Street Children Who Were Residing in Jimma Town, 2019

#### Anthropometric Data

The mean weight was 39.87 ( $\pm 7.197$  SD) ranging from 26.1–62.3 kg and the mean height was 151 cm ( $\pm 7.959$  SD) ranging from 130–176 cm

**Table 1** Sociodemographic Characteristics of Adolescent Street Children and their Parents in Jimma Town, South West Ethiopia, 2019 (N=312)

Characteristics	Category	Frequency	%
Sex	Male	281	90.1
	Female	31	9.9
Age, years	12–14	191	61.2
	15–18	121	38.8
Duration of being on the street in months	Less than 12 months	119	38.1
	More than 12 months	166	53.2
Highest Education attained by the child	Did not attend school	78	25.0
	Only read and write	23	7.4
	1–4	155	49.7
	5–8	56	17.9
Current Educational status of child	Attending	22	7.1
	Not attending	290	92.9
Educational status of mother/father	Attended school	193/214	61.9/68.9
	Did not attended school	119/98	38.1/31.4
Alive natural parents	Yes	156	50.0
	No	130	41.7
	Did not know	26	8.3
Work to earn money	Yes	309	99
	No	3	1
Type of work <sup>a</sup> N=309	Shoe-shining	19	6.2
	Carrying small items	225	72.8
	Delivering messages	57	18.4
	Attending and washing cars	84	27.2
	Begging	35	11.3
	Street vendor or trading	76	24.6
	Others <sup>b</sup>	38	12.3

**Notes:** <sup>a</sup>Type of work—sum of individuals in each work type may exceed total number of respondents, since a street child may be involved in one or more tasks in a single day, <sup>b</sup>Others indicate—escorting the disabled, exchange of sex for money.

The magnitude of thinness, stunting and both thinness and stunting was 29.2% (95%CI: 24–34.0); 30.4% (95%CI: 24.6–35.3) and 4.2% (95%CI: 2.2–6.4) respectively

### Factors Associated with Thinness and Stunting

After controlling for the effects of potentially confounding variables using multivariable logistic regression, sex (being female) (AOR: 2.55; 95%CI: 1.16–5.63; *P*-value=0.02), ever skipping one or more meal/day (AOR: 6.56; 95%CI: 2.25–19.15; *P*-value=0.001), low dietary diversity score (AOR: 1.86; 95%CI: 1.05–3.27; *P*-value=0.032) and using unprotected water source (AOR: 1.78; 95%CI: 1.03–3.05;

**Table 2** Frequency Distribution of Selected Dietary Behavior, Sanitation, Behavioral and Physical Characteristics of Adolescent Street Children and their Parents in Jimma Town, South West Ethiopia, 2019 (N=312)

Characteristics	Categories	Frequencies	%
Ever skipped one or more meals/day	Yes	249	79.8
	No	63	20.2
Dietary diversity score	Adequate	230	73.7
	Inadequate	82	26.3
Food security status	Food secure	64	20.5
	Food insecure	248	79.5
Use unprotected water source	Yes	173	55.4
	No	139	44.6
Hand washing habit during a meal	Yes	191	61.2
	No	121	38.8
Ever substance use	Yes	124	39.7
	No	188	60.3
Current substance use	Yes	96	30.8
	No	216	69.2
Low physical violence	Yes	253	81.1
	No	59	18.9
High physical violence	Yes	135	43.3
	No	177	56.7
Intestinal parasitic infection	Yes	208	66.7
	No	104	33.3
Polyparasitic infection N=208	Yes	33	15.87
	No	175	84.13

$P$ -value=0.037) significantly predicted thinness among street children (Table 3). Furthermore, age (15–18 years) (AOR: 5.78; 95%CI: 3.20–10.40;  $P$ -value <0.001) and ever use of substance (AOR: 3.01; 95%CI: 1.17–7.77;  $P$ -value=0.023) were variables that have increased the risk of stunting. Adolescents street children who encounter high physical violence were 0.52 times less likely to develop stunting (AOR: 0.48; 95%CI: 0.26–0.87;  $P$ -value=0.016) than those who did not encounter high physical violence (Table 4).

## Discussion

This study revealed that prevalence of thinness, stunting and both thinness and stunting was 29.2%, 30.4%, and 4.2% respectively.

The prevalence of thinness seen at the study area was lower than in the study conducted at Shabagh Area of Dhaka City<sup>33</sup> but nearly similar to the study conducted in southern India.<sup>23</sup> The discrepancy might be due to differences in the

setting like: age group at which the study was conducted (6–18 in Dhaka and 8–18 in southern India vs 12–18 in the current study), variation in the denominator and other socio-economic variables. The prevalence of stunting was 30.4% and higher among the 15–18 years age group which was lower than the study in southern India (48%) and higher among the under 10 years age group. The difference may be due to age composition, or socioeconomic characteristics of the study participants in different study areas.<sup>23</sup>

Even though there were no studies with similar study population in Ethiopia, the magnitude of thinness and stunting in the current study was higher than in previous studies among adolescent girls in the normal population in Ethiopia.<sup>24–26</sup> Similarly, the magnitude seen was also higher than school-going adolescents of general population,<sup>27–30</sup> adolescents from Somali refugee camps<sup>41</sup> and adolescents of pastoralist and agro-pastoralist communities.<sup>42</sup>

This study revealed that female street adolescents were twice as likely to have thinness (AOR: 2.55; 95%CI: 1.16–5.63) than male. This finding is different from studies conducted elsewhere among general population which states that females were less vulnerable to thinness than males.<sup>33–36</sup> The reason for the difference may be, that females in the street life have limited involvement with income generating activities, low daily income to purchase food, are less competent to fight and scramble for food from a common pot. Furthermore, in this study 90%, 68%, and 87% of female street inhabitants were skipping one or more daily meal, lived for more than one year in the street and were food insecure respectively. Thus the Cumulative effect of skipping meal, living on the street for more than a year, being food insecure and other related factors can lead to thinness.

The street children who were having low dietary diversity score were more likely to be thin (AOR: 1.86; 95%CI: 1.05–3.27) than those who were eating a dietary diverse meal. This finding is consistent with others finding that inadequate dietary diversity is a well-established predictor of undernutrition among adolescents in normal population. Additionally, since adolescence is a period for rapid growth and development, failure in supplying adequate food for daily bodily demand would result in loss of weight.

The street children who had ever skipped one or more daily meal were six times more likely to be thin (AOR: 6.56; 95%CI: 2.25–19.15) than those children who never skipped their daily meal. This may be due to a cumulative effect of daily deficiency in micro and macronutrients that are essential for body metabolism and energy supply. In addition, those who were using an unprotected water



**Table 3** Multivariable Logistic Regression Analysis of Factors Associated with Thinness among Street Adolescent Children inat Jimma Town, South West Ethiopia, 2019 (N=312)

Variable	Categories	Thinness		COR (95%CI)	AOR (95%CI)	P-value
		Yes	No			
Sex	Male Female	76 15	205 16	1 2.53 (1.19–5.36)	1 2.55 (1.16–5.63)	0.02 <sup>a</sup>
Ever skipped meal/day	Yes No	87 4	162 59	7.92 (2.784–22.538) 1	6.56 (2.25–19.15) 1	0.001 <sup>a</sup>
DDS <sup>b</sup>	Adequate Low	56 35	174 47	1 2.31 (1.36–3.94)	1 1.86 (1.05–3.27)	0.032 <sup>a</sup>
Unprotected water source	Yes No	61 30	112 109	2.00 (1.198–3.328) 1	1.78 (1.03–3.05) 1	0.037 <sup>a</sup>
Educational status of father	Did not attended Attended school	54 37	160 61	0.56 (0.334–0.928) 1	0.59 (0.34–1.03)	0.063

**Notes:** <sup>a</sup>Indicates variables that were statistically significant at P-value <0.05 in multivariable logistic regression. <sup>b</sup>Implies dietary diversity score.

**Table 4** Multivariable Logistic Regression Analysis of Factors Associated with Stunting among Street Adolescent Children inat Jimma Town, South West Ethiopia, 2019 (N=312)

Variables	Categories	Stunting		COR (95%CI)	AOR (95%CI)	P-value
		Stunted	Not Stunted			
Age categories	12–14 15–18	33 62	158 59	1 5.03 (3.00–8.44)	1 5.78 (3.20–10.40)	0.0001 <sup>a</sup>
Ever used substance	Yes No	45 50	79 138	1.57 (0.97–2.56) 1	3.01 (1.17–7.77) 1	0.023 <sup>a</sup>
Currently use substance	Yes No	33 62	63 154	1.30 (0.78–2.18) 1	0.42 (0.15–1.13) 1	0.085
Maternal education	Did not attend Attended school	44 51	75 142	1.63 (1.00–2.67) 1	0.61 (0.34–1.00) 1	0.100
High physical violence	Yes No	28 67	107 110	0.43 (0.26–0.72) 1	0.48 (0.26–0.87) 1	0.016

**Note:** <sup>a</sup>Indicates variables that were statistically significant at P-value <0.05 in multivariable logistic regression.

source were more likely to be thin (AOR: 1.78; 95%CI: 1.03–3.05) than those who did not use it. This may be due to impure water sources that serve as a vehicle for intestinal parasites and bacteria that would increase risk of infection especially diarrheal disease resulting in depletion of micronutrients as described elsewhere.<sup>47,48</sup>

Variables like age, educational status of the child and parents, daily income, food insecurity and presence of intestinal parasites do not show statistical association with thinness although they showed association in other target populations in the general population.<sup>21,37,38</sup> This may be due to sociodemographic compositions, cultural and geographical variations in the study settings.

This study also revealed that adolescents in the age range of 15–18 years were found to be five times more likely to be stunted (AOR: 5.78; 95%CI: 3.20–10.40) than the 12–14 age group. This finding is different from studies conducted among adolescents in the normal population which revealed early adolescents are more likely to be stunted than late adolescents.<sup>28,30</sup> The reason behind for this can be explained by the fact that stunting measures chronic or prolonged exposure to nutrient deficiencies so that the effect may be seen later in life.

In addition, those who ever used substance were three times more likely to be stunted (AOR: 3.01; 95%CI: 1.17–7.77) than those who never used substance. This

might be due to the fact that street children were involved in a range of substance abuse that can result in loss of appetite, early satiety, and increased expense for substances rather than food.

## Limitation of the Study

Prevalence of thinness and stunting observed in this study may not be due to living on the street as a street child. These street children might come up to the street while having thinness and stunting. Recall bias for retrospective inquiry of personal, family history and dietary practice may affect the results of the study.

## Conclusion

In this study group, undernutrition, especially thinness and stunting, was found to be high and a range of factors were observed that result in undernutrition. But, being female, ever having skipped one or more daily meals, inadequate dietary diversity score, and use of unprotected water source were statistically significant evidence for thinness and being older (found in the age group of 15–18 years) and ever used substances were statistically significant associated factors for stunting.

## Recommendations

Jimma town women, children, and youth office should show concern for the street children to reduce children's social, economic, personal, and environmental problems that contribute to undernutrition. Similarly, the town municipality should strive for provision of sanitation facilities to halt problems related with unprotected water sources and poor sanitation. Finally, the Federal Ministry of Health, Ethiopia (FMOH) should work on policies and a strategy that benefits females, including those who live on the street.

## Abbreviations

AOR, adjusted odds ratio; BAZ, body mass index for age Z-score; BMI, body mass index; COR, crude odds ratio; HAZ, height for age Z-score; DDS, dietary diversity score; IFIAS, individual food insecurity assessment scale; WHO, World Health Organization.

## Data Sharing Statement

All data that support the findings of this study is available from the corresponding author upon request.

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## Author Contributions

All authors contributed to data analysis, drafting and revising the article, gave final approval of the version to be published, and agree to be accountable for all aspects of the work. Finally all authors have proof read the final manuscript.

## Disclosure

The authors declare that they have no competing interests in this work.

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