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DETERMINATE FACTORS AND PREVALENCE OF THINNESS AMONG ADOLESCENT GIRLS: A SCHOOL-BASED CROSS-SECTIONAL STUDY

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Abstract

Background: Adolescence, marked by fast growth and development in human beings, requires additional nutrients and energy to support this growth. Paying particular attention to the nutrition of adolescents, particularly girls presents a distinct chance to disrupt the ongoing cycles of malnutrition across generations. **Materials and methods:** A cross-sectional quantitative study was conducted within a school setting involving 271 adolescent girl's selected using multistage sampling technique. Data was collected through a pretested questionnaire. Anthropometric measurements were used to calculate Z-scores, and analysis was conducted using WHO AnthroPlus software. Statistical analysis was performed using SPSS Version 22, and the strength of associations was determined using odds ratios (OR) along with a 95% confidence interval (CI). Variables with a p-value below 0.05 were considered statistically significant. **Results:** The study revealed that the prevalence of thinness was 22.9% (95% CI: 18.1–28.0%). Of which, overweight and obese subjects comprised 7.4% and 2.6% of the participants, respectively. Early adolescents' age (AOR = 2.99, 95% CI: 1.36–6.58), family size (AOR = 2.36, 95% CI: 1.23–4.52), and income (AOR = 2.71, 95% CI: 1.06–6.93) were the independent predictors of thinness among adolescent girls. **Conclusion:** In order to enhance the current nutritional challenges faced by adolescents, policies should take into consideration the above-mentioned determinants and work towards addressing them.

Keywords: Nutritional Status, Adolescent Girls, Southern Ethiopia.

BACKGROUND

The UN and WHO characterize adolescence as 10 to 19 years of age, marking a critical phase in human development encompassing significant physical, psychosocial, and cognitive growth as individuals progress from childhood to adulthood (1,2).

In adolescence, individuals typically achieve 20% of their eventual adult height and half of their adult weight. Additionally, there is a 45% increase in bone mass, significant bone remodeling, and growth in the size of soft tissues, organs, and even red blood cell mass (3). This situation becomes more complex when adolescents are frequently exposed to infections and parasites that can harm their nutritional well-being (4,5).

The global population includes 1.8 billion individuals, approximately 24.7%, aged between 10 and 24 years, with the youth demographic experiencing it's most rapid growth in economically disadvantaged countries. At present, adolescents represent approximately 20% of the total global population (1). Similarly, in Ethiopia, children and adolescents account for roughly 48% of the country's population, with adolescents making up 25% (2).

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Throughout adolescence, significant physical transformations impact the body's dietary requirements, and alterations in one's lifestyle may influence eating behaviours and food preferences. Due to the notable physical and psychosocial development, the nutritional demands during this period are more significant than at any other stage of life (6).

Nutritional deficiencies pose a significant public health challenge in advanced and emerging countries (1,7). The Global Education Monitoring report states that over 25% of children under 15 in Sub-Saharan Africa (SSA) suffer from insufficient weight. In Ethiopia, stunted growth and wasting vary between 8.9% and 42.7%, 8.0% and 26.1%, respectively (8).

Malnutrition leads to elevated illness and death in children in developing nations. It can also disrupt cognitive abilities, ultimately impacting the economic well-being of households, communities, and entire nations (3).

At this point, insufficient nutrition frequently leads to reduced school enrollment, increased absenteeism, premature discontinuation of education, subpar classroom performance, and overall diminished health, resulting in inadequate educational achievements and limited intellectual and physical capabilities in adulthood (8,9).

In adolescence, achieving optimal growth is crucial for preserving good health. Adolescents have the highest nutritional requirements, and their dietary habits significantly influence their long-term nutritional well-being and health (10). Without effective nutritional interventions, girls born with low birth weight may become stunted mothers, thus continuing the harmful cycle of malnutrition (2).

The Ethiopian Federal Government has been actively addressing the issue of undernutrition by utilizing public education, offering nutritional supplements, and providing financial assistance to vulnerable families. Nevertheless, the risk factors associated with undernutrition are varied and may evolve over time and across different regions. Therefore, assessing the current nutritional situation, identifying shortcomings, and formulating effective intervention plans are essential (11).

A study on the prevalence of thinness among school adolescents in various parts of the country was undertaken by multiple academics. There is a notable variation in the occurrence of thinness among different regions of Ethiopia. According to research conducted in Bedlle, Adama, Arsi Durbete, Mekelle City, and Tigray, among adolescent girls, thinness prevalence was 28%, 21.3%, 14.8%, 27.1%, 37.8%, and 58.3%, respectively (1, 5, 12, 13).

Research indicates that childhood undernutrition persists into adolescence. Still, insufficient focus has been placed on the undernutrition of adolescents, possibly due to the misconception that adolescents are at a low risk. Despite these findings, there is a shortage of information regarding the nutritional status of adolescents in Ethiopia. Consequently, adolescent nutrition faces challenges stemming from inadequate data, limited policymaker attention, minimal program implementation experience, and a

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shortage of resources. Collectively, these factors represent a missed opportunity to enhance nations' health, development, and economic advancement.

Nonetheless, there hasn't been any documentation regarding the nutritional status within the specified research region. This research will establish a foundational framework for future investigations, hold significance in formulating interventions, and provide direction to policymakers and development strategists. The primary objective of this study was to evaluate the occurrence of thinness in adolescent girls residing in Hawassa City, located in the southern region of Ethiopia, along with identifying its underlying factors.

MATERIALS AND METHODS

Study Area and Period

Between July 2022 and April 2023, a cross-sectional study was carried out within the educational institutions of Hawassa, a city situated 275 kilometres south of Addis Ababa. The city administration covers a total land area of 157.2 square kilometres. Out of the 27 government schools within the city, four high schools and two elementary schools were chosen through a random selection process.

Source and Study Population

The source population for this study encompassed adolescent girls aged 10 to 19 years who were enrolled in the chosen public schools within Hawassa City during the research period. The study population, on the other hand, comprised randomly selected adolescent girls within the same age range from the six selected schools. Excluded from the study were adolescents who declined to volunteer and those with noticeable deformities in their anthropometric measurements.

Sample Size Determination

The sample size was determined using a formula for a single population proportion. A prevalence of 21.3% (12) was taken into account. The 95% confidence interval (Zα/2=1.96) and 5% margin of error were used to calculate the sample size.

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

For this study, the ultimate sample size achieved was 271. A multistage sampling method was utilized. Initially, the schools were divided into high schools and elementary schools. Then, four high schools and two elementary schools were randomly picked from the city's entire pool of government schools.

Subsequently, the total sample size was proportionally allocated among these selected schools. Finally, a systematic random sampling approach was employed to select a specific number of adolescent girls from each school.

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Data Collection Procedure

A pretested structured questionnaire in the Amharic language was employed to gather information on demographic details, socioeconomic status, and the participants' dietary habits and meal frequency concerning their health.

The questionnaire was initially developed in English and later translated into the local language. Afterward, it was translated back into English to guarantee consistency. Anthropometric measurements were obtained, and height and weight assessments were conducted using a stadiometer and digital scale. Weight measurements were recorded with an accuracy of 0.1 kg, and the scale was regularly calibrated against a known weight reference. Height was measured with a precision of 0.1 cm. Individuals with a BMI-for-age z-score (BAZ) and height-for-age z-score (HAZ) below -2 standard deviations were categorized as thin (13).

The evaluation of dietary diversity in adolescent girls involved employing the 24-hour recall method, which considered the consumption of nine distinct food groups. These food groups included cereals, roots and tubers, vegetables, fruits, meat and meat products, milk and milk products, legumes, eggs, and oils and fats. The dietary variety score was categorized based on the number of food groups consumed: when it was three or fewer, it was considered low; when it ranged from four to six, it was classified as medium; and if it exceeded six, it was categorized as high (16).

Data Processing and Analysis

The gathered data underwent encoding, entry into Epi-Info, and subsequent transfer to SPSS version 22 for analysis. The WHO Anthro Plus software was utilized to calculate anthropometric indices. Descriptive summary techniques such as tables, charts, frequencies, percentages, mean, standard deviation, and crosstabs were employed for data presentation.

Associations between dependent and independent variables were assessed using odds ratios with a 95% confidence interval. Bivariate analysis was employed to identify potential variables for inclusion in the multivariable logistic regression. All variables with p-values less than 0.20 in the bivariate analysis were included in the final multivariable logistic regression model to control for confounding factors. A p-value less than 0.05 was considered statistically significant. The adequacy of the model fit was tested using the Hosmer and Lemeshow test.

Ethical Consideration

The Sidama Regional State Health Bureau in Hawassa provided ethical approval. The research's objectives were comprehensively communicated to the participants in their local language. Adolescent girls gave verbal consent after ensuring that their privacy and confidentiality were safeguarded throughout the investigation. Furthermore, all participants were explicitly informed of their right to decline or withdraw from the study at any point without facing any repercussions.

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RESULTS

Socio-Demographic Characteristics

The study included two hundred seventy-one - adolescents, achieving a 100% response rate. Most of the participants, constituting 97%, reside in urban areas. Among the total number of adolescent girls, 31% fell into the age group of 10–14 years, denoting early adolescence, while 69% were in the age category of 15–19 years, signifying late adolescence. Concerning their religious affiliations, 53.0% identified as Orthodox Christians, 42.1% as Protestants, 3% as Muslims, and 0.4% as Catholics. Almost all adolescents (98.2%) were unmarried. Approximately 58% came from families with a monthly income of less than 5,000 Ethiopian Birr (Table 1).

Table 1: Socio-demographic Characteristics of Respondents in Hawassa City, Southern Ethiopia

Characteristics	Category	Frequency (n)	Percent (%)
Age in years			
Early adolescent	10-14	85	31.4
Late adolescent	15-19	186	68.6
Religion			
	Orthodox	144	53.0
	Protestant	114	42.1
	Muslim	8	3.0
	Catholic	1	0.4
	Others	4	1.5
Residence			
	Urban	263	97
	Rural	8	3
Family Size			
	1-5	120	44.3
	>5	151	55.7
Marital status			
	Single	266	98.2
	Married	5	1.8
Income in Ethiopian Birr			
	<5000	156	57.6
	5000-10000	87	32.1
	>10000	28	10.3
Educational status of Father			
	No formal education	61	24.7
	Primary education	54	21.9
	Secondary education	60	24.3
	College and above	72	29.1
Educational status of Mother			
	No formal education	126	47.9
	Primary education	44	16.7
	Secondary education	59	22.5
	College and above	34	12.9
Father's employment			

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	Formal employed	124	50.2
	Daily labourer	43	17.4
	Merchant	47	19.0
	Farmer	33	13.4
Mother's employment			
	Housewife	108	41.1
	Formal employed	110	41.8
	Merchant	36	13.7
	Daily labourer	9	3.4

Reproductive Health Characteristics of Respondents

Most survey participants, precisely 94.5%, had experienced menstruation. Among them, 68.0% indicated that their menstrual cycles began at 13 or younger, while 32% commenced menstruating after age 13. Additionally, nearly 65% of the respondents reported having menstrual periods lasting less than five days. Approximately 62% disclosed that their menstrual cycle typically ranged from 26 to 30 days in length.

Regarding recent health status, 33.2% of the participants mentioned experiencing some form of illness in the past few weeks. It was also observed that 38% of the respondents had a history of malaria, while 63.5% reported a prior history of intestinal parasites.

Meal Frequency and Dietary Variety of Respondents

Most participants, approximately 89%, mentioned having meals three times a day or more. 77.5% of them frequently skipped regular meals. Breakfast was the meal most often overlooked, with approximately 53% of adolescents mentioning it. The commonly cited reasons for skipping meals varied and included a lack of appetite, time constraints, food shortages, and illness, with 56%, 23%, 12%, and 5%, respectively. Of the respondents, 252 (93.0%), mostly purchased food rather than producing it at home.

Regarding dietary variety, 33.9% of girls reported consuming meat and meat products, while 45% of milk and milk products and 42.4% included eggs in their diet, all at a rate of about two times per week. Only 18.5% and 7% of the participants said they never consumed milk and eggs, respectively. Fast food consumption was prevalent, with approximately 84%. The most commonly consumed type of food among the participants was teff, which 90% favoured. (Table 2)

Table 2: Meal frequency pattern and related characteristics of respondents in Hawassa City, Southern Ethiopia

Characteristics	Category	Frequency (n)	Percent (%)
Meal frequency per day			
	One time	4	1.5
	Twice	26	9.6
	Three and more	241	88.9
Skip any regular meal.			
	Yes	210	77.5
	No	61	22.5
Usually skipped meal			

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	Breakfast	111	52.9
	Lunch	31	14.8
	Dinner	68	32.3
Reason for skipping meals			
	Shortage of food	26	12.4
	Lack of appetite	118	56.2
	Sickness	10	4.8
	Lack of time	49	23.3
	Others	7	3.3
Source of food consumed			
	Home Production	17	6.3
	Purchased	252	93.0
	Borrowed from other	2	0.7
Eat fast food usually.			
	Yes	228	84.1
	No	43	15.9
Kind of food always eaten.			
	Teff	244	90.0
	Wheat	2	0.7
	Rice and Spaghetti	14	5.2
	Maize and Sorghum	11	4.1

Dietary Diversity Score by Adolescent Girls

Using data from 24-hour dietary recalls, it was observed that approximately 69.7% of adolescent girls had a dietary diversity score of three or more, as depicted in Figure 1.

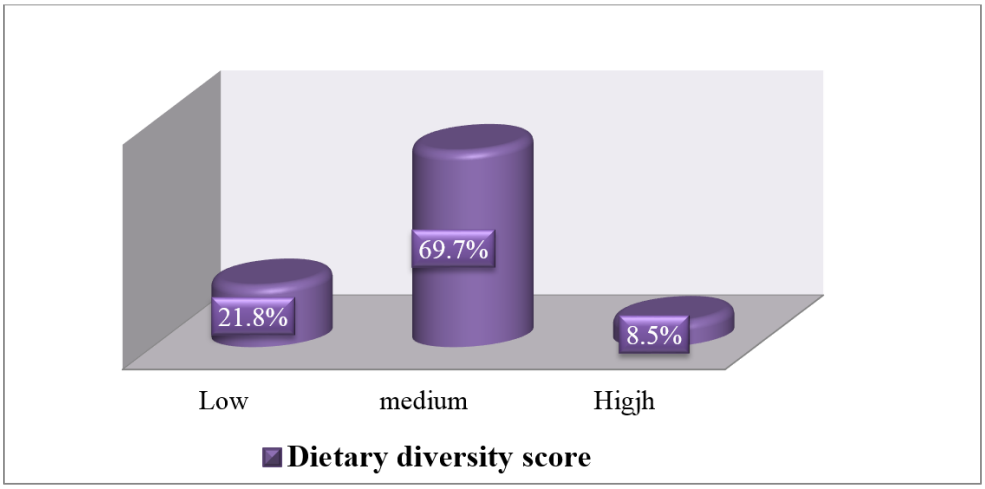

Figure 1: Dietary Diversity Score among Adolescent Girls in Hawassa City, Southern Ethiopia

In the study area, the most frequently consumed food group by adolescent girls was oil and fats (100%) and starchy staples, which were chosen by 99.6% of the respondents. Other food groups included legumes (selected by 69.7% of participants), tubers (57.6%), vegetables (37.6%), meat (17.3%), milk (14%), fruits (12.2%), and eggs (6.3%) (Fig 2)

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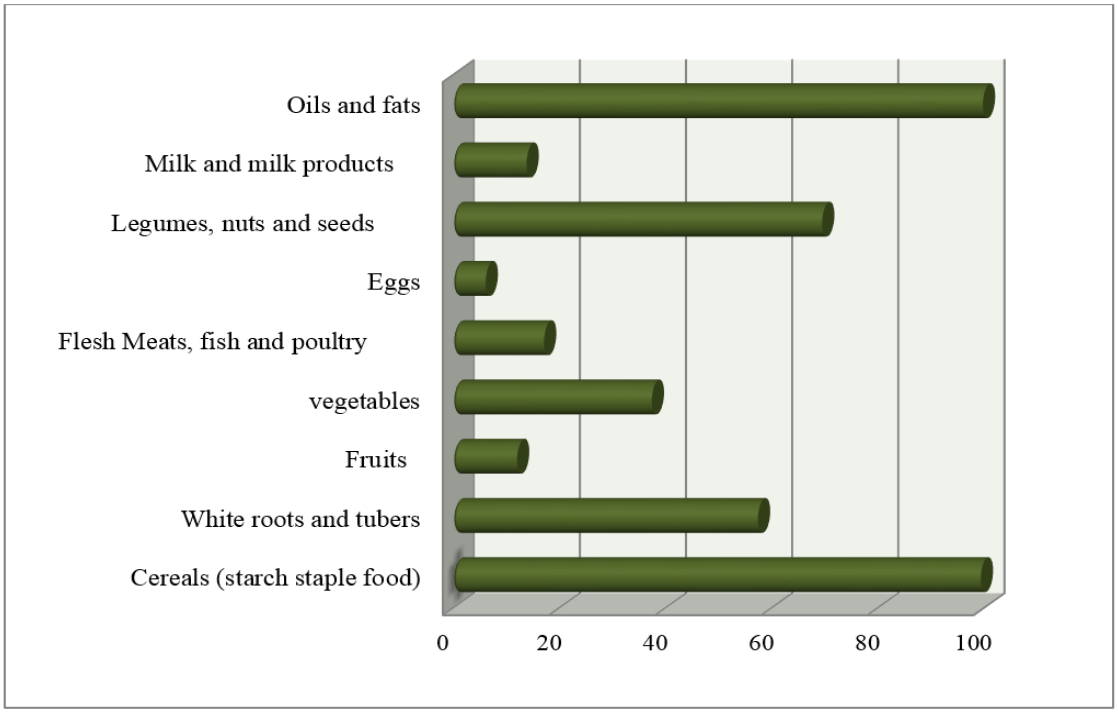

Figure 2: Types of Food Groups Consumed among Adolescent Girls in Hawassa City, Southern Ethiopia

Anthropometric Measurements of Respondents

The categorization of thinness or wasting indicates that 4.8% of individuals were severely thin, 18.1% were moderately thin, 67.2% had an average weight, 7.4% were overweight, and 2.6% were classified as obese.

Table 3: Anthropometry Status of Respondents in Hawassa City, Southern Ethiopia

Characteristics	Category	Frequency (n)	Percent (%)
BMI for age (thinness)			
	Severely thin	13	4.8
	Moderately thin	49	18.1
	Normal	182	67.2
	Overweight	20	7.4
	Obesity	7	2.6

Prevalence of Thinness

Out of the entire sample size examined, 22.9% were determined to be experiencing thinness (wasted), indicating a BMI for age below -2 standard deviations (SD), while 77.1% were classified as non-thin. (Fig 3)

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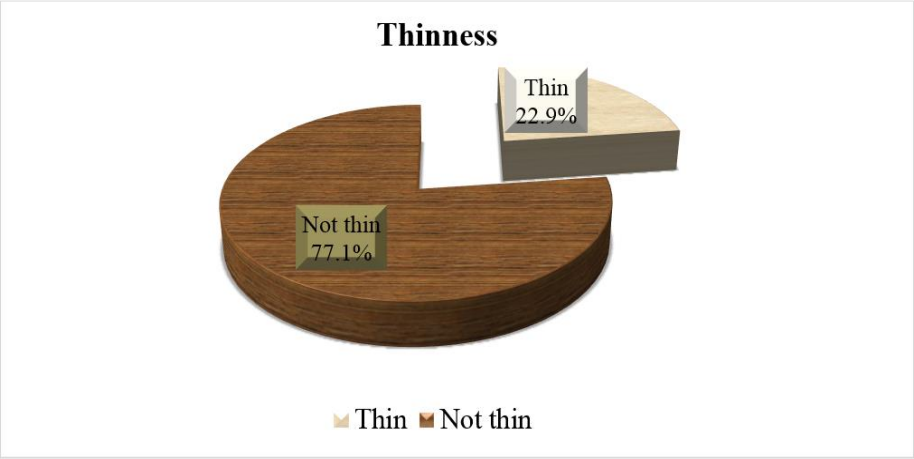

Figure 3: Thinness Prevalence among Adolescent Girls in Hawassa City, Southern Ethiopia

Factors Associated with Thinness

After looking at the effects of confounders, the final multivariable binary logistic regression analysis found that early age (AOR = 2.99, 95% CI: 1.36–6.58), family size (AOR = 2.36, 95% CI: 1.23–4.52), and income (AOR = 2.71, 95% CI: 1.06–6.93) were the most critical factors for being thin. The odds of thinness were significantly higher among adolescents in early adolescence, large family sizes, and less than 5000-birr family monthly income than their counterparts. (Table 4)

Table 4: Bivariate and Multivariate Analyses Showing Factors Associated with Thinness among Adolescent Girls in Hawassa City, Southern Ethiopia

Characteristics	Thinness		Crude OR (95% CI)	Adjusted OR (95%CI)
	Yes (%)	No (%)		
Age				
10-14	22 (25.9)	63 (74.1)	2.24 (1.12-4.46)	2.99 (1.36-6.58) *
15-19	40 (21.5)	146 (78.5)	1	1
Dietary diversity score				
Low (<4)	21 (35.6)	38 (64.4)	0.79 (0.28-2.23)	0.82 (0.26-2.62)
Medium (4-5)	34 (18)	155 (82)	1.99 (0.76-5.22)	1.98 (0.68-5.77)
High (6-9)	7 (30.4)	16 (69.6)	1	1
Family size				
1-5	29 (24.2)	91 (75.8)	1	1
>5	33 (21.8)	118 (78.2)	2.68 (1.49-4.81)	2.36 (1.23-4.52) *
After a meal, coffee consumption				
Always	8 (22.9)	27 (77.1)	1.27 (0.53-3.08)	1.80 (0.63-5.16)
Sometimes	5 (10.9)	41 (89.1)	3.10 (1.13-8.49)	2.33 (0.76-7.11)
Rarely	15 (22.7)	51 (77.3)	1.28 (0.64-2.58)	1.39 (0.63-3.05)
Not at all	34 (27.4)	90 (72.6)	1	1
Income				
<5000	32 (20.4)	125 (79.6)	2.60 (1.14-5.96)	2.71 (1.06-6.93) *
5000-10000	18 (21.4)	66 (78.6)	2.44 (0.99-5.99)	2.12 (0.77-5.85)

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>10000	12 (40)	18 (60)	1	1
Meat consumption frequency				
Once or twice a week	27 (28.7)	67 (71.3)	1	1
Once or twice per month	22 (22)	78 (78)	1.43 (0.74-2.74)	1.44 (0.69-3.02)
Occasionally	13 (16.9)	64 (83.1)	1.98 (0.94-4.18)	2.13 (0.91-4.95)
Fruit consumption frequency				
Every day	13 (25)	39 (75)	1	1
Once or twice a week	21 (17.5)	99 (82.5)	1.57 (0.71-3.44)	1.64 (0.67-4.01)
Once or twice per month	8 (21.6)	29 (78.4)	1.21 (0.44-3.29)	1.11(0.34-3.64)
Rarely	20 (32.3)	42 (67.7)	0.70 (0.31-1.59)	0.63 (0.23-1.71)
Egg consumption frequency				
Every day	5 (20.8)	19 (79.2)	1	1
Once or twice a week	15 (17)	73 (83)	1.28 (0.41-3.97)	1.13 (0.30-4.18)
Once or twice per month	12 (23.5)	39 (76.5)	0.85 (0.26-2.78)	0.56 (0.13-2.39)
Rarely	22 (24.7)	67 (75.3)	0.80 (0.27-2.40)	0.80 (0.22-2.84)
Not at all	8 (42.1)	11 (57.9)	0.36 (0.95-1.38)	0.31 (0.07-1.46)

DISCUSSION

Nutrition-related concerns have been identified as significant public health issues in Ethiopia. Several studies have been conducted to determine the extent and consequences of malnutrition across different age groups. Adolescents are particularly vulnerable to inadequate attention to their dietary needs. As a result, ensuring that their nutritional requirements are met becomes crucial.

The study found that 22.9% of adolescent girls were affected by thinness (95% CI: 18.1–28.0%). The finding was similar to the survey conducted in the Somali Region, Ethiopia, which was 22.9% (17). Likewise aligned with previous research including Wukro town 21.6%, Tigray Ethiopia. (18) Jimma 25.3%, Southwest Ethiopia (19). Adama City, 21.3% Central Ethiopia. (13) Babile district, 21.6% Eastern Ethiopia (2).

Another study conducted in rural Bangladesh found a 26% prevalence (20).

However, this finding was lower than the study done in Wayu Tuqa district, which was 33% in Southwest Ethiopia (21). Mekelle City 37.8%, Northern Ethiopia (22). Debre Tabor town, North-Central Ethiopia 32.4 (23). Much lower than the study conducted in Tigray, 58.3% of Northern Ethiopia (24). Another high prevalence was found in Eastern Sudan at 38.3% (25).

Studies were done in different places in India, like Karnataka 50.1% (26), Raipur City Chhattisgarh 53.8% (27), Kolar District 54.79% (28), and 59% in rural communities in Bangladesh (29). The observed variations can be attributed to disparities in the composition of the study cohort and discrepancies in the urban-rural divide among the participants and locations under investigation.

On the contrary, compared with other studies, the present figure is higher than the study conducted in Afar, 15.8% in northeastern Ethiopia (30). In Goba town, 11.9% of Southeast Ethiopia (31). Gondar, 12.9% Northwest Ethiopia (32). 8.8% Awash Town, Afar Region, Ethiopia (33). Amhara region: 13.6% Northwest Ethiopia (16). 19.5% of Sodo town,

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Ethiopia (34). 14.8% Oromia region, Eastern Ethiopia (35). Prevalence of 13.3% in urban Dhaka City, Bangladesh (36). A study in western Kenya found a 15.6% prevalence (37). The observed variation may be attributed to socioeconomic and cultural disparities in food availability, environmental conditions, nutritional knowledge, eating patterns, and community caregiving practices.

Based on this study, early adolescent girls had about three times greater chances of being thin than late adolescents. This conclusion is aligned with findings from local studies in Wukro in the Tigray Region (18). Wolaita and Hadiya zones of Southern Ethiopia (38). Finote Selam Town (12). Goba Town Southeast, Ethiopia (31). Afar, northeastern Ethiopia (30), Systematic review and meta-analysis conducted in Ethiopia (39).

A similar result was also found in Telangana, India (40). This could be because early adolescence has faster growth and reproductive development than late adolescence, which raises energy and nutrient requirements and, thus, the demand for quality meals. If the criterion for meeting their maximal requirements for growth and development is not met, they are at risk of becoming underweight.

The current study also indicates that the likelihood of thinness was approximately 2.36 times greater among adolescent girls from a family of more than five than those with fewer than five family members. This figure resembled the local study in Southern Ethiopia's Wolaita and Hadiya zones (38), East Wollega (41), Systematic review and meta-analysis conducted in Ethiopia (39), and Mieso Woreda, Somali Region (17). One possible explanation for this phenomenon is that large families have a greater tendency to divide their meals among themselves, which reduces the total quantity of high-quality food available. Adolescent girls with less than 5,000 Birr family monthly income had approximately 2.71 times greater likelihood of being thin than those who had more than 5,000. This finding was consistent with research conducted in Southern Ethiopia's Wolaita and Hadiya zones (38), Finote Selam, town Northwest Ethiopia (12), and Mieso Woreda, Somali Region (17). Similar results were found in a study in Zambia (42). This phenomenon could be attributed to the limited monthly income of the household, which subsequently impacts their purchasing power and results in the consumption of food that is of suboptimal quantity and quality. An improved socioeconomic situation in the home will positively impact the nutritional well-being of teenagers.

CONCLUSION

According to the study, 22.9% of school-going adolescent girls in Hawassa City were classified as thin. Additionally, 7.4% were classified as overweight, and 2.6% were classified as obese. The study also found a significant association between being in the early teenage age group, belonging to a family with more than five members, and having an estimated monthly income of less than five thousand Ethiopian Birr and the occurrence of thinness. Based on these findings, it is crucial to establish a collaborative effort between the health and education sectors to address the issue of adolescent undernutrition in the city. The study suggests providing nutrition-focused education and evaluations targeting teenage girls in school and community settings.

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