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Magnitude of Undernutrition and Associated Factors among Adolescents in Refugee Camps in Somali Region, Ethiopia

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Authors' contributions

This work was carried out in collaboration among all authors. Author NDY designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Authors AMS, SA, SMS and MDA managed the analyses of the study. Authors NDY and SMH managed the literature searches. All authors read and approved the final manuscript.

Original Research Article

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ABSTRACT

Background: Adolescence 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.
Objectives: To assess the magnitude of undernutrition (thinness and stunting) and associated factors among adolescents living in refugee camps in the Somali region, Ethiopia.
Methods: An institute-based cross-sectional study design was employed among adolescents in refugee camps. About 433 adolescents were sampled by using simple random sampling procedures. Anthropometric measurements followed by the WHO growth standard procedure were employed to generate anthropometric indices. WHO Anthro Plus software was used to calculate body mass index for age z-score and height for age z-score. Data were entered into Epi Data and transferred to SPSS (version 22) for analysis. Multivariable logistic regression was used to measure the association between the dependent variable and independent variables with a 95% confidence interval and the significance of the outcome variable was declared at P<0.05.

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Results: an overall magnitude of stunting and thinness of the adolescents were found in 34.4% and 33.9%, respectively. In multivariable logistic regression model, head of household (Adjust odd ratio (AOR) = 1.758, 95%, and Confidence Interval (CI): 1.019–3.003), place of refugee (AOR 3.611, 95%, and CI: 1.835-7.105) Awbarre and (AOR = 16.039, 95%, and CI: 5.950-43.237) Kebribayah, monthly income (AOR = 5.847, 95%, and CI: 1.486-23.007) were significantly associated with stunting. The family size [AOR = 9.776, 95%, and CI: 1.132-84.404) and age of the adolescents (AOR = 0.596, 95%, and CI: 0.362-0.982).

Conclusion: The prevalence of thinness and stunting was high in this study, being the head of household location of refugees and monthly income statistically significant with adolescent stunting. Being larger family size was found to be statistically significant with adolescents' thinness. Therefore, stakeholders should support nutrition intervention and other activities to reduce stunting and thinness among adolescents living in refugee camps.

Keywords: Adolescent; food frequency; stunting; thinness; undernutrition.

1. INTRODUCTION

1.1 Background

Undernutrition is a silent crisis that is one of the leading causes of illness and mortality among children and adolescents globally [1]. In many developing countries, stunting, being underweight, and micronutrient deficiencies among teenagers frequently result from poor nutrition and illnesses in early infancy, combined with a diet insufficient to fulfill the intensive nutritional demands of fast growth during adolescence [2]. According to the World Health Organization, Adolescence is the period between 10 and 19 years of age which is again classified as younger (10 - 14 years) and older (15 - 19 years) [3]. It is a progressive physical, cognitive, behavioral, and psychosocial transformation marked by increased levels of individual autonomy, a growing sense of identity, self-esteem, and progressive independence from adults [4].

Adolescent undernutrition is a significant determinant of health outcomes in adulthood. Aside from producing high mortality, it has a long-term impact on growth and development and survivors' physical fitness [5]. Girls with short stature are more likely to live to adulthood and have poorer reproductive results. There is dietary supplementation at this stage of life has an effect not only on the individual well-being of adolescents but also on the well-being of whole communities and the reduction of intergenerational nutritional challenges. Additionally, ensuring that teenagers can effectively manage this time of life is helpful to people, families, and nations by breaking the cycle of poverty [6].

Teenage undernutrition often occurs at higher rates in Asia and Africa, at 32–65 percent and 4–30 percent, respectively. In sub-Saharan Africa (SSA), the prevalence of adolescent malnutrition ranges from 15 to 58 percent and is greater than in other African nations [7]. Adolescents in Ethiopia accounted for 25.2% of the total population [8]. In Ethiopia Adolescents and infants make up about 48% of Ethiopia's population, with 25% of girls and 23% of boys [9]. The foundation for optimum growth and development is established before birth, during childhood, and in the teenage age. In the majority of developing countries, nutritional interventions have been focusing on children and women, thus neglecting adolescents. The most vulnerable and excluded populations in terms of nutritional interventions are particularly young people living in refugee camps. To eliminate the cycle of malnutrition, it may be necessary to address the nutritional needs of adolescents, especially those who reside in refugee camps, and in countries like Ethiopia that are undernourished [10]. This study aimed to evaluate the incidence of undernutrition among teenagers residing in different refugee camps in the Somali region, Ethiopia as well as its contributing factors.

2. METHODOLOGY

2.1 Study Area and Study Period

This study was conducted in March-August 2022 at refugee camps found in the Somali region, Ethiopia. The Somali Regional State is the second-largest region of the country after the Oromia Regional State. Somali region with its capital city Jigjiga, is one of the ten regions and two city administrations making up the Federal Democratic Republic of Ethiopia. It has a total

land area of 376,073 km^2 and an estimated population of 6 million with an annual population growth rate of 2.6 percent. Located in the southeast of the country, the Somali region is inhabited mostly by pastoralists and agro-pastoralists. It shares borders with Somalia to the east and southeast, Kenya to the south, and Djibouti to the north. To the northwest and west, it borders the Afar and Oromia Regions, respectively. The region is divided into 11 zones, 93 rural woredas, and 6 city administrations. Four generic livelihood types exist in the region: pastoralist (comprising 60 percent of the rural population), agro-pastoralist farming (25 percent, livestock rearing, and rain-fed crop production), and sedentary and urban sector (15 percent). The average household consists of 6.3 persons [11].

The primary source of income for the rural population is livestock rearing, which constitutes 40 percent of the total income, while crop production constitutes 26 percent, trade 14 percent, and gift (in-kind) 7 percent. More than 90 percent of Somalis live in rural areas with high poverty levels. The budget is usually allocated for basic services with priority on health, education, water, agriculture, and roads. There are 8 refugee camps and 1 transit center. The Somali region has three major moisture zones: hyper-arid, arid, and semi-arid zones. The hyper-arid zone, which covers the southern part of the country with marginal rainfall and is noted for its high seasonal and yearly variability, covers the southern part of the region with marginal rainfall [12]. The desert zone, which encompasses most of the region, including the Shinile zone, is generally suitable for pastoral and rangelands, but it has a lot of annual variability. Its temperature ranges from 19°C (Jigjiga Zone) to 40°C in the southern zones, particularly in the Shebelle, Dawa, and Genale river basins. The annual rainfall ranges between 150 and 1,000 millimeters

2.2 Study P

- ✓ The st$\mathbf{n = \frac{(Za/2)^2\, P(1-p)}{d^2}}$ to August

2.3 Study Design

- ✓ The institutional-based cross-sectional study design was used

2.4 Study Population

- ✓ The source populations were all adolescents aged 10-19 years and living in the refugee camps of the Somali region, Ethiopia.

2.5 Study Population

- ✓ All adolescents living in the selected refugees of the Somali regional state.

2.6 Inclusion Criteria and Exclusion Criteria

2.6.1 Inclusion criteria

- ✓ Healthy adolescents
- ✓ Adolescents who lived six months and above in the refugee camp during the time of the data collection.
- ✓ All adolescents who are willing to participate in our study.

2.6.2 Exclusion criteria

- ✓ Those who are unable to respond and communicate appropriately.
- ✓ Those who are mildly, moderately, and severely ill.

2.7 Sample Size and Sampling Technique

2.7.1 Sample size determination

The sample size for this study was calculated using a single population proportion formula based on a previous study in Awbarre refugee camps with the prevalence rate of stunting was 9.7% and the prevalence of thinness in adolescents girls was 15.2% in Somali refugee camps, Somali regional state, Southeast Ethiopia. Fischer was used to determine the sample size with a 95% level of confidence and a 5% margin of error:

First indicator (stunting):

n = (1.96)2 (0.097) (1-0.097)/ (0.05)2
n = 135

Where**:**

n = the required Sample size
p **=** prevalence of adolescent thinness (9.7% or P=0.097
Z **=** the value of the standard normal curve score corresponding to the given
Confidence interval 1.96
d = the permissible Margin of error (the required precision) = 5%

By adding 10% of the non-response rate, a total of adolescents were recruited as study units among the undernutrition of adolescents.

Second indicator (thinness):

$$n = \frac{(Za/2)^2 P(1-p)}{d^2}$$

n = (1.96)2 (0.152) (1-0.152)/ (0.05)2
n = 198
Samples of 198+10%=218 are obtained after considering the 10% non-response rate.

Where:

n = the required Sample size
p **=** prevalence of adolescent stunting (11.5% or P=0.115)
Z **=** the value of the standard normal curve score corresponding to the given
Confidence interval 1.96
d = the permissible Margin of error (the required precision) = 5%

The last sample size will be **218** since it is the largest number

The Sample size of the second objective is calculated by using EPI-INFO version 7.1.1 with the assumptions: ratio 1, confidence interval 95%, and Power of test = 80% showed the following table.

Finally, the appropriate sample size for this research was determined by taking the maximum sample size obtained from the second objective (394) by adding 10% of the non-participant rate, and the estimated total sample of 433 was considered for the final study.

2.8 Sampling Technique and Procedure

The Somali region consists of 9 refugee camps and was selected three refugee camps out of the 9 camps by using a simple random sampling technique. According to the WHO guideline of 30% to represent other refugees. When there is more than one adolescent in the household, we were selected by using a simple random sampling technique in the lottery method.

2.9 Study Variables

2.9.1 Dependent variables

- ✓ Nutritional status (stunting of adolescent and thinness of the adolescent)

2.9.2 Independent variables

Socio-demographic Factors: Family income, Parent's education, Family size, Area of residency

Occupation status, Age, Sex

Environmental Factors: Safe Water, Sanitation, Availability of food, Access to health

2.10 Data Collection Technique and Tools and Procedure

A structured questionnaire was prepared after reviewing different published literature, WHO, and UNICEF checklists, then adapted and contextualized to the local situation. The questionnaire was first developed in English and then translated into Somali and back-translated to English, to keep consistency. The data was collected through face-to-face interviews with data collectors.

Data collectors and supervisors were trained for two days on the study objectives, tools, and ethical procedures. The supervisor and primary investigator closely follow up on the data collection activities, ensuring complete and ethical data collection. At the end of the data collection, double data entry was made to check the consistency.

2.10.1 Anthropometric measurements

The anthropometric measurements were done by using the WHO guidelines,

Table 1. Sample size determination for the second objective

No	Factor	CI	Ratio	Power	% of outcomes with unexposed	AOR	Sample size	Reference
1	Family size	95%	1	80%	66%	2.05	320	(Gebregyorgis et al., 2016)
2	Age of adolescent	95%	1	80%	77.2%	2.15	394	

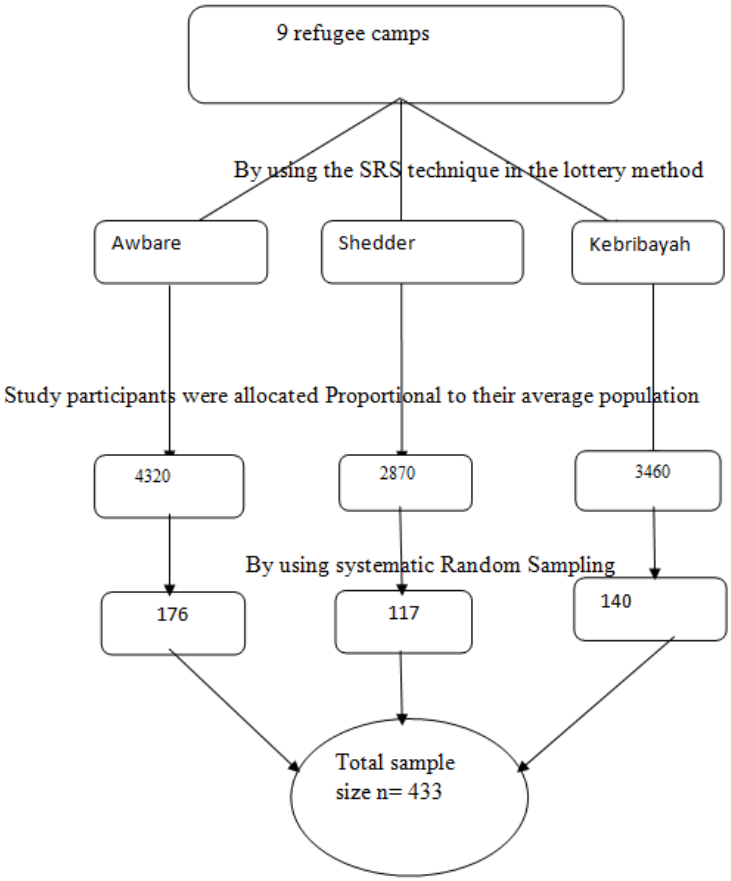

Fig. 1. Flow chart of the sampling frame

Weight was measured using a digital scale to the nearest 0.1 kg, without shoes and light clothes. The weight measurement scale was calibrated and standardized with known weight to maintain the accuracy of the measurement.

Height was measured with a portable stadiometer to the nearest 0.1 cm. The study participants stood upright on bare check-ups, with heels together, and buttocks and back touching the meter rule. Single measurements were taken. In each case, nutritional status indices were generated through anthropometry conversion to sex-specific Z-scores using WHO Anthro Software. Stunting and thinning were defined as low height-for-age (HAZ) and body-mass-index-for-age < −2SD). (BAZ), respectively, below −2SD, while normal nutritional status was Z-scores between −2SD to +2SD.

Food frequency: Food Frequency (FF) is a method for collecting dietary data and using context-specified food lists to estimate the usual dietary intake and also to understand the relationship between the adolescent's nutritional status and health outcomes based on their diet intake. Also, a food frequency questionnaire (FFQ) consists of a finite list of foods and beverages with response categories used to indicate the usual frequency of consumption over the time queried.

2.11 Data Quality Control

To assure the quality of data, the questionnaire was pre-tested, training was given to the data collectors based on the objective of the study, and role play was done by data collectors to strengthen their skills about how to interview and approach the study participants during the actual data collection. Data collectors were also being trained on how to minimize recall bias during an interview and the use of local languages adequate. The questionnaires were pre-tested on 5 % (19 adolescents) in different study locations than selected refugees (qoloji refugee) and correction was done accordingly. Questionnaires were checked for their completeness, validity, and consistency by the principal investigator

2.12 Data Processing and Analysis

The collected data was manually checked for completeness and consistency. Data was sorted, coded, and entered into a computer using Epi-data, version 3.01. Then it was transferred to SPSS version 22 software for statistical analysis and to identify the missing and outliers.

The participant's socio-demographic information was compiled using descriptive statistics, and the odds ratio and 95% confidence interval were used to determine the relationship between the variables. Multivariable logistic regression model analysis was used by selecting those variables that appeared to have a p-value of < 0.25 in the bivariate analysis to control the confounding effect for different variables while assessing the effect of each variable on the likelihood of undernutrition and associated factors among adolescents. A p-value of <0.05 was considered statistically significant in the multivariable logistic regression. The result was presented in the table and graphs.

3. RESULTS AND DISCUSSION

3.1 Results

3.1.1 Socio-Demographic Characteristics

The response rate for this study was 433 (100%), as shown in Table 2. In this survey, 309 (71.50%) of the household head participants were wives, compared to 124 (28.50%) who were husband participants. In the present study, the majority of 400 (92.40%) participants in the refugee camps lived 8 years and above. Most of the participants in the study were distributed in the age range of 10-12 years 40 (9.20%), 13-14 years 275 (63.50%), and 15-19 years and above 118 (27.10%), respectively. All of the study participants were Muslims and ethnic Somali. Two hundred and eighty-four (65.60%) were females while 149 (34.40%) were males. While 410 (94.70%) of the participants were unmarried. Fathers with an education level of high school were 162 (37.41%). Adolescents whose father's occupation was a private employer were majority 231 (53.30%. Illiterate participant mothers were 408 (94.20%). Most of the study participants were housewives 312 (72.10%). A family size of 357 (82.40%) were from families of more than five, and 76 (17.60%) were less than three family size. Regarding monthly income, participants with monthly income between 3500-<4500 birr were 180 (41.60%). The majority of household income generators were husbands 301 (69.50%).

3.1.2 Health-related characteristics

In this study 58 (13.39%) of participants were anemic and 358 (82.68%) were not anemic in the last six months. While 26 (6.00%) used drugs for intestinal worms and 363 (83.83%) were not taken any drug. In the last two weeks, 114 (26.33%) of the study participants were ill with diarrhea. The majority of the participants were not having breathing problems 401 (92.60%). Also, in 387 (89.40) there was no fever ill in most participants in the last weeks. According to this study area malaria is not common 378 (87.30%). Whereas 400 (92.40%) of participants did not visit a health facility in the last two weeks.

3.1.3 Environmental characteristics of participants

The study participants around 379 (87.50) used public tape water sources, while 36 (8.30%) used well water. Most of the research participants 334 (77.10%) used segregated trash and burned it. 433 (100%) of were used pit latrine toilets, 319 (73.70%) were not drinking boiled water, on the other hands 384 (88.70%) were not boiled water in their home. The majority of participants 387 (89.40%) washed their hands before eating the meal and after defecation.

3.1.4 Food Frequency

The reported consumption frequency of food revealed that 71.40%, 84.80%, 80.40%. 85.50%, 85.50%, and 71.40% of adolescents consumed rice, injera, macaroni, sorghum, maize, and wheat one to six times per week respectively. It was found that about 43.60% of adolescents consumed meat one to two times per month. Whereas, about 39.30% of them never consumed meat. The majority (61.40%) of adolescents consumed pasta one time per year. About 49%, 58%, 58.70%, and 97.90% of adolescents never consumed biscuits, milk and milk products, eggs, and pumpkin respectively. All (100%) of the participants never consumed chicken and fish 97.50%, 47.10%, 67.00%, 93.10%, and 75.30% of the study participants never consumed sweet potatoes, carrots, mangos, papaya, fats, and 63.30% of the participants consumed oils two times per week while 66.10% of adolescents never consumed butter. The majority of the adolescents consumed sugar one time per day 58% and 75.50% of the study participants never consumed honey.

Table 2. Socio-demographic characteristics of participants in refugee camps (n = 433), Somali, Ethiopia

Variables	Category	Response	
		Frequency	Percent
Head of household	Wife	309	71.50%
	Husband	124	28.50%
Place of the refugee	Awbarre camp	176	40.60%
	Kebribayah camp	140	32.30%
	Shedder camp	117	27.10%
Length of Living at Refugee Camps	5-8 years	33	7.60%
	>8years	400	92.40%
Age	10-12 years	40	9.20%
	13-14 years	275	63.50%
	15-19years	118	27.30%
Religion Preferences	Muslim	433	100
Sex	Female	284	65.60%
	Male	149	34.40%
Ethnicity	Somali	433	100.00%
Marital status	Unmarried	410	94.70%
	Divorced	7	1.60%
	Married	14	3.20%
	Widowed	2	0.50%
Father's educational level	Illiterate	148	34.18
	Elementary school	115	26.56
	High school	162	37.41
	College &Above	8	1.85
Father's occupation	daily labor	107	24.70%
	Farmer/pastoral	58	13.40%
	Business/trader	37	8.50%
	Private employer	231	53.40%
Mother's educational level	Illiterate	408	94.20%
	Elementary school	11	2.50%
	High school	12	2.80%
	College &Above	2	0.50%
Mother's occupation	Business/trader	81	18.70%
	daily labor	38	8.80%
	Housewife	312	72.10%
	Other	2	0.40%
Family size	<5	76	17.60%
	>5	357	82.40%
Family income	<3500 birr	103	23.80%
	3500-4500 birr	180	41.60%
	4500-5500	119	27.50%
	>5500 birr	31	7.10%
Households' principal income generator	Wife	97	22.40%
	Husband	301	69.50%
	Both	35	8.10%

Table 3. Health-related of the participants in refugee camps in the Somali region, Ethiopia

Variables	Category	Response	
		Frequency	Percent
Anemia in the past six months	No	358	82.68%
	Yes	58	13.39%
	don't know	17	3.93%
Drugs for intestinal worms in the past six months	No	363	83.83%
	Yes	26	6.00%
	don't know	44	10.17%
Diarrhea in the past 2 weeks	No	295	65.59%
	Yes	114	26.33%
	Don't know	24	8.08%
Cough or breathing problems in the past 2 weeks	No	401	92.60%
	Yes	9	2.10%
	Don't know	23	5.30%
Fever in the past 2 weeks	No	387	89.40%
	Yes	6	1.40%
	Don't know	40	9.20%
Malaria illness in the past 2 weeks	No	378	87.30%
	Yes	6	1.40%
	don't know	49	11.30%
Hospitalization and /or clinic visits due to illness in the last 2 weeks?	No	400	92.40%
	Yes	33	7.60%
	don't know	0	0.00%

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Table 4. Environmental characteristics of the participants in refugee camps (n = 433), Somali, Ethiopia

Variables	Category	Response	
		Frequency	Percent
Main sources of water	Pipe water	0	0.00%
	public tap water	379	87.50%
	well water	36	8.30%
	Rainwater	18	4.20%
Household waste disposal			
	Segregate the trash and throw it	22	5.10%
	throw it in deep pit/ dirt thrash	75	17.30%
	segregate the trash and burn it	334	77.10%
	Burn it without segregating	2	0.50%
Type of toilets used	Pit latrine	433	100.00%
Do you boil drinking water while at home?	Yes	49	11.30%
	No	384	88.70%
Handwashing habits before eating and after defecation	Yes	387	89.40%
	No	46	10.60%

3.1.4.1 Prevalence of stunting and thinness of adolescents

As indicated in Fig. 2, the overall prevalence of the Awbarre refugee camp was 32.4% stunted while 67.6% was normal. The prevalence of the Kebribayah refugee camp was 13.16% stunted and 86.64% was normal. The overall prevalence of Shedder refugee camp was 62.43% stunted and 37.6% was normal.

3.1.4.2 Prevalence of thinness

About 126 (44.1%) of adolescents were thin at Awbarre refugee camp, 83 (29.0%) at Kebribayah, and 77 (26.9) at Shedder refugee camp, respectively as presented in Fig. 3. The highest magnitude of adolescents was found in Awbarre refugee camp relative to other refugee centers in this study.

Table 5. Cereal-based food consumption food-frequency of the participants in refugee camps (n = 433) Somali, Ethiopia

Variable	Category	Response	
		frequency	Percent
Rice	1x per day	21	4.80%
	1-6x per week	309	71.40%
	1-2x per month	45	10.40%
	>2x per month	4	0.90%
	1x per year	54	12.50%
Pasta	1x per day	9	2.10%
	1-6x per week	101	23.30%
	1-2x per month	19	4.40%
	>2x per month	37	8.50%
	1x per year	266	61.40%
	Never	1	0.30%
Injera	1x per day	0	0.00%
	1-6x per week	367	84.80%
	1-2x per month	3	0.70%
	>2x per month	1	0.20%
	1x per year	62	14.30%
Macaroni	1x per day	53	12.20%
	1-6x per week	348	80.40%
	1-2x per month	20	4.60%
	>2x per month	12	2.80%
Sorghum	1x per day	24	5.50%
	1-6x per week	370	85.50%
	1-2x per month	16	3.70%
	>2x per month	23	5.30%
Maize	1x per day	24	5.50%
	1-6x per week	370	85.50%
	1-2x per month	16	3.70%
	>2x per month	23	5.30%
Wheat	1x per year	0	0.00%
	1x per day	29	6.70%
	1-6x per week	309	71.40%
	1-2x per month	46	10.60%
	>2x per month	49	11.30%

Table 6. Animal source food consumption foods frequency of the participants in refugee camps

Variables	Category	Response	
		Frequency	Percent
Biscuits	1x per day	71	16.40%
	1-6x per week	56	12.90%
	1-2x per month	62	14.30%
	>2x per month	29	6.70%
	Never	215	49.70%
Milk and milk products	1x per day	29	6.70%
	1-6x per week	74	17.10%
	1-2x per month	67	15.50%
	>2x per month	11	2.50%
	Never	252	58.20%
Meats	1x per day	3	0.70%
	1-6x per week	36	8.30%

Variables	Category	Response	
		Frequency	Percent
	1-2x per month	189	43.60%
	>2x per month	35	8.10%
	Never	170	39.30%
Eggs	1x per day	43	9.90%
	1-6x per week	82	18.90%
	1-2x per month	41	9.50%
	>2x per month	13	3.00%
	Never	254	58.70%
Chicken	Never	433	100.00%
Fish	Never	433	100.00%
Pumpkin	1-6x per week	4	0.90%
	>2x per month	5	1.20%
	Never	424	97.90%

Table 7. Frequency of fruit and vegetable consumption by participants

Variables	Characteristics	Response	
		frequency	Percent
Sweet potatoes	1x per day	0	0.00%
	1-6x per week	1	0.20%
	1-2x per month	0	0.00%
	>2x per month	0	0.00%
	1x per year	10	2.30%
	Never	422	97.50%
Carrots	1x per day	9	2.10%
	1-6x per week	172	39.70%
	1-2x per month	19	4.40%
	>2x per month	27	6.20%
	1x per year	2	0.50%
	Never	204	47.10%
Mangoes	1x per day	0	0.00%
	1-6x per week	42	9.70%
	1-2x per month	15	3.50%
	>2x per month	58	13.30%
	1x per year	28	6.50%
	Never	290	67.00%
Papayas	1x per day	0	0.00%
	1-6x per week	2	0.50%
	1-2x per month	18	4.20%
	>2x per month	9	2.10%
	1x per year	1	0.20%
	Never	403	93.00%
Fats	1x per day	2	0.50%
	1-6x per week	87	20.10%
	1-2x per month	4	0.90%
	>2x per month	14	3.20%
	1x per year	0	0.00%
	Never	326	75.30%
Oils	1x per day	159	36.70%
	1-6x per week	274	63.30%
	1-2x per month	0	0.00%
	>2x per month	0	0.00%
	1x per year	0	0.00%
	Never	0	0.00%

Variables	Characteristics	Response	
		frequency	Percent
Butter	1x per day	7	1.60%
	1-6x per week	119	27.40%
	1-2x per month	16	3.70%
	>2x per month	5	1.20%
	Never	286	66.10%
Sugar	1x per day	251	58.00%
	1-6x per week	177	40.90%
	1-2x per month	5	1.10%
	>2x per month	0	0.00%
	1x per year	0	0.00%
	Never	0	0.00%
Honey	1x per day	3	0.70%
	1-6x per week	73	16.90%
	1-2x per month	10	2.30%
	>2x per month	10	2.30%
	1x per year	10	2.30%
	Never	308	75.50%

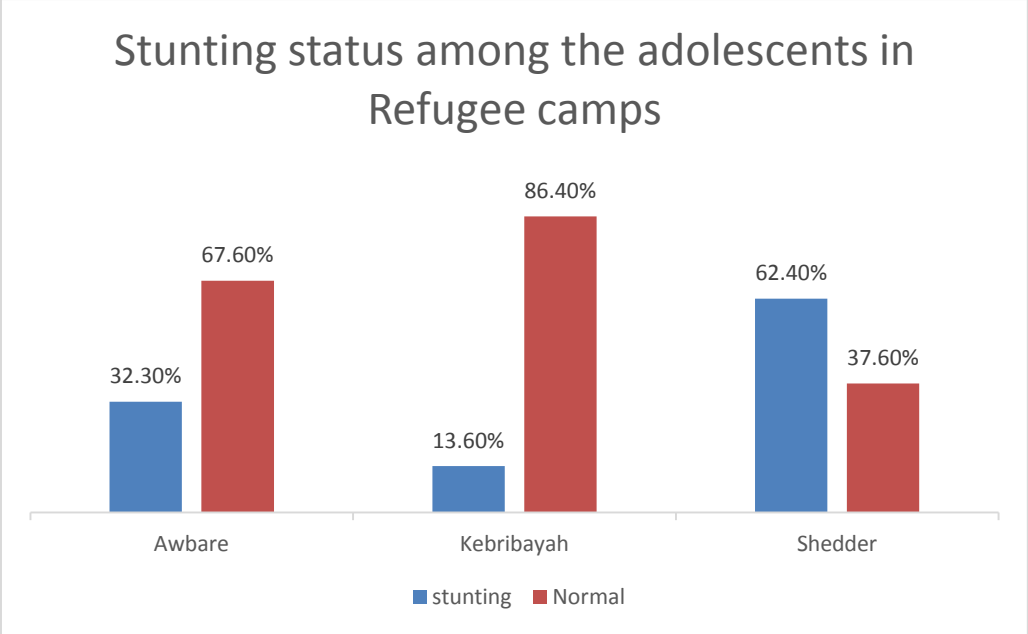

Fig. 2. Prevalence of stunting among the adolescents in the study settings

3.1.5 Factors Associated with Stunting of Adolescents

3.1.5.1 Results of Bivariate logistic regression

In the bi-variable logistic regression analyses, household head, place of refuge, length of stay in refugee, father's occupation, monthly income, household income source, any drug for intestinal worms in the past six months, hospitalization in the last 2 weeks, the main source of water, drinking water that is not boiled, were statistically associated stunting in the study area. Variables that showed a significant association on bivariate analysis but were less than 0.25 were entered into multivariate logistic regression analysis during binary logistic regression analysis.

3.1.6 Result of Multivariable logistic regression analyses

The multivariable analysis was done by considering the conceptual framework to assess the relative effect of explanatory factors on the outcome variable (stunting). Multivariable analysis of this study showed that after controlling confounding variables, household head, place of refugees, and monthly income

were significantly associated with stunting. Those adolescents who lived in households headed by females were 1.75 times more likely to be stunted compared to those whose household head was male (AOR = 1.758 (95% CI: 1.019–3.003).

Participants from Awbarre and Kebribayah refugee camps were 3.61 and 16.03 times more likely to be stunted when compared to Shed-der participants (AOR 3.611 (95% CI: 1.835-7.105) and (AOR 16.039 (95% CI: 5.950-43.237) respectively. Participants with a monthly income of less than three thousand and five hundred birr were 5.84 times (AOR 5.847 (95% CI: 1.486-23.007) and adolescents who their monthly income between 4500-5500 9.36 times (AOR 9.365 (95% CI: 2.496-35.136) more likely to develop stunting than those with a monthly income of more than five thousand five hundred birr.

3.1.7 Factors Associated with Thinness of Adolescent

3.1.7.1 Results of Bivariate Logistic Regression

In the bi-variable logistic regression analyses, length of refugee in years, household head age, family size, ill with malaria in the last 2 weeks, boiling drinking water while at home, and handwashing habits before eating and after defecation were used as predictors for adolescent thinness status in this study. Accordingly, those potential predictors with p ≤0.25 were identified and entered into multivariable logistic regression analysis.

3.1.7.2 Result of Multivariable logistic regression analyses

The multivariable analysis was done by considering the conceptual framework to assess the relative effect of explanatory factors on the outcome variable (Thinning). The multivariable logistic regression analysis of this study revealed that after controlling confounding variables, family size. The odds of becoming stunted were 37% less likely among those adolescents aged 13 up to 14 than those adolescents aged between 15 and 19 years.

Adolescents who lived in a household with greater than five were two times more likely to become stunted compared with adolescents whose family is less than three [[AOR= 2.034(,95% CI: (1.205-3.343)].

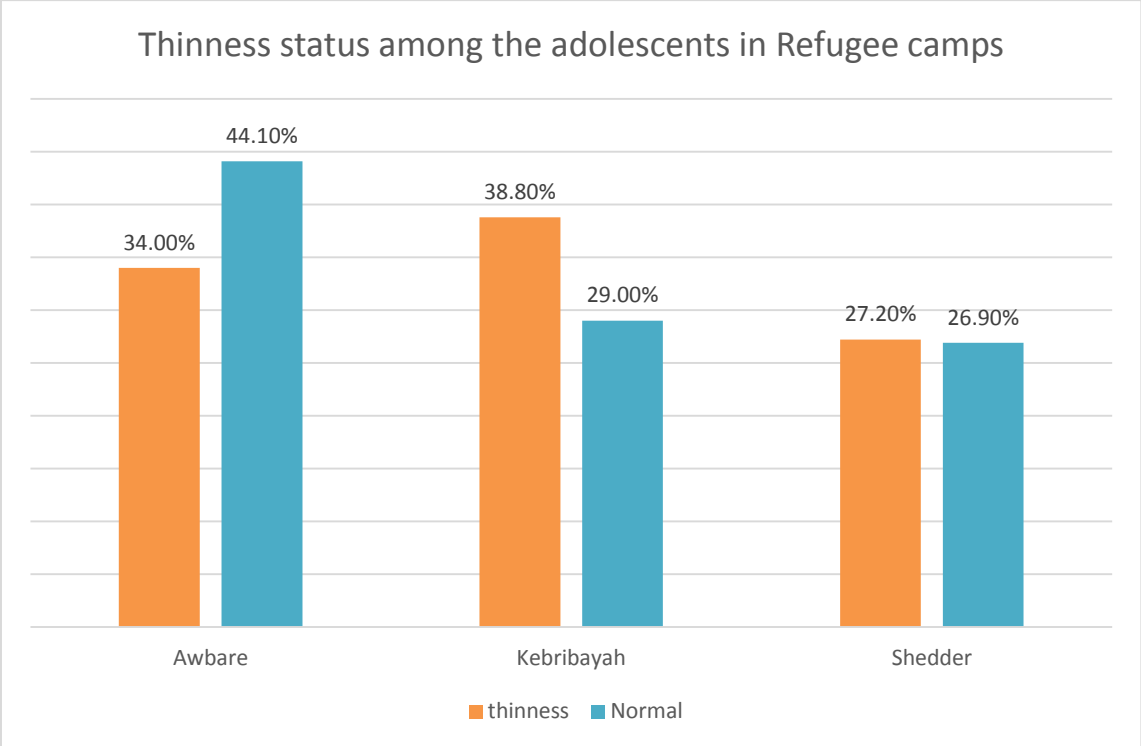

Fig. 3. Prevalence of thinness among adolescents in the study settings

Table 8. Bivariate and multivariate logistic regression factors associated with stunting among adolescents

Variable	Category	Stunting			
		Normal	Stunting	COR (95%CI	AOR (95%CI)
Household head	Wife	210(73.9%)	99(66.4%)	1.433(0.932-2.206)	1.758(1.019-3.033) *
	Husband	74(26.1%)	50(33.6%)	1	
Place of refugee	Awbarre camp	119(41.9)	57(38.3%)	3.464(2.123-5.651)	3.611(1.835-7.105) **
	Kebribayah camp	121(42.6%)	19(12.8%)	10.566(5.733-19.474)	16.039(5.950-43.237) **
	Shedder camp	44(15.5%)	73(19.0%)	1	
Length of refugee in years	5-8	26(78.8%)	7(21.2%)	2.044(0.866-4.828) *	0.652(0.209-2.030)
	>8	258(64.5)	142(35.5%)	1	
Fathers' occupation	Daily labor	63(58.9%)	44 (41.1%)	0.573(.355-.925) *	0.535(0.283-1.012)
	Farmer/pastoral	31(53.4%)	27 (46.6%)	0.459(o.255-.828) *	0.684(0.311-1.501)
	Business/trader	25(67.6%)	12 (32.4%)	0.833(0.396-1.756)	0.616(0.249-1.528)
	Private employer	165(71.4%)	66 (28.6%)	1	1
Monthly income	<3500 birr	89(86.4%)	14(13.6%)	2.601(0.997-6.783)	5.847(1.486-23.007) **
	3500-4500 birr	87(48.3%)	93(51.7) %	0.383(0.167-0.877)	1.480(0.441-4.966)
	4500-5500	86(72.3%)	33(27.7%)	1.066(.445-2.553)	9.365(2.496-35.136) *
	>5500 birr	22(71.0%)	9(29.0%)	1	1
Income generator	Wife	90(92.8%)	7(7.2%)	15.268 (5.524-42.202)	2.568(0.715-9.229)
	Husband	178(59.1%)	123(40.9%)	1.718(0.850-3.473)	0.679(0.241-1.912)
	Both	16(45.7%)	19(54.3%)	1	
Drugs for intestinal worms in the past six months	No	233(64.2%)	130(35.8%)	0.461(0.215-0.989)	0.659(0.260-1.665)
	Yes	16(61.5%)	10(38.5%)	0.411(0.140-1.208)	469(0.124-1.779)
	don't know	35(79.5%)	9(20.5%)	1	
Hospitalization in the last 2 weeks?	No	267(66.8%)	133(33.2%)	0.529(0.259-1.080)	1.716(0.705-4.175)
	Yes	17(51.5%)	16(48.5%)	1	
The main source of water	public tap water	240(63.3%)	139(36.7%)	0.216(0.049-0.953)	0.514(0.102-0.594)
	well water	28(77.8%)	8(22.2%)	0.438(0.083-2.317)	0.445(0.054-3.696)
	Rainwater	16(88.9)	2(11.1%)	1	
drinking water that is not boiled	No		115(36.1%)	0.754(0.475-1.196)	0.678(0.386-1.189)
	Yes		34(29.8%)	1	

** P < 0.05, **P<0.001, AOR: Adjusted Odds Ratio, COR: Crud Odds Ratio, CI: Confidence Interval, 1: Reference group*

Table 9. Bivariate and multivariate logistic regression factors associated with thinning

Variable	Category	Thinness		COR (95%CI)	AOR (95%CI)
		Thinness	Normal		
Length of refugee	5-8	17(51.5%)	16(48.5%)	0.453(0.222-0.925)	0.496(0.231-1.063)
	>8	130(32.5%)	270(67.5%)	1	1
Age	10-12 years	17(42.5%)	23(57.5%)	0.441(0.207-0.937)	2.034(1.205-3.434)
	13-14 years	101(36.7%)	174(63.3%)	0.561(0.345-0.912)	0.624(0.378-1.0302)
	15-19years	29(24.6%)	89(75.4%)	1	1
Family size	<5	35(61.1%)	41(53.9%)	1	1
	>5	112(31.4%)	245(68.6%)	1.867(1.129-3.089)	2.034 (1.205-3.434) *
Ill with malaria in the last2 weeks	No	125(33.1%)	253(66.9%)	1.175(0.633-2.183)	1.115(0.604-2.206)
	Yes	4(66.7%)	2(33.3%)	0.290(0.048-1.746)	0.370(0.157-2.428)
	Don’t know	18(36.7%)	31(63.3%)	1	1
Boil drinking water while at home	Yes	21(42.9%)	28(57.1%)	0.651(0.356-1.192)	0.635(0.340-1.187)
	No	126(32.8%)	258(67.2%)	1	1
Handwashing habits before eating and after defecation,	Yes	126(32.6%)	261(67.4%)	1.740(0.938-3.228)	1.682(0.888-3.184)
	No	21(45.7%)	25(54.3%)	1	1

** P < 0.05, **P<0.001, AOR: Adjusted Odds Ratio, COR: Crud Odds Ratio, CI: Confidence Interval, 1: Reference group*

3.2 Discussion

This study aimed to assess the magnitude of undernutrition and associated factors among adolescents living in refugee camps in the Somali region of Ethiopia. The overall prevalence of stunting among adolescents in Awbarre, Kebribayah, and Shedder refugee camps was 34.4%. This prevalence is similar to findings from studies done in West Bengal (34.2%) [13], and studies done in Peshawar, Pakistan among Afghan adolescent refugees 35.4% [14]. This similarity might be due to a similar study design and same.

This prevalence is higher than studies done in Dangila Town, Northwest Ethiopia (24.8%) [15], Southwest Nigeria (19.1%) [16], Northeastern Brazil (20.7%), and Adama City (15.6%). This discrepancy might be due to the difference in socioeconomic status and cultural variation as well as the study settings. On the other hand, this prevalence is lower than in studies conducted in India (53.5 %) and 48.75%. and in Nigeria (57.8%) [17]. The difference might be due to the ongoing implementation of nutrition intervention programs by the united nations and Ethiopian government refugee agencies.

The total prevalence of thinness among adolescents in Awbarre, Kebribayah, and Shedder refugee camps was 33.9%. This prevalence is similar to studies done in West Bengal, India (28%) [1]. And studies were done in southwest Ethiopia (30.4%) [18]. This finding is higher than studies done in Nigeria (18.9%), Pakistan (4.4%), Nakivale Refugee Uganda (5.5%) [19], Southeast Ethiopia (13.6%) [15], and Northern Ethiopia (26.1%). The discrepancy might be due to the time gap between studies and the current implementation of nutritional programs. On the other hand, this result is lower than studies conducted in India (40.94%) [20], and Tigray (58.3%) [21]. This difference might be due to study area and socio-economic issues.

Those adolescents who lived in households headed by females were 1.75 times more likely to be stunted compared to those whose household head was male (AOR = 1.758 (95% CI: 1.019–3.003). Adolescents from female-headed households were more stunted than male-headed households. This might be due to the traditional burden of caretaking for both young and old family members. female-headed households as our proxy for female empowerment. Due to the absence of their husbands, these women have increased decision-making power in the household [22].

Participants from Awbarre and Kebribayah refugee camps were 3.61 and 16.03 times more likely to be stunted when compared to shed-der participants (AOR 3.611 (95% CI: 1.835-7.105) and (AOR 16.039 (95% CI: 5.950-43.237) respectively. this implies that living in urban areas will have the potential to be associated with being stunted. In other way living in rural areas will increase the chance of being normal. With this finding, it can be said that having a majority of the participants from urban areas affects the result. Nonetheless, [23] found that place of residence is one of the factors that determine nutrition status.

Adolescents from families whose monthly income was less than three thousand five hundred birr were 5.84 times (AOR 5.847 (95% CI: 1.486-23.007) and adolescents who their monthly income between four thousand five hundred up to five thousand five hundred birr 9.36 times (AOR 9.365 (95% CI: 2.496-35.136) were significantly associated with stunting. This resulted in lower affordability of quality nutrition, health care, and hygiene than wealthy families [24]. The possible reason is also due to the positive correlation between income level and the nutrition status of adolescents; a higher income could mean a stronger purchasing power for better-quality foods, while a limited income restricts access to nutrient-dense foods [25].

Adolescents who were from families with a size greater than five were about 9.7 times [AOR= 9.776,95% CI: (1.132-84.404)] more likely to be thin as compared to adolescents whose family size was less than three. This result matched that of a study conducted in Northwest Ethiopia [26]. This finding is in line with a study done in Jimma, Ethiopia [27]. This might be due to having more family members, which could lead to sharing of the available food among the large household members, causing inadequate consumption of food, leading to being thin. Adolescents in refugee camps who were thin had a larger family size. This may be nutrition-related problems due to inadequate diet and health status.

4. CONCLUSION

The prevalence of stunting and thinness among adolescent refugees was high in this study. This study was done in three refugee camps:

Awbarre, Kebribayah, and Shedder, and the overall prevalence of stunting was 34.4% for all three refugee camps and the thinness was 33.9% for the refugee camps. Factors associated with thinness were a bigger family size and the age of the adolescents, which were found to be statistically significant. Being the head of the household, location of refugee, and monthly income were found to be statistically significant with stunting.

CONSENT AND ETHICAL APPROVAL

Ethical clearance was obtained from the School of Graduate Studies, Department of Food Science and Nutrition (applied human nutrition), Jigjiga University Research and Ethical Committee (REC). The administration of the refugee camps received an official letter from the graduate school requesting authorization, and each respectable home also received a letter of support. A right thumbprint was collected, the goal of the study was presented to the study participants, and a written agreement was obtained from participants to determine whether they were willing to participate. Permission to survey illiterate adolescents was obtained. The research process also included safeguards to maintain participants' privacy.

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COMPETING INTERESTS

The authors have declared that no competing interests exist.

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