The Prevalence of Underweight and Overweight and the Influential Factors in the Adolescent Students in Finote Selam Town in Amhara Region, Ethiopia

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A R T I C L E I N F O	A B S T R A C T
Article type: Research Paper	**Introduction:** Adolescence is the transition from childhood to adulthood, which occurs within the age range of 10-19 years. The present study aimed to assess the nutritional status and influential factors in the adolescent students of Finote Selam town in Ethiopia in 2018.
	Methods: This school-based, cross-sectional study was conducted on 437 adolescent students, who were selected via stratified simple random sampling. Data analysis was performed in the EPI Info version 7 and SPSS version 20 using binary logistic regression to identify the influential factors in the underweight students. In addition, crude and adjusted odds ratios with 95% significance level were used to measure the strength of the associations, and statistical significance was considered at the P-value of less than 0.05.
	Results: The total prevalence of underweight, normal weight, and overweight in the adolescent students in Finote Selam town was 46.2%, 51.0%, and 2.7%, respectively. Significant associations were observed between underweight and the male gender, living in rural areas, having illiterate fathers and uneducated mothers, and the family size of larger than or equal to five (P<0.05).
	Conclusion: According to the results, underweight was the most prevalent issue in the study area. The most influential factors in this regard were gender, place of residence, parental education level, family size, and occupation status of the father. Therefore, the impact of these factors should be further investigated to develop strategies for the reduction of malnutrition in Finote Selam town.

Introduction

Adolescence is a decisive period of development as it represents the transition from childhood to adulthood, occurring within the age range of 10-19 years (1). During this crucial period, dietary patterns have a vital impact on lifetime nutritional status and health (2). Increased nutritional needs at this life juncture are due to the fact that adolescents gain up to 50% of their adult weight, more than 20% of their adult height, and 50% of their adult skeletal mass during this period. However, adolescents are faced with a series of severe nutritional challenges, which may affect the rapid growth spurt and their health as adults (3). Adolescents are considered to be the best human resources, yet for many years, their health has been compromised as they have been considered to be less susceptible to diseases compared to younger children or the elderly. Adolescent health attracted global attention only in the past decade. The assessment of the nutritional status of adolescent girls has been the latest explored area of research in the world (4-7).

Poor nutritional status during adolescence is an important determinant of health outcomes. Adolescents have various needs and diverse problems. Chronic energy deficiency in adolescents leads to short stature and lean body mass and is also associated with deficiencies in the muscle strength and working capacities (8). In females, short stature persisting into adulthood increases the risk of adverse reproductive outcomes. In many Western countries, children and adolescents seem to increasingly adopt lifestyles that adversely affect

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their nutritional and health status, substantially increasing the risk of the premature development of chronic diseases, such as cardiovascular diseases, metabolic syndrome, osteoporosis, and some cancers (9). Poor dietary habits, sedentary leisure time, and lack of physical activity are among the lifestyle patterns that once instilled, have a strong tendency to track from childhood into adulthood and become extremely resistant to modification (10).

Several studies have indicated that the educational achievement of parents is associated with the nutritional status of the children. The educational attainment of parents results in the higher income of the family, implying the higher availability of various foods and household resources (11). On the other hand, it might be positively associated with higher nutritional awareness, as well as better child care. Furthermore, maternal education level has been positively associated with the body mass index (BMI) of adolescents, which could be explained through the assumption that maternal education is also an income determinant in families. Mothers are also responsible for shopping and cooking, and their education level affects the purchased food items and methods of cooking (12).

Data is scarce regarding the nutritional status of adolescents in Ethiopia. A study conducted in Addis Ababa (the capital of Ethiopia) on the elementary school children to investigate child and adolescent obesity indicated that the total prevalence of underweight, overweight, and obesity was 13.0%, 7.6%, and 0.9%, respectively (13). In the mentioned study, the prevalence of underweight, overweight, and obesity in the female students was reported to be 9.0%, 9.4%, and 0.8%, respectively, while it was estimated at 18.1%, 5.4%, and 1.1% in the males, respectively. In addition, the prevalence of adolescent obesity was 0.9% (95% CI: 0.027-1.53%), and the gender-specific prevalence was slightly higher in the proportion of obesity in the boys (1.1%) compared to the girls (0.8%) (14).

Another study conducted in the elementary and secondary schools of Ambo town in Ethiopia showed the prevalence of obesity, overweight, normal weight, and underweight to be 1.7%, 2.6%, 68.2%, and 27.5%, respectively (15). In the mentioned research, the prevalence of obesity, overweight, normal weight, and underweight in

the females was reported to be 1.1%, 3.8%, 70.5%, and 24.6%, respectively (16).

To date, no studies have been focused on the nutritional status of the adolescent students in Finote Selam town. The present study aimed to assess the nutritional status and the influential factors in the adolescent students in Finote Selam town, Ethiopia.

Materials and Methods

Study Design and Setting
This school-based, cross-sectional study was conducted on the adolescent students aged 10-19 years in public primary and secondary schools during February 5-March 27, 2018 in Finote Selam town, Ethiopia. Finote Selam town has six primary schools, one high school, one preparatory school, and five colleges, and the total number of the students in grades 5-12 is 12,289 (17).

Source and Sample Population
All the adolescent students (10-19) of the schools in Finote Selam town were considered as the source population, and the randomly selected adolescent students of the schools (10-19) were considered as the sample population.

Sample Size and Sampling Procedure
The minimum sample size required for the study was calculated using a single proportion formula. The proportion of the female underweight adolescent students in Adama city in central Ethiopia has been reported to be 21.3% (18) at 95% confidence interval (CI) and 4% margin of error, with an added 10% as a contingency for the non-response rate.

$$n = \left(\frac{z}{d}\right)^2 xP(1-p) \quad (19)$$

In the formula above, *n* shows the sample size, *Z* represents the Z score at 95% CI of 1.96 and P-value of 21.3%, and *d* is the marginal error (0.04).

$$n = \frac{(1.96)^2 * 0.213(1-0.213)}{(0.04)^2} = \frac{3.8416 * 0.213*0.787}{(0.04)^2} = 403$$

By adding 10% of the non-response rate, the minimum sample size required to estimate the prevalence of stunting and the influential factors among the adolescent students was calculated to be 403+10% (403+41)=444.

To obtain the sample size, the stratified random sampling technique was used. To this end, the schools were stratified into primary schools, junior high schools, high schools, and preparatory schools. Three primary schools (Bata, Bakel, and Efrata) and three junior high schools (Edgetber, Bata, and Bakel) were selected via simple random sampling from six primary schools and six junior high schools, respectively. On the other hand, one high school (Finote Selam Secondary School) and one preparatory school (Damot Preparatory School) were selected purposively since Finote Selam town has one high school and one preparatory school. The total sample size was distributed proportionally to the schools. The sampling frame was the identification number of the students as recorded in the respective schools, and the number of the students to be enrolled in the study was determined via simple random sampling (Figure 1).
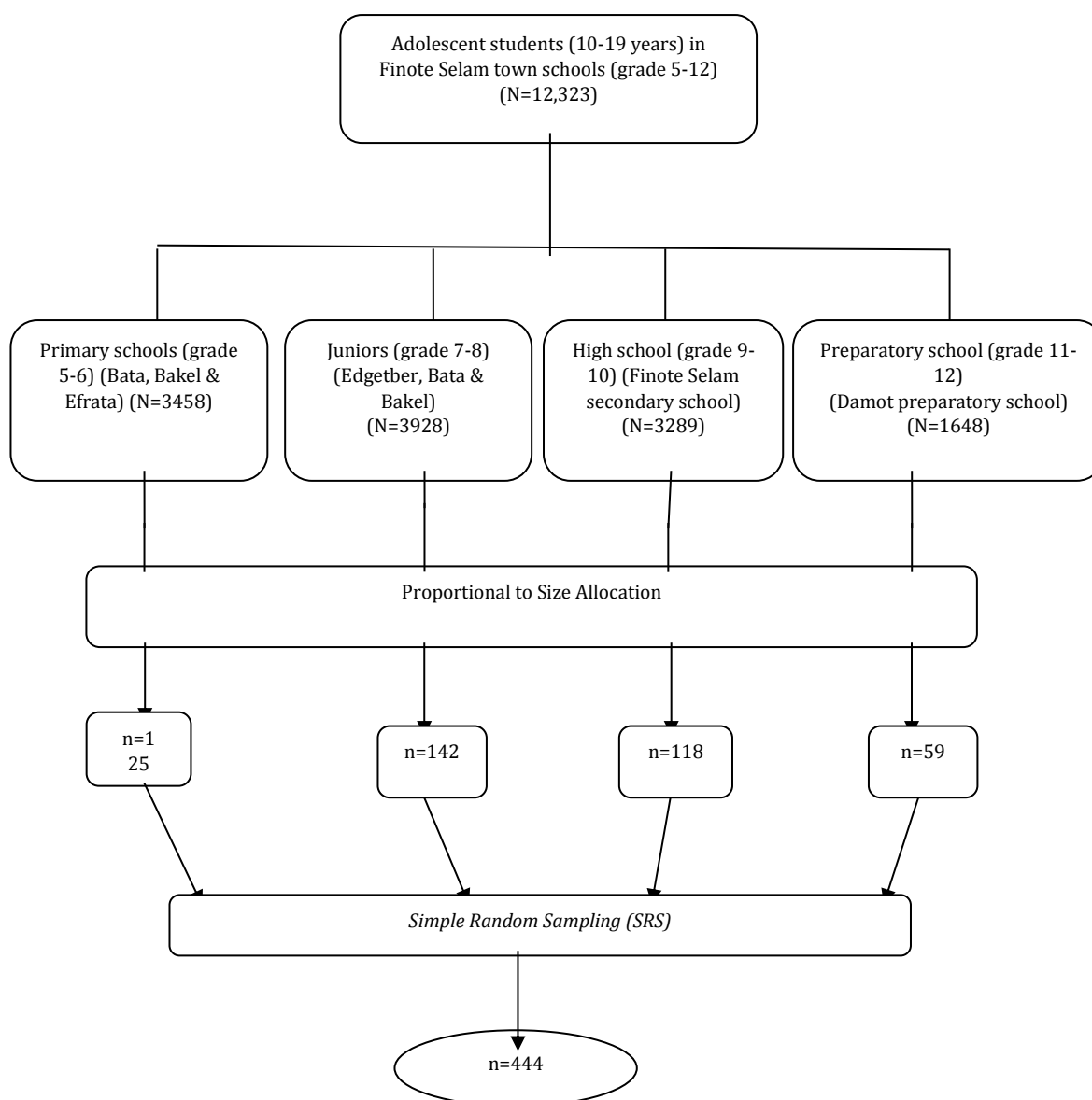

Figure 1. Schematic Presentation of Sampling Procedures

Data Collection

To generate the dataset used in the study, pre-tested structured questionnaires were used for data collection by trained data collectors. These standardized interview questionnaires were adopted and modified based on relevant articles to collect the socio-demographic, nutritional, and health-related data of the subjects (18, 20-23). Each student was interviewed separately for data collection. The recorded parameters were height and weight, and the anthropometric data were collected by trained data collectors who were health extension workers; notably, the procedure was entirely coordinated by the investigators. The height of the adolescent students was measured without shoes in centimeters with an accepted error of 0.1 centimeter. To do so, the adolescent students stood against the wall without footwear, with their head and eyes positioned straight ahead (Frankfurt plane), so that the sightline would be perpendicular to the body. The same measurer was employed in the other anthropometric measurements to avoid variability.

Data Quality Control and Management

To ensure the reliability and validity of the study, training was provided to the data collectors, and data collection was performed by two health extension workers. Moreover, a close follow-up was carried out by the investigator during data collection. The Amharic version of the questionnaire was also tested on 5% of the students of Selamamba Primary School, who were not enrolled in the study, but had similar characteristics with the participants. The data collectors and investigators participated in the pre-testing and standardization of the questionnaires, and the problems highlighted during the preliminary assessment were corrected prior to the actual survey. Each question was properly coded, and continuous supervision was performed during the pretest and data collection processes by the investigator. Furthermore, the completeness and consistency of the recorded data in the questionnaire sheets were evaluated by the investigator at the end of each working day, so that the required corrective measures would be taken the next time.

Statistical Analyses

The socio-demographic, anthropometric, nutritional, and health-related data of the subjects were analyzed in EPI Info version7 and assessed in terms of completeness and consistency, followed by data cleaning and editing in the EPI Info software. Following that, data analysis was performed in SPSS version 20 using descriptive statistics (frequency and proportion) to express the results.

BMI was calculated by dividing weight (kg) by height (m2). Accordingly, underweight, normal weight, and overweight were defined with the BMI of <18.50, 18.50-24.99, and 25.00-29.99 kg/m2, respectively (23). Chi-square and odds ratio (OR) with 95% CI were used to evaluate the strength of the associations between the outcome variable (nutrition status) and independent variables. In addition, bivariate and multivariate binary logistic regression was applied to determine the associations between the dependent variable and independent variables with 95% CI, and the covariates with the P-value of less than 0.25 were retained and analyzed via multivariable logistic regression (24). The P-value of less than 0.05 was considered as the cutoff point for an independent variable to be significantly associated with the outcomes.

Results

Socio-demographic Characteristics of the Participants and Their Families In total, 444 adolescent students were selected as the sample population, and with the response rate of 98.4%, 437 students were enrolled in the study. Out of 437 respondents who were selected for the study, 47 cases (10.8%) were in their early adolescence, 151 (34.6%) were in their mid-adolescence, and 239 (54.7.6%) were in their late adolescence. The male students constituted 257 of the sample population (58.8%), and the females constituted 180 (41.2%). Among the participants, 108 cases (24.7%) were from the primary schools, 132 cases (30.2%) were from the junior high schools, 130 cases (29.7%) were from the high schools, and the others (n=67; 15.3%) attended the preparatory school. In total, 220 students (50.3%) were from urban areas, while 217 cases (49.7%) were from rural areas. The family size of 207 (47.4%) and 230 students (52.6%) was <5 and >5, respectively (Table 1).

Table 1. Sociodemographic Characteristics of Adolescent Students in Finote Selam Town, Amhara Region, Ethiopia (2018)

Variables	Frequency	Percentage
Age Group (year)		
Early Adolescence (10-13)	47	10.8
Mid-adolescence (14-16)	151	34.6
Late Adolescence (17-19)	239	54.7
Gender		
Female	180	41.2
Male	257	58.8
Grade		
5-6	108	24.7
7-8	132	30.2
9-10	130	29.7
11-12	67	15.3
Religion		
Muslim	24	5.5
Orthodox	413	94.5
Place of Residence		
Urban	220	50.3
Rural	217	49.7
Education Level of Father		
Illiterate	96	22.0
Basic	116	26.5
Primary School (1-8)	48	11.0
Secondary School (9-12)	105	24.0
College (or higher)	72	16.5
Education Level of Mother		
Illiterate	103	23.6
Basic	124	28.4
Primary School (1-8)	44	10.1
Secondary School (9-12)	102	23.3
College (or higher)	64	14.6
Occupation Status of Father		
Daily Laborer	59	13.5
Farmer	136	31.1
Merchant	97	22.2
Government/NongovernmentEmployee	145	33.2
Occupation Status of Mother	5	1.1
Daily Laborer	94	21.5
Housewife	127	29.1
Merchant	119	27.2
Farmer	92	21.1
Government/nongovernment Employee	5	1.1
Family Size		
<5	207	47.4
≥5	230	52.6
Source of Drinking Water		
Spring Water	205	46.9
Well Water	114	26.1
Public Tap Water	30	6.9
Tap Water	88	20.1
Presence of Functional Latrine		
Yes	157	35.9
No	280	64.1

Nutritional and Health-related Characteristics of the School Adolescents The majority of the adolescents (n=303; 69.3%) consumed meals three or more times per day, while 134 adolescents (30.7%) consumed meals twice per day. Among the respondents, 68.2% reported illness within the past month. In addition, 233 subjects (53.3%) had a home garden and consumed vegetables (53.3%) and fruits (47.8%) daily (Table 2).

Table 2. Nutritional and Health-related Characteristics of School Adolescents in Finote Selam Town, Amhara region, Ethiopia (2018)

Variables	Frequency	Percentage
Number of Meals per Day		
2	134	30.7
≥3	303	69.3
Illness Reported in Past Month		
Yes	298	68.2
No	139	31.8
Home Garden		
Yes	233	53.3
No	204	46.7
Eat Vegetables at Least Once per Day		
Yes	233	53.3
No	204	46.7
Eat Fruits At Least Once Per Day		
Yes	209	47.8
No	228	52.2
Eat Farm Animal Products At least Once per Week		
Yes	319	73.0
No	118	27.0
Nutritional and Health Information		
Yes	377	86.3
No	60	13.7

Anthropometric Measurements

The minimum and maximum height of the students was 127.50 and 186.70 centimeters, respectively, and the mean total height of the participants was 158±10.67 centimeters. The minimum and maximum weight of the students was 20.5 and 68 kilograms, respectively, and the mean total weight of the participants was 45.99±10.09 kilograms. The mean height of the male and female students was 158.99±12.24 and 156.31±6.94 centimeters, respectively. The mean weight of the male and female students was 45.1±10.97 and 47.53±8.17 kilograms, respectively. The mean age of the participants was 15.54+2.41 years. Underweight, normal weight, and overweight were observed in 202 cases (46.2%), 223 cases (51.1%), and 12 cases (2.7%), respectively.

Factors Associated with the Nutritional Status of the School Adolescents

The results of Chi-square indicated that age, gender, grade, source of drinking water (P<0.0001), occupation status of the father, family size (P=0.003), occupation status of the mother (P=0.01), presence of functional latrine (P=0.024), and the number of the consumed meals per day (P=0.044) were associated with nutritional status (Table 3).

Table 3. Chi-square Analysis of Factors Associated with Nutritional Status in Adolescent School Students in Finote Selam Town, Amhara Region, Ethiopia (2018)

Variables	Nutritional Status by BMI (kg/m²)			X²	P-value
	Underweight N (%)	**Normal Weight N (%)**	**Overweight N (%)**		
Age Group					
Early Adolescent (10-13 years)	40 (85.1)	5 (10.6)	2 (4.3)	65.41	0.000
Mid-adolescent (14-16 years)	89 (58.9)	58 (38.5)	4 (2.6)		
Late Adolescent (17-19 years)	73 (30.5)	160 (66.9)	6 (2.6)		
Gender					
Female	48 (26.7)	124 (68.9)	8 (4.4)		0.000
Male	154 (59.9)	99 (38.5)	4 (1.6)	47.67	
Grade					
5-6	79 (73.1)	27 (25.0)	2 (1.9)	89.87	0.000
7-8	78 (59.1)	48 (36.4)	6 (4.5)		
9-10	30 (23.1)	98 (75.4)	2 (1.5)		
11-12	15 (22.4)	50 (74.6)	2 (3.0)		
Religion					
Muslim	12 (50.0)	10 (41.7)	2 (8.3)	3.40	0.146
Orthodox	190 (46.0)	213 (51.6)	10 (2.4)		
Place of Residence					
Urban	97 (44.1)	115 (52.3)	8 (3.6)	1.85	1.849

Variables	Nutritional Status by BMI (kg/m²)				
Rural	105 (48.4)	108 (49.8)	4 (1.8)		
Education Level of Father					
Illiterate	36 (50.0)	32 (44.4)	4 (5.6)	14.52	0.069
Basic	27 (56.2)	19 (39.6)	2 (4.2)		
Primary School (1-8)	51 (53.1)	45 (46.9)	0 (0.0)		
Secondary School (9-12)	49 (42.2)	65 (56.0)	2 (1.7)		
College (or higher)	39 (37.1)	62 (59.0)	4 (3.8)		
Education Level of Mother					
Illiterate	25 (56.8)	19 (43.2)	0 (0.0)	14.05	0.080
Basic	32 (50.0)	28 (43.8)	4 (6.2)		
Primary School (1-8)	54 (52.4)	49 (47.6)	0 (0.0)		
Secondary School (9-12)	51 (41.1)	69 (55.6)	4 (3.2)		
College (or higher)	40 (39.2)	58 (56.9)	4 (3.9)		
Occupation Status of Father					
Daily Laborer	39 (66.1)	20 (33.9)	0 (0.0)	20.16	0.003
Farmer	65 (47.8)	67 (49.3)	4 (2.9)		
Merchant	40 (41.2)	57 (58.8)	0 (0.0)		
Government/non government Employee	58 (40.0)	79 (54.5)	8 (5.5)		
Occupation Status of Mother					
Daily Laborer	3 (60.0)	2 (40.0)	0 (0.0)	21.87	0.010
Farmer	52 (55.3)	36 (38.3)	6 (6.4)		
Housewife	47 (37.0)	80 (63.0)	0 (0.0)		
Merchant	53 (44.5)	64 (53.8)	2 (1.7)		
Government/non government Employee	47 (51.1)	41 (44.6)	4 (4.3)		
Family Size					
<5	80 (38.6)	123 (59.4)	4 (1.9)	11.26	0.003
≥5	122 (53.0)	100 (43.5)	8 (3.5)		
Source of Drinking Water					
Well Water	52 (59.1)	36 (40.9)	0 (0.0)	27.81	0.000
Spring Water	103 (50.2)	92 (44.9)	10 (4.9)		
Public Tap Water	40 (35.1)	72 (63.2)	2 (1.8)		
Tap Water	7 (23.3)	23 (76.7)	0 (0.0)		
Presence of Functional Latrine					
Yes	131 (46.8)	137 (48.9)	12 (4.3)	7.46	0.024
No	71 (45.2)	86 (54.8)	0 (0.0)		
Number of Meals per Day					
2	152 (50.2)	143 (47.2)	8 (2.6)	6.21	0.044
≥3	50 (37.3)	80 (59.7)	4 (3.0)		
Illness Reported in Past Month					
Yes	71 (51.1)	62 (44.6)	6 (4.3)	4.52	0.104
No	131 (44.0)	161 (54.0)	6 (2.0)		
Home Garden					
Yes	143 (44.1)	173 (53.4)	8 (2.5)	2.91	0.230
No	59 (52.2)	50 (44.2)	4 (3.5)		
Eat Vegetables at Least Once per Day					
Yes	82 (40.2)	116 (56.9)	6 (2.9)	5.61	0.058
No	120 (51.5)	107 (45.9)	6 (2.6)		
Eat Fruits at Least Once per Day					
Yes	95 (41.7)	125 (54.8)	8 (3.5)	4.50	0.105
No	107 (51.2)	98 (46.9)	4 (1.9)		
Eat Farm Animal Products At least Once per Week					
Yes	52 (44.1)	60 (50.8)	6 (5.1)	3.38	0.187
No	150 (47.0)	163 (51.1)	6 (1.9)		
Nutritional and Health Information					
Yes	26 (43.3)	34 (56.7)	0 (0.0)	2.47	0.272
No	176 (46.7)	189 (50.1)	12 (3.2)		

Factors Associated with the Underweight School Adolescents

According to the multivariable logistic regression analysis, the factors of gender, place of residence, education level of the father and mother, family size, number of the meals per day, and illness reported in the past one month were significantly associated with being underweight.

According to the findings, the OR of nutritional status was 1.64 times higher in the adolescent students in their early adolescent stage compared to those in the late adolescent stage (AOR=1.64; 95% CI: 0.87-3.08). Furthermore, the OR of the male adolescent students was 1.58 times higher in terms of being underweight (AOR=1.58; 95% CI: 1.04-2.39) compared to the female adolescent students. The OR of underweight was also 1.68 times higher in the adolescent students living in rural areas compared to those living in urban areas (AOR=1.68; 95% CI: 1.22-2.47). The adolescent students with illiterate fathers were more likely to become underweight compared to those whose fathers had college (or higher) education levels (AOR=2.54, 95% CI: 1.16-4.81). Similarly,

the adolescents with uneducated mothers were more likely to become underweight compared to those whose mothers had college (or higher) education levels (AOR=2.84; 95% CI: 1.02-7.94). The adolescent students whose family size was ≥5 were 1.58 times more likely to become underweight compared to those with the family size of <5 (AOR=1.58; 95% CI: 1.06-2.48). In addition, the adolescent students who consumed less than three meals per day were 1.67 times more likely to become underweight compared to those who consumed three or more meals per day. Furthermore, the risk of underweight was 1.62 times higher in the adolescent students with illnesses within the past one month compared to those who were apparently healthy (Table 4).

Table 4. Bivariate and Multivariable Logistic Regression of Factors Associated with Underweight in Adolescent School Students in Finote Selam Town, Amhara Region, Ethiopia (2018)

Variables	Underweight		COR (95% CI)	AOR (95% CI)
	Yes N (%)	No N (%)		
Age Group				
Early Adolescent (10-13 years)	40 (85.1)	7 (14.9)	3.06 (1.68-5.67)	1.64 (0.87-3.08)
Mid-adolescent (14-16 years)	89 (58.9)	62 (41.1)	1.73 (1.12-2.71)	1.23 (0.59-2.54)
Late Adolescent (17-19 years)	73 (30.5)	166 (69.5)	1	1
Gender				
Female	48 (26.7)	132 (73.3)	1	1
Male	154 (59.9)	103 (40.1)	2.43 (1.42-4.06)	1.58 (1.04-2.39)*
Grade				
5-6	79 (73.1)	29 (26.9)	1.97 (1.19-3.25)	1.79 (0.85-3.67)
7-8	78 (59.1)	54 (40.9)	1.38 (0.76-2.48)	1.11 (0.63-1.97)
9-10	30 (23.1)	100 (76.9)	1.28 (0.62-2.74)	0.82 (0.33-2.03)
11-12	15 (22.4)	52 (77.6)	1	1
Religion				
Muslim	12 (50.0)	12 (50.0)	1.05 (0.31-1.73)	0.92 (0.53-1.76)
Orthodox	190 (46.0)	223 (54.0)	1	1
Place of Residence				
Urban	97 (44.1)	123 (55.9)	1	1
Rural	105 (48.4)	112 (51.6)	2.12 (1.30-3.42)	1.68 (1.22-2.47)*
Education Level of Father				
Illiterate	51 (53.1)	45 (46.9)	2.84 (0.78-11.72)	2.54 (1.16-4.81)*
Basic	27 (56.2)	21 (43.8)	1.61 (0.44-5.91)	1.78 (0.76-3.86)
Primary School (1-8)	36 (50.0)	36 (50.0)	1.21 (0.23-6.74)	1.53 (0.99-2.36)
Secondary School (9-12)	49 (42.2)	67 (57.8)	1.40 (0.83-2.35)	0.98 (0.16-5.82)
College (or higher)	39 (37.1)	66 (62.9)	1	1
Education Level of Mother				
Illiterate	25 (56.8)	19 (43.2)	2.92 (1.53-5.57)	2.84 (1.02-7.94)*
Basic	54 (52.4)	49 (47.6)	2.39 (1.55-3.68)	2.03 (0.68-5.82)
Primary School (1-8)	32 (50.0)	32 (50.0)	1.86 (1.15-3.00)	2.26 (0.85-6.03)
Secondary School (9-12)	51 (41.1)	73 (58.9)	0.98 (0.47-1.86)	1.60 (0.90-2.84)
College (or higher)	40 (39.2)	62 (60.8)	1	1
Occupation Status of Father				
Daily Laborer	39 (66.1)	20 (33.9)	3.07 (1.67-5.68)	2.85 (1.06-7.98)*
Farmer	65 (47.8)	71 (52.2)	2.63 (1.58-4.33)	2.27 (0.89-6.06)
Merchant	40 (41.2)	57 (58.8)	1.74 (1.12-2.72)	2.03 (0.69-5.83)
Government/non-government Employee	58 (40.0)	87 (60.0)	1	1
Occupation Status of Mother				

Daily Laborer	3 (60.0)	2 (40.0)	1.69 (0.98-2.49)	1.66 (0.56-5.04)
Farmer	52 (55.3)	42 (44.7)	1.15 (0.67-1.96)	0.79 (0.33-2.06)
Housewife	53 (44.5)	66 (55.5)	0.92 (0.55-1.54)	0.64 (0.18-2.22)
Merchant	47 (37.0)	80 (63.0)	0.82 (0.15-4.86)	0.44 (0.16-1.29)
Government/non-government Employee	47(51.1)	45 (48.9)	1	1
Family Size				
<5	80 (38.6)	127 (61.4)	1	1
≥5	122 (53.0)	108 (47.0)	1.73 (1.04-2.81)	1.58 (1.06-2.48)*
Source of Drinking Water				
Well Water	52 (59.1)	36 (40.9)	2.78 (1.23-11.79)	1.73 (0.96-3.14)
Spring Water	103 (50.2)	102 (49.8)	2.37 (1.58-7.23)	1.05 (0.63-1.87)
Public Tap Water	40 (35.1)	74 (64.9)	1.38 (0.60-2.88)	0.83 (0.48-1.44)
Tap Water	7 (23.3)	23 (76.7)	1	1
Presence of Functional Latrine				
Yes	131 (46.8)	149 (53.2)	1	1
No	71 (45.2)	86 (54.8)	0.96 (0.51-1.84)	0.79(0.31-2.06)
Number of Meals per Day				
2	152 (50.2)	151 (49.8)	1.88 (1.25-3.20)	1.67 (1.22-2.48)*
≥3	50 (37.3)	84 (62.7)	1	1
Illness Reported in Past Month			2.92 (2.04-7.57)	1.62 (1.03-2.57)*
Yes	71 (51.1)	68 (48.9)		
No	131 (44.0)	167 (56.0)	1	1
Home Garden				
Yes	143 (44.1)	181 (55.9)	1	1
No	59 (52.2)	54 (47.8)	1.55 (0.98-2.37)	1.28 (0.69-2.56)
Eat Vegetables at Least Once per Day				
Yes	82 (40.2)	122 (59.8)	1	1
No	120 (51.5)	113 (48.5)	1.63 (0.91-2.89)	1.28 (0.89-1.78)
Eat Fruits at Least Once per Day				
Yes	95 (41.7)	133 (58.3)	1	1
No	107 (51.2)	102 (48.8)	1.45 (0.85-2.43)	1.28 (0.86-1.88)
Eat Farm Animal Products At least Once per Week				
Yes	52 (44.1)	66 (55.9)	1	
No	150 (47.0)	169 (53.0)	1.87 (1.05-3.39)	1.25 (0.69-2.56)
Nutritional and Health Information				
Yes	26 (43.3)	34 (56.7)	1	1
No	176 (46.7)	201 (53.3)	1.42 (0.85-2.56)	1.24 (0.98-1.79)

Discussion

In the present study, the prevalence of underweight and overweight and the influential factors were investigated in the adolescent students of Finote Selam town. According to the findings, the prevalence of underweight was 46.2%, which is significantly higher compared to the studies in Chiro town (24.4%) (25), Ambo town (27.5%) (26), and Arba Minch town (19.7%) (27). In the present study, the prevalence of underweight was higher compared to the studies in West Bengali, India (42.2%) (28), Djibouti (31.9%) (29), and Egypt (12.6%). The discrepancy might be due to the differences in the socioeconomic background, sample size, dietary habits, and type of meals.

In the current research, the prevalence of overweight in the participants was 2.7%, which is similar to the study in Chiro town (2.7%) (25) due to the almost similar demographic

conditions. On the other hand, the prevalence of overweight in the present study was higher compared to Mekelle City (2%) (10), while lower than Addis Ababa (8.5%) (30). Furthermore, the prevalence of overweight in the current research was significantly lower compared to Arba Minch town (8.7%) (27), Ghana (8.7%), and Egypt (31.4%) (29), which might be due to the differences in the barriers to under-nutrition, such as cultural differences and other socio-demographic characteristics.

Among the studied factors in the current research, gender, place of residence, education level of the father, education level of the mother, family size, number of the meals per day, occupation status of the father, and illness in the past one month were associated with underweight. The OR of underweight was 1.64 times higher in the early adolescent stage compared to the late adolescent stage, which is

consistent with the results obtained in Chiro town in eastern Ethiopia (25). This might be due to the fact that with increased age, adolescents are likely to access food easily and become more matured. In the present study, the risk of underweight was 1.58 times higher in the male adolescent students compared to the females. This finding is consistent with the studies in Chiro town in eastern Ethiopia (25) and Arba Minch town (27). The difference might be due to the fact that boys are more influenced by environmental stress compared to girls.

In the current research, the risk of underweight was 1.68 times higher in the adolescent students living in rural areas compared to those living in urban areas, which is in line with the study conducted in Gobu Seyo District in East Wollega Zone, Oromia regional state of West Ethiopia (31). The difference might be due to the food preferences, food consumption patterns, and inequalities in dietary diversity between urban and rural areas.

In the present study, the adolescent students with illiterate fathers were more likely to become underweight compared to those whose fathers had college or higher education levels; this is consistent with the studies in Arba Minch town in Ethiopia (27) and Chiro town in eastern Ethiopia (25). Paternal education level might be an essential factor in food security and feeding practices as educated fathers might also have a better income than non-educated fathers. On the other hand, the risk of underweight in the school adolescents whose mothers were illiterate was 2.84 times higher compared to those whose mother had college or higher education levels. This finding is in line with a study conducted in south Ethiopia (27) possibly due to the fact that if the education level of the mother is low, her decision-making and contribution to the total family income may be inadequate.

The risk of being underweight in the school adolescents whose fathers had a daily laborer occupation was 2.85 times higher compared to those whose fathers had a government/non-government job. This is consistent with the finding in Chiro town and west Hararge (25). Having government/non-government jobs might be an essential factor for the family to have a permanent income source for livelihood.

According to the results of the present study, the school adolescents who had meals twice per day were 1.67 more likely to become underweight compared to those who had three meals. The risk

of being underweight in the school adolescents who had reported illnesses in the past one month was 1.62 times higher compared to the others. Furthermore, the adolescent students with the family size of ≥5 were 1.58 times more likely to become underweight compared to those with the family size of <5. This is in line with the studies in Addis Ababa, Ethiopia (32), Arba Minch town, Ethiopia (27), and Osun State, Nigeria (33). The probable reason is that with many children living together in the family, there may be food competition and tendency toward under-nutrition.

Limitations of the Research
The major limitations of the study were the lack of a fund source and the fact that the age of the children obtained from the school records might have been underestimated and there also might have been measurement bias in the anthropometric measurements. Moreover, the study was conducted on school adolescents, and the findings cannot be generalized to the adolescent population.

Conclusion
According to the results, underweight was the major prevalent issue in the study area. Factors such as gender, place of residence, parental education level, family size, number of the meals per day, and illness reported in the past one month largely influenced underweight in the adolescent students. Therefore, the effects of these factors should be considered in the adoption of strategies for the reduction of malnutrition in the town.

Ethical Approval and Consent to Participate
The study protocol was approved by the Ethics Committee of the Faculty of Chemical and Food Engineering at Bahir Dar University (protocol No. 12/2010). Supportive letters were also obtained from Amhara Public Health Institute to the West Gojjam Health Office, Finote Selam Town Administration Health Office, and the target schools. In addition, written informed consent was obtained from the parents or legal guardians after clearly explaining the research objectives.

Conflicts of interest
None declared.

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