

Adolescent Girls Nutritional Status and its Determinants: Prospect to Alarming Rise of Over Nutrition in Southern Ethiopia

Bemnet Moges Gebremariam^{1*}, Tsegaye Gebre Argago², Tadesse Lelago Ermolo², Biruk Assefa Kebede³, Negesso Gebeyhu Gejo³, Million Mohammed Asfaw⁴ and Ritbano Ahmed Abdo^{3*}

¹Department of Public Health, College of Medicine and Health Sciences, Wachemo University, Hosanna, Ethiopia

²Department of Nursing, College of Medicine and Health Sciences, Wachemo University, Hossana, Ethiopia

³Department of Midwifery, College of Medicine and Health Sciences, Wachemo University, Hossana, Ethiopia

⁴Department of Surgery, School of Medicine, College of Medicine and Health Sciences, Wachemo University, Hossana, Ethiopia

*Corresponding Author: Bemnet Moges Gebremariam (PhD), Department of Public Health, College of Medicine and Health Sciences, Wachemo University, Hossana, Ethiopia.

Received: June 11, 2021; Published: August 09, 2021

Abstract

Background: Adolescence is a vulnerable period in human life cycle when nutritional requirements increase due to speedy adolescent growth. Addressing the nutritional status of adolescent girls who are the future mothers brings remarkable opportunity to break the intergenerational cycles of malnutrition and emerging consequences non- communicable disease before reaching for the next.

Methods: A cross-sectional study using a stratified sampling technique was conducted with sample size of 402 adolescent girls. The data was entered and analyzed using SPSS version 20, Stata 14 and WHO's AnthroPlus software was used to generate the height for age z-scores. Bivariate and multivariate logistic regression analysis was performed.

Result: Among adolescent school girls, the prevalence of underweight, overweight, and obesity was 10.2%, 15.7% & 2.0% respectively. About 42.3% of adolescent girls drink Soda and 60.9% used solid vegetable oil to cook food at home. Adolescent girls in governmental schools [AOR=0.52] was less likely and girls in 9th grade [AOR=3.47] and girls consumed fruits 4-7 days in a week [AOR=3.89] were more likely to become underweight. While age of girls 17-19 years [AOR=0.52] & girls spent ≥ 3 hours in sedentary activity in a day [AOR= 0.32] were less likely become overweight.

Conclusion: Over nutrition were alarmingly increasing problem and underweight were medium prevalent among adolescent girls. Hence, there is a need to design and implement adolescent girls' dietary and physical activity guidelines to reduce an alarming rise of over nutrition and the risk of non-communicable disease among adolescent girls who are the near future mothers.

Keywords: Adolescent girls; Nutritional status; Dietary intake; Dietary guidelines

Volume 4 Issue 1 August 2021

© All Copy Rights are Reserved by Bemnet Moges Gebremariam., et al.

Background

Adolescence is a period of gradual transition from childhood to adulthood and it includes persons aged 10-19 as defined by WHO.

Citation: Bemnet Moges Gebremariam., et al. "Adolescent Girls Nutritional Status and its Determinants: Prospect to Alarming Rise of Over Nutrition in Southern Ethiopia". *Nutrition and Food Toxicology* 4.1 (2021): 13-23.

Adolescents account for 1 billion of the world population [1]. Adolescence is a vulnerable period in human life cycle when nutritional requirements increase due to speedy adolescent growth. During this critical period of rapid growth: up to 45% of skeletal growth takes place and 15 to 25% of adult height is achieved and also up to 37% of total bone mass may be accumulated during adolescence [2]. This period is also characterized by major rapid psychological and behavioral changes take place in an individual [3].

Adolescent girls are exposed to Undernutrition, micronutrient malnutrition as well as obesity. Their nutritional deficiencies have far-reaching consequences and if their nutritional needs are not met, they are likely to give birth to undernourished children, thus transcend the cycle of Undernutrition to future generations [4, 5].

Evidence showed that the extremes of overnutrition and undernutrition are oftentimes concurrent problems in adolescent populations. Factors such as poverty lead to poor eating patterns, dietary inadequacies as to the primary underlying cause, frequently coupled with lifestyle factors and health conditions that further compromise nutritional status. Early pregnancy is a major risk factor in adolescence anywhere. Past malnutrition, or low body nutrient stores, are in the background; they may have consequences during adolescence or further increase chronic disease risk later on in adulthood. Determinants of dietary inadequacies are many, and they have been grouped under psycho-social and socioeconomic factors while recognizing that they are intertwined [2, 6].

Improving adolescent girls' nutrition has the following reproduction-related benefits: increased pre-pregnancy weight and body stores of nutrients, thus contributing to improve future pregnancy and lactation outcome, improved iron and folate status with reduced risk of anemia and neural tube defects in pregnancy, low birth weight, maternal morbidity and mortality, and with enhanced work productivity and perhaps linear growth [7]. Provision of strict attention to the nutritional status of adolescent girls, the future mothers brings remarkable opportunity to break the intergenerational cycles of under nutrition before reaching the next. However for many years their health and nutritional needs have been neglected by considering them as less vulnerable to diseases but the recent Lancet nutrition series has underlined the need to focus on adolescent girls [8].

In Ethiopia among adolescent girls aged 15-19 years underweight (thinness), 29.0%, Overweight 3.2% and obesity accounts 0.2% [9]. Although, most studies from Northern, Eastern, and western part of Ethiopia indicates more underweight (thinness) [10-13]. However, a very few evidence from central and southern Ethiopia showed increments in over-nutrition among adolescent girls who are the future mothers [14, 15]. Since there is a paucity of research that addresses whole pictures of malnutrition among adolescent girls the finding of this study will be informative to improve dietary interventions and design healthy eating guidelines for programmers. Therefore, the aim of the study was to assess adolescent girls' nutritional status and its determinants in the high schools of Southern Ethiopia.

Methods and Materials

Study Design, Setting and Period

School-based cross-sectional study design was conducted. The study was conducted in high schools of Hossana province, southern Ethiopia. Hossana is found in the Hadiya zone of the Southern Region of Ethiopia, located 232 km from Addis Ababa and 157 km from Hawassa. The total number of adolescent girls in high schools in the province was 5,630 in the year 2018[16]. The study was conducted from April, 02 to May 30, 2018.

Populations

High school adolescent girl students in Hossana province were the source population of this study and adolescent girls who attended high school who are included in the sample were study populations. All adolescent girls who attend high school present at the time of data collection were included in the study. But, adolescent girls who were seriously ill during the study period were excluded.

Sample Size and Sampling Technique

The sample size was determined using a single population proportion formula assumption of taking: a 95 % confidence interval, marginal of error 5 % ,10 % non-response rate and (p) the Prevalence of thinness in female in high and preparatory school gov't and private in Mekelle city is 14% [17]. The final sample size with a design effect of 2(201) was 402. A stratified sampling the technique was employed to select the required, a total of 5 schools were selected, 2 governmental and 3 private high schools were included using lottery method. To take the exact sample size systematic random sampling was used by taking every kth (2nd-4th) student proportional to the size the adolescent girls in a class.

Definitions of Terms

Thinness: defines BMI-for-age, of which below <-2 SD (BMI value, $<18.5\text{kg/m}^2$)[18, 19]

Overweight: BMI-for-age values between $+1$ SD and $+2$ SD(BMI value, $25.0-29.9\text{kg/m}^2$)[18, 19]

Obesity: BMI-for-age values above $+2$ SD value (BMI value, $\geq 30\text{kg/m}^2$).

Whereas, overweight and or obese BMI-for-age values above $+1$ SD value(BMI value, $\geq 25.0\text{kg/m}^2$)[18, 19]

Data Collection Tools and Procedures

Data was collected by using a pre-tested structured interviewer-administered questionnaire which was adapted from WHO and FAO after reviewing different literatures of similar studies. The data was collected by 6 diploma nurses and two supervisors BSc holders. To ensure the quality of data, a pre-test was done among adolescent girls in high school of Belesa on 10% of the total sample size and necessary modification was made after the pre-test. The training was provided and regular supervision was done to control the quality of the data.

Anthropometric Measurement

Measurement of height was to the nearest 0.1 cm using a Stadiometer (SECA, Hannover, Germany) and weight to the nearest 0.1 kg using digital scales (SECA). Underweight (Thinness), Overweight & Obesity were measured based on BMI and it was computed using WHO Athro-Plus software version 1.0.4.

Data Processing and Analysis

After coding, data was entered and analyzed by using SPSS version 20 and Anthropometric data were analyzed by WHO Anthro-plus software. The descriptive statistic was carried out to compute the different frequency, percentage and different diagrams. To determine the determinants of adolescent girl's nutritional status, binary logistic regressions analysis was performed and the variables ($p \leq 0.2$) found to have an association with the outcome variable was entered into the multivariate analysis which uses to control confounding factors. Finally, the variables which have significant association were identified with 95% CI and p -value < 0.05 to measure the strength of the associations.

Results

Socio-Demographic Characteristics of Adolescent Girls and Parents

A total of 402 adolescent school girls were included in the analysis with a response rate of 100%. The mean age was 17.4 and $SD \pm 1.2$ years. Out of the total respondents, 294(73.4%) were Protestant, 305(75.9%) were Hadiya in the ethnic group and the majority (96.5%) were single. Additional to schooling only 10(2.5%) adolescent girls had an occupation. From the mothers of adolescent girls, Housewife represented 220(54.7%) and 133(33.1%) had above secondary education status. Concerning fathers, 143(35.6%) were government employee and 225(56%) were above secondary in educational level. From the total study participated in adolescent girls, 249(61.9%) were living in households with Low monthly Income, whereas 89(22.1%) were living in households with high monthly Income.

Health Care and Life-Style Related Characteristics of Adolescent Girls in High Schools

Among the adolescents, about 14(3.5%) had history of pregnancy and 8(2.0%) of them got birth. Thirty (7.5%) adolescent girls had

morbidity and regarding behavioral issues, 8(2.0%) and 10(2.5%) of adolescents had currently smoked cigarettes and history of alcohol drinking respectively. Physical activity was one of the main variables of the study, the result of the study indicated Vigorous-intensity activity was performed by 57(14.2%) of adolescent girls and 45(11.2%) performed less than 4 days vigorous-intensity activity in a week and also this activity was practiced by 40(10.0%) for less than 2hours in a day. However moderate-intensity activity was performed by 62(15.4%) of adolescent girls, additionally, this activity was done by 52(12.9%) and 48(11.9%) for less than 4 days in a week and less than 2hours in a day respectively. The majority (75.6%) of adolescents spent less than three hours a day in sedentary activity. Of all adolescents, 152(37.8%) spent 2 and more hours on computers, games and TV watching in a day.

Dietary Intake and Food Choice Characteristics of Adolescent Girls

According to the findings of this study, 245(60.9%) were used Solid vegetable oil and 157(39.1%) were used Liquid vegetable oil to cook their food in their home. Only, 36(9%) of adolescents respond they use butter regularly for cocking food at home. Of the total adolescent girls, 52.5% were consumed fruits from 1-3 days per week and about 148(36.8%) adolescents were consumed fruits 1-3 days in a week. From the total respondents, 262(65.2%) of them were eating snacks between their main meals, and eating snacks one time a day is practiced by the predominant. This study identified not feed during studying accounts 319(79.4%) and 238(59.2%) of adolescents were experienced feeding during watching of TV or films. Soda drink was practiced by 170(42.3%) adolescent girls one to three times in a week and biscuit was purchased by 199(49.5%) adolescent girls from types of foods outside the home (Table 1).

Variables	Frequency	Percent
Types of oil used for cocking food at home		
Liquid vegetable oil	157	39.1
Solid vegetable oil	245	60.9
Butter usage regularly for cocking food at home		
Yes	36	9.0
No	366	91.0
Number of days Fruit consumption in a week		
Not consumed	89	22.1
1-3 days	211	52.5
4-7 days	102	25.4
Number of days Vegetable consumption in a week		
Not consumed	129	32.1
1-3 days	148	36.8
4-7 days	125	31.1
Snack eating history		
Yes	262	65.2
No	140	34.8
Daily number of snack		
Not consumed	147	36.6
1 time a day	230	57.2
2 times a day	25	6.2
Feeding during study time		
Yes	83	20.6
No	319	79.4

Feeding during watching of TV or films		
Yes	238	59.2
No	164	40.8
Number of Soda drunk in a week		
None	182	45.3
1-3 times	170	42.3
4-7times	50	12.4
Types of foods purchased outside home		
Cake	68	16.9
Biscuit	199	49.5
Ice cream	21	5.2
Chocolate	49	12.2

Table 1: Food and dietary characteristics of adolescent girls in high schools of hosanna, Southern Ethiopia, 2019 (n=402)

Prevalence of underweight (thinness), Overweight, and obesity among Adolescent girls

The prevalence of underweight (thinness) was 10.2% [95% CI:7.58,13.58], overweight 15.7% [95% CI:12.42,19.58] and obesity was 2.0% [95%CI:0.99,3.93]. Age group and the nutritional status of adolescent girls Figure 1 and the comparison against the WHO reference population based on WHO AnthroPlus BMI for age analysis shown in Figure 2.

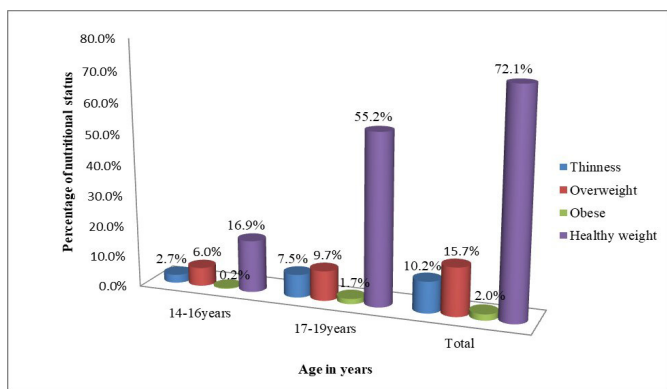


Figure 1: BMI- for-age (BAZ) of the study population in comparison with the 2007 WHO growth reference populations (n=402), 2019.

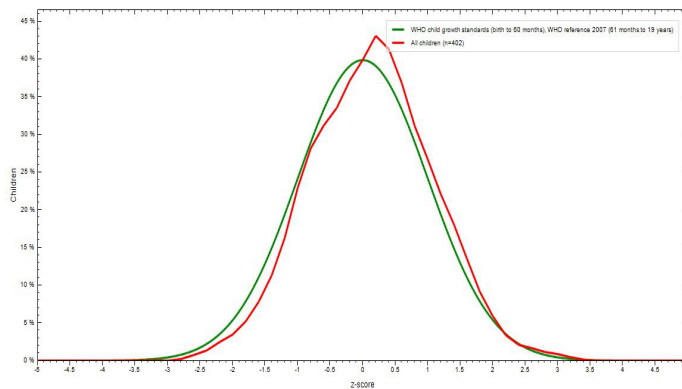


Figure 2: Nutritional status and Age groups of adolescent girls in high schools of Hossana Province, Southern Ethiopia, 2019.

Determinants of Nutritional Status among Adolescent School Girls in Southern Ethiopia

Determinants of Underweight (thinness) Status among Adolescent Girls

Age of girls, grade level, school type, morbidity in the last 2wks, snack eating history, soda drinks per week, and fruit consumption per week were significantly associated with underweight (thinness) in bivariate analyses. Then, grade level, school type, and fruit consumption per week of adolescent girls were identified as significant associated factors with underweight status in the multivariate analysis. School type was one of the significant determinant factors for underweight status in the study area. Adolescent girls who learned in governmental schools were 48% less likely to become underweight (thin) than private school counterpart [AOR=0.52; 95% CI:0.27,0.99].

The analysis also confirmed that the grade level of adolescent girls is one of the significant determinants of underweight status, the

odds of underweight among girls in 9th grade were 3.47 times higher than adolescent girls who are in grade 12 [AOR=3.47; 95% CI: 1.15,10.46]. While Number of day's fruits consumed in a week of adolescent girls is also a significant determining factor of underweight or thinness in this study. Adolescent girls who consumed fruits 1 to 3 days in a week were 3.49 [AOR=3.49; 95: CI: 1.17, 10.40] and those consumed 4 to 7 days in a week were 3.89[AOR=3.89; 95: CI: 1.22,12.40] times more likely to become underweight than those not consumed vegetables in a week (Table 2).

Explanatory Variables	Underweight (Thinness) Status		COR 95% CI	AOR 95% CI	P - Value
	Under-weight	Healthy Weight			
Age in years					
14-16	17	60	2.08(1.07,4.02)	1.23(0.42,3.63)	0.710
17-19	30	220	1	1	
Grade					
9	16	55	4.07(1.41,11.81)	3.47(1.15,10.46)	0.027*
10	9	45	2.80(0.88,8.89)	1.97(0.60,6.51)	0.266
11	17	110	2.16(0.76,6.13)	1.81(0.63,5.22)	0.273
12	5	70	1	1	
School type					
Government	16	149	0.45(0.24,0.87)	0.52(0.27,0.99)	0.049*
Private	31	131	1	1	
Had morbidity in last 2 weeks					
Yes	7	20	2.28(0.90,5.73)	2.25(0.87,5.81)	0.094
No	40	260	1	1	
Snack eating history					
Yes	35	173	1.80(0.90,3.63)	1.39(0.67,2.92)	0.379
No	12	107	1	1	
Soda drink per week					
None	16	132	1	1	
1-3times	27	117	1.90(0.98,3.71)	1.29(0.61,2.72)	0.512
4-7times	4	31	1.07(0.33,3.41)	0.95(0.27,3.39)	0.942
Number of days Fruit consumption in a week					
Not consumed	4	77	1	1	
1-3 days	28	137	3.93(1.33,11.63)	3.49(1.17,10.40)	0.025*
4-7 days	15	66	4.38(1.38,13.83)	3.89(1.22,12.40)	0.022*

*Statistically significant at p-value<0.05; 1 is Odds ratio for reference category.

Table 2: Determinants of underweight (thinness) among adolescent girls in high schools of hosanna province, Southern Ethiopia, 2019 (n= 327)

Determinants of Overweight Status among Adolescent Girls

In the study Age of girls, grade level, Average hours spent on sedentary activity in a day, the number of soda drink per week, fruit consumption per week, and Vegetable consumption in a week were significantly associated with overweight in bivariate analyses. In the final multivariate analysis

Age of adolescent girls, average hours spent on sedentary activity in a day and vegetable consumption per week were identified as

Citation: Beminet Moges Gebremariam., *et al.* "Adolescent Girls Nutritional Status and its Determinants: Prospect to Alarming Rise of Over Nutrition in Southern Ethiopia". *Nutrition and Food Toxicology* 4.1 (2021): 13-23.

Age of adolescent girls, average hours spent on sedentary activity in a day and vegetable consumption per week were identified as determinants of overweight among adolescent girls in the high schools of hosanna province. Age of adolescent girls became one of the risk factors which significantly associated with overweight, adolescent girls at the age 17-19 years were 48% less likely to become overweight than aged 14-16years [AOR=0.52;95% CI:0.28,0.96.]

Although, average hours spent on sedentary activity in a day of adolescent girls is also significantly determining factor of overweight in this study. Adolescent girls who spent 3 and more hours in a day 68% less likely overweight than those who spent less than 3 hours in a day [AOR= 0.32; 95% CI:0.15,0.72]. The number of days Vegetable consumed in a week was one of the determinants that significantly associated with overweight status in the study area. Those adolescent school girls who consumed vegetable 4 to7 days per week were 2.82 times more likely to become overweight than those not consumed vegetables in a week [AOR= 2.82; 95% CI:1.22,6.53] (Table.3).

Explanatory Variables	Overweight status		COR 95% CI	AOR 95% CI	P - Value
	Over- weight	Healthy Weight			
Age in years					
14-16	24	63	1	1	
17-19	39	229	0.45(0.25,0.79)	0.52(0.28,0.96)	0.035*
Grade					
9	21	56	1	1	
10	12	49	0.65(0.29,1.46)	0.67(0.27,1.63)	0.375
11	17	115	0.39(0.19,0.81)	0.54(0.18,1.61)	0.272
12	13	72	0.48(0.22,1.05)	0.65(0.21,2.07)	0.469
Hours spent in sedentary activity in a day					
Less than 3hours	55	209	1	1	
3 and more hours	8	83	0.37(0.17,0.80)	0.32(0.15,0.72)	0.006 *
Soda drink per week					
None	31	135	1	1	
1-3times	19	124	0.67(0.36,1.24)	0.63(0.33,1.21)	0.164
4-7times	13	33	1.72(0.81,3.64)	1.74(0.79,3.84)	0.172
Number of days Fruit consumption per week					
Not consumed	8	77	1	1	
1-3 days	37	146	2.44(1.08,5.49)	1.52(0.37,6.21)	0.557
4-7 days	18	69	2.51(1.03,6.14)	1.50(0.33,6.87)	0.598
Number of days Vegetable consumption in per week					
Not consumed	9	82	1	1	
1-3 days	25	112	2.03(0.90,4.59)	2.09(0.89,4.89)	0.090
4-7 days	29	98	2.69(1.21,6.02)	2.82(1.22,6.53)	0.016*

*Statistically significant at p-value<0.05; 1 is Odds ratio for reference category.

Table 3: Determinants of overweight among adolescent girls in high schools of hosanna province, Southern Ethiopia, 2019 (n=355)

Discussion

In this study the nutritional status of adolescent school girls indicates, the prevalence of underweight (thinness), overweight, obesity

Citation: Beminet Moges Gebremariam., et al. "Adolescent Girls Nutritional Status and its Determinants: Prospect to Alarming Rise of Over Nutrition in Southern Ethiopia". *Nutrition and Food Toxicology* 4.1 (2021): 13-23.

and also combined overweight and or obesity status was 10.2% [95%CI: 7.58,13.58], 15.7% [95% CI: 12.42,19.58], 2.0% [95% CI: 0.99,3.93] and 17.7% [95% CI: 14.2,21.7]respectively.

The underweight (thinness) status in this study is lower than study In Malaysia 24.7% [20], India 15% [21], Bangladesh, 41.3% [22], Ghana, 31.7% [23]and also lower than studies in Ethiopia, 14% in mekelle city [17], 21.4% in Adwa Town [24], 13.7% in Agarfa [25], 20.9 % in Goba Town [26], 21.3% in Adama City [27] and 19.7% in Arba Minch town southern Ethiopia[28]. In the current study, the overweight status of adolescent girls was in-line with study in Malaysia 14.5%[20]. Overweight status was also lowered than studies in Hawassa city, 20.2% [15], and 23%, in India[21]. Whereas, The overweight status was higher than the study conducted in Mekelle city 1.1% [17], Bangladesh 8.3% [22], Agarfa town 8.9% [25], 3.3 % in Adama City [27], and in Gondar Town 5.4% [29].

The obesity status of adolescent girls was lower than study in Hawassa city 4.4% [15], in Malaysia 11.1% [20] and 6.67% in Bangladesh [21]. But, the obesity status in this study was in-line with study in Adama City, 1.0 % [27], and higher than study in Gondar Town, 0.5% [29].

The combined overweight and or obesity status of this study was higher than studies in Addis Ababa city 11.3% [14] and 13.6% in Ghana [23] and lower than study in Hawassa, 24.6% [15] and Malaysia 25.6% [20]. While, in-line with study in Bangladesh,15.0% [22].

The increment in overweight and obesity level in this study might be due to adolescent girls choose and consumed high fat and energy diet, economic disparities and increase family food items purchasing power due to regular cash support to their families in may lead to a rapid shift from undernutrition to over nutrition. Although, the difference might relate to sample characteristics and socio-demographic factors.

In the study, adolescent girls who learned in governmental schools were 48% less likely to become underweight (thinness) than private school counterparts. The possible explanation for this finding could be, those students who learn may spend only half-day and their hours of the rest of a day they may sedentary activities such as sitting, watching TV or Facebook. In addition to this, those government schools give little attention and small hours for sport and physical exercise in their school compounds than their private counter parts. The finding was in contradiction with studies conducted in Addis Ababa [14] and Hyderabad [30] specified that, adolescents in government schools were more significantly to be underweight than the private counterparts.

Comparing from adolescent girls who were in 12th grade, the odds of underweight (thinness) among girls in 9th grade were 4 folds higher. However, In Jimma the result indicated that the highest grade completed was positively associated with underweight[13]. This might be due to those grade 9 students or high school beginners may receive even a minimal education with lower the educational burden which leads them to spent little time on study than grade 12 and also this might be related to the physiologic change in which due to their age their body growth is in spurt and their body is too slim.

On the other hands, adolescent girls who consumed fruits 1 to 3 days in a week were 3.49 and those consumed 4 to 7 days in a week were 3.89 times more likely to become underweight than those not consumed fruits in a week. This might be due to since they are students learning and study requires energy with-stand their brain activity however those adolescent girls who eat fruits as their regular meal and their content of high sugar in the fruits decreases appetite may affect their appetite of feeding during their regular meal time may lead to a reduced optimal level of macro and micronutrients then lead to underweight (thinness).

This finding was supported with A systematic review and meta-analysis of eight studies [31] and a study by Wall *et. al*, [32] identified that increased fruit consumption in the absence of specific advice to decrease consumption of other foods may have a role in weight maintenance or loss. While, the association disagreed with a study in Hawassa city [15] and seven African countries [33] which showed regular consumption of fruit were associated with overweight.

Regarding the determinants of overweight status of adolescent girls in the study, Age of adolescent girls was one of the determinants which significantly associated with overweight, adolescent girls at the age 17-19 years were 48% less likely to become overweight than aged 14-16 years. The finding was agreed by studies in Meerut and West Bengal, India [34, 35] and Barcelona, Spain [36]. This might be related to, the older adolescent girls may have heavy workloads in their home, take care of family burdens and they receive less care and attention from their parents and they will consume the minimum amount of foods than the younger age girls.

Adolescent girls who spent 3 and more hours in sedentary physical activity a day 68% less likely overweight than those who spent less than 3 hours in a day. The association could be related to those adolescents spent 3 and more hours had higher grade level and they read more hours in a day and their energy may be utilized for study which supported by technological devices include: computers and mobile phone. Therefore, they will have a low probability of gaining weight. This finding was supported by a study in ten cities of china [37].

The odds of overweight among adolescent school girls who consumed vegetables 4 to 7 days per week were 2.82 times higher than those not consumed vegetables in a week. This might be associated with culturally preparing and consumption of vegetables mixing with cheese, butter, and meat is commonly practiced in southern Ethiopia. Therefore, eat high fat and high energy diet which vegetables mixed with is root and tubers which facilitate weight gain. This finding was supported by Manyanga *et al*, indicated that consumption of vegetable appears to increase the odds of being overweight in Mauritania and Malawi [33]. In contrary, a study among university students in Kuwait revealed regular consumption of fruits and vegetables was a protective factor for obesity [38]. Despite the fact, this study addresses very important issues, there are also some limitations since this study used cross sectional study design can't form temporal relationships. Furthermore, some variables such as medication use, food selection, and nutritional knowledge and genetic influence from parents was not addressed in this study.

Conclusion

In this study underweight was medium prevalent and overweight and or obese were alarmingly increasing among adolescent girls and the level was almost similar to the moderate and high-income countries. School type, Grade level, and Number days fruit consumed per week were associated with underweight whereas, Age of adolescent, average hours spent on sedentary activity in a day and Number days vegetable consumed per week were significantly associated with overweight in the study. Furthermore, there is a need to design and implement adolescent girls' dietary and physical activity guidelines to reduce an alarming rise of overweight and or obesity and risk of non-communicable disease among adolescent girls who are the near future mothers.

Ethics Approval and Informed Consent

Approval for this study was provided by the Wachemo University, Research Ethical review committee. Permission to review charts was obtained from selected hospitals and data was obtained from mothers of children after obtaining written consent.

Availability of Data and Materials

The datasets developed and/or analyzed during the current study are available from the first author or from the corresponding author on reasonable request.

Competing Interests

The authors declare that they have no competing interests

Funding

Wachemo University funded the research and it is open for the researchers to publish the manuscript. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Authors' Contributions

BMG, TGA, TLE and BAK designed the study, guided the methodology, and BMG, BAK, NGG and MMA wrote the first draft; BMG, TLE, MMA and RAA were responsible for reviewing of data analysis; BMG, BAK, TGA, NGG and MMA critically reviewed, discussed, and modified the manuscript. All authors read and approved the final manuscript for publication.

References

1. WHO. "WHO recommendations for augmentation of labour". *World Health Organization* (2014).
2. WHO. "Nutrition in adolescence: issues and challenges for the health sector: issues in adolescent health and development". (2005).
3. Patil S., et al. "Health problems amongst adolescent girls in rural areas of Ratnagiri district of Maharashtra, India". *Journal of Clinical and Diagnostic Research* 3.5 (2009): 1784-1790.
4. Mulugeta A., et al. "Nutritional Status of Adolescent Girls from Rural Communities of Tigray, Northern Ethiopia". *Ethiopian Journal of Health Development* 23.1 (2009)
5. WHO. "Adolescent nutrition: a review of the situation in selected South-East Asian countries". In: WHO Regional Office for South-East Asia (2006).
6. Gillespie SR. "Improving adolescent and maternal nutrition: an overview of benefits and options". UNICEF New York (1997).
7. ACC U. "SCN 4th report on the world nutrition situation: Nutrition throughout the life cycle". ACC/SCN in collaboration with the International Food Policy Research Institute: Geneva (2000).
8. Cappa C., et al. "Progress for children: a report card on adolescents". *The Lancet* 379.9834 (2012): 2323-2325.
9. Agency CS. "Ethiopia Demographic and Health Survey 2016". Key Indicators Report. Addis Ababa, Ethiopia, and Rockville, Maryland, USA. CSA and ICF. (2016).
10. Demilew YM and Emiru AA. "Under nutrition and associated factors among school adolescents in Dangila Town, Northwest Ethiopia: a cross sectional study". *African Health Sciences* 18.3 (2018): 756-766.
11. Bidu KT., et al. "Prevalence and associated factors of undernutrition among school adolescents in Gobu Seyo District, East Wollega Zone, Oromia regional state of West Ethiopia 2016". *Journal of Public Health and Epidemiology* 10.7 (2018): 251-269.
12. Arage G., et al. "Socio-demographic and economic factors are associated with nutritional status of adolescent school girls in Lay Guyint Woreda, Northwest Ethiopia". *SAGE open medicine* 7 (2019).
13. Assefa H., et al. "Socioeconomic Factors Associated with Underweight and Stunting among Adolescents of Jimma Zone, South West Ethiopia: A Cross-Sectional Study". *International Scholarly Research Notices* (2013).
14. Gebreyohannes Y., et al. "Nutritional Status of Adolescents in Selected Government and Private Secondary Schools of Addis Ababa, Ethiopia". *International Journal of Nutrition and Food Sciences* 3.6 (2014): 504-514..
15. Tesfalem Teshome PS., et al. "Prevalence and Associated Factors of Overweight and Obesity Among High School Adolescents in Urban Communities of Hawassa, Southern Ethiopia". *Current Research in Nutrition and Food Science Journal* 1.1 (2013): 23-36.
16. Bureau E. "Hadiya Province Education Administration: Annual Registered schools and students Report". (2018).
17. Gebremariam H., et al. "Assessment of Nutritional Status and Associated Factors among School Going Adolescents of Mekelle City, Northern Ethiopia". *International Journal of Nutrition and Food Sciences* 4.1 (2015): 118-124.
18. Onis Md., et al. "Development of a WHO growth reference for school-aged children and adolescents". *Bulletin of the World health Organization* 85.9 (2007): 660-667.
19. WHO. "Nutrition Landscape Information System (NLIS) country profile indicators: Interpretation guide". (2010).
20. Zarei M., et al. "Nutritional status of adolescents attending the Iranian secondary school in Kuala Lumpur, Malaysia". *Global journal of health science* 6.6 (2014): 185-197.
21. Pramanik P., et al. "Lifestyle and Nutritional Status of School Going Adolescent Girls in a Semi Urban Area of West Bengal, India". *OSR Journal of Dental and Medical Sciences* 13.8 (2014): 37-42.
22. Hossain GM., et al. "A Study on Nutritional Status of the Adolescent Girls at Khagrachhari District in Chittagong Hill Tracts, Bangladesh". *American Journal of Life Sciences* 1.6 (2013): 278-282.

Citation: Beminet Moges Gebremariam., et al. "Adolescent Girls Nutritional Status and its Determinants: Prospect to Alarming Rise of Over Nutrition in Southern Ethiopia". *Nutrition and Food Toxicology* 4.1 (2021): 13-23.

23. Danquah AO, *et al.* "Nutritional Status of Upper Primary School Pupils in a Rural Setting in Ghana". *International Journal of Nutrition and Food Sciences* 2.6 (2013): 320-326.
24. Tsgehana Gebregyorgis, *et al.* "Prevalence of Thinness and Stunting and Associated Factors among Adolescent School Girls in Adwa Town, North Ethiopia". *International Journal of Food Science* 8 (2016).
25. Mohammed AY and Tefera TB. "Nutritional Status and Associated Risk Factors Among Adolescents Girls in Agarfa High School, Bale Zone, Oromia Region, South East Ethiopia". *International Journal of Nutrition and Food Sciences* 4.4 (2015): 445-452.
26. Tegegne M., *et al.* " Nutritional Status and Associated Factors of Adolescent School Girls, Goba Town, Southeast Ethiopia". *Global Journal of Medical Research* 16.1 (2016): 5-12.
27. Roba K., *et al.* "Nutritional status and its associated factors among school adolescent girls in Adama City, Central Ethiopia". *Journal of Nutrition & Food Sciences* 6.3 (2016): 2-8.
28. Berbada DA., *et al.* "Magnitude of double burden of malnutrition and its associated factors among selected in-school adolescents: Evidence from South Ethiopia". *International Journal of Nutrition and Metabolism* 9.4 (2017): 30-37.
29. Gebregergs G., *et al.* "Overweight and Obesity, and Associated Factors among High School Students in Gondar Town, North West Ethiopia". *Journal of Obesity & Weight Loss Therapy* 3.2 (2013): 1-5.
30. Kokiwar PR., *et al.* "Correlates and determinants of nutritional status of adolescent girls: a comparative study among government and private schools". *International Journal of Community Medicine and Public Health* 5.4 (2018): 1547.
31. Mytton OT., *et al.* "Systematic review and meta-analysis of the effect of increased vegetable and fruit consumption on body weight and energy intake". *BMC public health* 14.1 (2014): 886.
32. Wall CR., *et al.* "Association between Frequency of Consumption of Fruit, Vegetables, Nuts and Pulses and BMI: Analyses of the International Study of Asthma and Allergies in Childhood (ISAAC)". *Nutrients* 10.3 (2018): 316.
33. Manyanga T., *et al.* "The prevalence of underweight, overweight, obesity and associated risk factors among school-going adolescents in seven African countries". *BMC public health* 14.1 (2014): 887.
34. Jain S., *et al.* "Obesity among adolescents of affluent public schools in Meerut". *Indian journal of public health* 54.3 (2010): 158-160.
35. Maiti S., *et al.* "Overweight and obesity among early adolescent school girls in urban area of west bengal, India: prevalence assessment using different reference standards". *International journal of preventive medicine* 4.9 (2013): 1070-1071.
36. Garcia-Continente X., *et al.* "Eating habits, sedentary behaviours and overweight and obesity among adolescents in Barcelona (Spain)". *Anales de Pediatría (English Edition)* 83.1 (2015): 3-10.
37. Chen Y., *et al.* "Associations between physical inactivity and sedentary behaviors among adolescents in 10 cities in China". *BMC public health* 14.1 (2014): 744.
38. El-Ghazali S., *et al.* "The relationship between lifestyle and body mass index among university students in Kuwait". *Egyptian Journal of Community Medicine* 28.1 (2010): 69-76.