

Prevalence and Associated Factors of Overweight and Obesity among High School Adolescents in Mizan Aman Town, Bench Sheko Zone, Southwest Ethiopia, 2020. A Cross-Sectional Study

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Abstract

Background: Overweight and obesity are common problems of high-income countries, but recently it is dramatically on the rise in low- and middle-income countries, particularly in urban settings. Worldwide, approximately in million people died per year due to overweight and obesity. Studies in Ethiopia showed that overweight and obesity are caused due to physical inactivity, increased intake of energy-dense food, changing modes of transportation, and increasing urbanization. In addition to this, some polished papers released that short sleep duration is an independent risk factor to cause overweight and obesity for adolescents girls in the country.

Objectives: To assess the prevalence of overweight and obesity and associated factors among adolescent girl attending High School in Mizan Aman Town, Southwest Ethiopia.

Methods: Institutional based Cross-sectional study design was done among randomly selected 293 high school adolescent girl students in Mizan-Aman Town from March 01 to April 19, 2020. Data were entered into Epi-Data and exported to SPSS version 24 for analysis. On bivariate analysis $p, \leq 0.25$ were considered as candidates for multivariable logistic regression. Multivariable logistic regression was done to control confounders and to identify determinant factors associated with overweight and obesity. statistical significance was declared at $P\text{-value} < 0.05$.

Results: A total of 281 high school adolescent girl students were involved in this study with a response rate of 95.9%. The prevalence of overweight/obesity among high school adolescent girls in Mizan Aman high school was 18% from this 13% was overweight and 5% were obesity. This study identified important Factors associated with overweight/obesity among adolescent girl in the study area were Physical exercise (AOR = 2.68;95% CI:1.02,7.04; $p = 0.008$). Short sleep duration (AOR = 2.03;95% CI:1.16,8.49; $p = 0.024$). Rich-est wealth status families (AOR = 2.30;95% CI:1.02,5.16; $p = 0.044$), depression (AOR = 4.90;95% CI:1.86,12.88; $p = 0.001$), anxiety (AOR = 2.54 ;95% CI:1.53,4.58; $p = 0.001$).

Conclusion: The case of overweight/obesity in high school adolescent girls are still prevalent. Several determinant factors were correlated with overweight/obesity. Therefore, interventions like eating healthy food, psychological stability, and physical activity are recommended to prevent the problem as well as a large number of adolescent girls suffered from short sleep duration.

Keywords: Overweight/Obesity, Adolescent Girls, High School, Mizan Aman, Ethiopia

Abbreviations

AOR: Adjusted Odds Ratio; FANTA: Food and Nutrition Technical Assistance; BMI: Body Mass Index; IDDS: Individual Dietary Diversity Score; CI: Confidence Interval; SNNPR: Southern Nation Nationalities Peoples Region; COR: Crude Odds Ratio; SPSS: Statistical Package for Social Sciences; DASS21: Depression, Anxiety, and Stress 21; WHO: World Health Organization

Introduction

Overweight and obesity were problems of high-income countries, but nowadays it is dramatically on the rise in low- and middle-income countries, particularly in an urban area [1,2]. Adolescence age [10-19], particularly teenagers age [13-19] is a critical period for the development of overweight and obesity that transit into adulthood [3-5]. Overweight is defined as Body Mass Index (BMI) for ages greater than or equal 85th percentile and, Obesity is BMI for ages greater than 95th percentile [4]. In worldwide, around 2.8 million peoples are died per year due to overweight and obesity as well as around 35.8 million (2.3%) of global Disability Adjusted Life Years (DALYs) are caused by overweight and obesity [2]. In Africa, the prevalence of overweight and obesity is estimated that 4% to 7% of urban children are overweight [4]. Currently, there is a growing pattern of adolescents overweight and obese in Ethiopia especially in urban areas. WHO reported that 2008 in Ethiopia, the prevalence death due to overweight and obesity was 7.4% and 1.1%, respectively [5].

The major cause of overweight and obesity is an energy imbalance between calories used and calories expended [4,6]. different factors contribute toward the occurrence of overweight and obesity in adolescents. Globally it has been an increased taking of energy source diet food that is high in salt, fat, sugar and an increase in physical inactivity due to the increasingly sedentary nature of many forms of activities, changing modes of transportation, and increasing urbanization [4,7]. However, recently, short sleep duration has received greater attention as an independent risk factor for overweight and obesity in adolescents [8,9].

Overweight and obesity are major risk factors for many chronic diseases, including hypertension, diabetes, stroke, and cancer as well as depression and anxiety [10]. Studies released that adolescents girls are still more vulnerable groups to develop overweight and obesity, early control is necessary at this stage of life, to avoid an unfavorable long-term prognosis, as in adulthood [14,25,36]. Future complications of this condition in adulthood can be serious if early intervention measures are not established [10]. In recent, prevalence of overweight and obesity among children is increased worldwide from 4.2% in 1990 to 6.7% in 2010, and this trend is expected to reach 9.1% in 2020. These findings is alarming if obesity is strongly associated with a wide serious health complications and an increased risk of illness and death later [11]. Short Sleep duration has emerged as a risk factor for childhood obesity with higher BMI, weight gain, and increased risk of overweight/obese. The association between sleep duration and overweight or obesity has been mostly studied in developed countries. Several findings suggested that these observations may not fully extrapolate a wider diversity of the ethnic group and socio-demographic variables [12]. In Ethiopia, Previous reports revealed that the increasing intake of energy-dense food, physical inactivity, changing modes of transportation, and increasing urbanization are considered important risk factors for overweight/obesity. Specifically, there are no sufficient articles on overweight and obesity among high school adolescent girls in Ethiopia, and there is no documented study is found in the study area. Therefore, this study aimed to determine the prevalence and associated factors of obesity and overweight among high school adolescents girls in Mizan Aman Town.

Methods

Study setting and period

An Institutional-based cross-sectional study design was conducted. And was conducted from March 01 to April 19, 2020 in Mizan Aman town High Schools Bench-sheko Zone, South West Ethiopia. Mizan Aman Town is found 561 km from the capital city Addis Ababa,

and it is the largest town and administrative center for Bench Sheko Zone. This town has a latitude and longitude of 70 'N 3535' E/ 7.000N 35.583E and an elevation of 1451 meters above sea level. According to the Mizan Aman Town education office in 2012 E.C, there are about six high schools of which four them were governmental, and the rest two were private schools. And the total number of students in both government and private in high schools is 7724, from this 3590 were males and 4134 females from this 3792 were an adolescent girl aged 10 - 19 years.

The main sources of income for residents in the town are trade, government employee, and agriculture, mostly main food crops in this zone include maize, taro root (local launguge called godere and Enset), sorghum, teff, wheat, barley, and coffee are cultivated to a significant extent. Although goats, cattle, and poultry are produced in limited numbers, milk, and meat are very much appreciated. Cash crops include fruits (bananas, oranges) and spices (e.g. coriander and ginger) are grown in the zone. Honey is also an important local source of income [13].

Source and study population

All high school adolescent girl students who attending their education in Mizan Aman Town were the source of populations. and all randomly selected adolescent girl students in the high school in Mizan Aman Town were considered the study population.

Sampling techniques

First, I was taken a list of all high schools with their list of students found in the town that were registered in the Mizan Aman Town educational office. By using the student registration document as the sampling frame, which included the name, age, and sex of all list students (from 9 - 12) were written in the registration document in each school with their level of grade. Then the eligible adolescent students are selected from each school, and then the sample size was allocated proportionally for each school after that, Study participants were selected using a simple random sampling technique specifically by the computer-generated method to allocate the participant students.

Sample size determination

Sample size was calculated using a single proportion formula by considering the following assumptions: prevalence of overweight/obesity among adolescent girl of 24% adolescents of high schools in southern Italy [29]. And 95% confidence level, and a 5% margin of error from a prior study and adding a contingency for a non-response rate of 10%.

$Z=1.96, P=24\%, d= 5\% =0.05$, then

$$n = \frac{(Z)^2 \times p(1-p)}{(d)^2}$$

$$n = \frac{(1.96)^2 \times 0.24(1-0.24)}{(0.05)^2} = 282$$

$n = 282$, the source of population are less than 10,000, so that using correction formula.

$n = no / (1+ no/N)$, Where: $N=$ Population size (3792),

$$n = 292 / (1+ 292/3792) = 266$$

By adding 10% non-response rates sample size becomes 293 adolescents.

Inclusion and exclusion criteria

Adolescent girls who are high school students in Mizan Aman Town were included in the study. On the other hand, adolescents who are ill during data collection, pregnant adolescents, and adolescents out of the targeted age group (10 - 19 years) were excluded from the study.

Data collection instruments and procedure

A structured pretested interviewer-administered questionnaire was developed in English and then translated into the Amharic language for simplicity then back-translated to the English language for its consistency by two different language expert individuals who speak both Amharic and English fluently. The questionnaire having social-demographic characteristics, Dietary habits and meal patterns, WHO-STEP instrument and Depression, Anxiety and Stress Scale (DASS21), Physical activity, sedentary activity (TV, Video game or Internet), and sleep duration were collected.

Sleep duration

Sleep duration was calculated by self-administered questionnaires by recalling the average time of falling asleep and getting up in the preceding 7 days. Short sleep duration was defined as sleep duration less than 8 hours a day, normal 8 - 10 hours, and length greater than 10 hours per day for adolescents according to the recommendation of the American Academy of Sleep Medicine (AASM) [15,16].

Anthropometric measurements

Height measurements were done using a wooden height measuring board with a sliding head bar. The subject was asked to stand straight on the leveled surface with heels together and their heads positioned and eyes looking straight ahead (Frankfort plane) without shoes. Heels, buttocks, shoulder blades should touch the vertical surface of the Stadiometer. The moving headpiece of the Studio meter was applied to lower to rest flat on the top of the head and read to the nearest 0.1cm.

And the weight was measured using an electronic digital weight scale (Secca Germany) with light clothing and without shoes and then record to the nearest 0.1kg. Calibration was done every morning and before every weight measurement, the data collectors assured the scales reading exactly at zero. The weight scale was checked through known object weighing measured regularly. The same measures were conducted to given anthropometric measurements to avoid variability. Height and weight were measures twice and the average value was taken, then According to this reference BAZ \leq -2SD considered as thinness, normal if BAZ between -2SD and +1 and overweight was considered as if the BAZ \geq +2SD and if the respondents HAZ \leq -2SD was stunting [17].

Dietary diversity score (IDDS)

It was conducted consuming adolescent girls within 24 hours from the nine food groups such as starch (cereals, tuber, and wheat), vegetables, fruits, fish, tubers, meat, honey, milk, egg, and legumes. Each food group had been counted only once resulting in a possible score of zero to nine. So that the study food groups were categorized into low dietary diversity (\leq 3 food groups), medium dietary diversity score who consumed four and five food groups, and high dietary diversity (\geq 6) [18].

Depression anxiety and stress score

Psychological factors, depression anxiety, and stress were measured using Lovibond and Lovibond's short version of the DASS-21. DASS-21 is a psychological screening instrument that is capable of differentiating symptoms of depression, anxiety, and stress [19]. This

is a validated and reliable instrument with 21 items in three domains. Each domain has seven items that assess symptoms of depression, anxiety, and stress. Respondents were reported to indicate the presence of symptoms in each domain over the past week scoring from 0 (did not apply at all) to 3 (applied most of the time). Scores from each dimension were summed. Then, the final score was multiplied by 2 and then categorized according to the DASS manual as normal, mild, moderate, severe, and extremely severe. The reliability of these instruments was checked using the Cronbach alpha and it was 0.89 for depression, 0.86 for anxiety, and 0.82 for stress components.

Wealth index status

Nineteen items used to assess household assets. The tool was adapted from the Ethiopian demographic and health survey (EDHS) and it was ranked as tertile (low, medium, and high) [20].

Data processing and analysis

Data were collected by trained data collectors then, the data were entered into Epi data 3.1 after coding and checking for completeness and consistency and exported to Statistical Package for Social Sciences (SPSS) software version 22.0 appropriate analyses were done. Descriptive statistics like frequency, Mean, standard deviation (SD), and percentage were used to give a clear picture of background information and determine the prevalence of overweight/obesity. The normality of continuous variables (anthropometric, food groups, and hemoglobin) was checked using graphic methods (Histograms with normality curves and QQ-plots) and models. Height and weight were transferred into WHO Anthro plus considering age to convert nutritional data into Z-score of indices HAZ and BAZ [21]. According to this reference if adolescent girls had $BAZ \leq -2SD$ considered as thinness, normal if BAZ between $-2SD$ and $+1$ and overweight was considered as if the $BAZ \geq +2SD$ and if the respondents $HAZ \leq -2SD$ was stunting [21].

Household wealth: principal component analysis (PCA) to construct a wealth index. To construct a relative household's wealth index, a suite of several socio-economic indicators was collected. A relative socio-economic status was constructed by dividing the resulting score into quintiles that indicate the poorest, medium, and richest households.

Bivariate and multivariate logistic regressions were used to assess the association of various determinant factors of anemia. Binary logistic regression was used to identify the presence of an association between independent variables and overweight/obesity. Multivariable logistic regression analysis was used to control the possible confounding effects of variables. In Bivariate logistic regression analysis all variables are significant at a p-value of 0.25 and 95% CI were entered into a multivariate logistic regression analysis model. Variables that are significant at p-value <0.05 level and 95% CI are considered to be the determinant factors of overweight/obesity. The fitness of the model was checked by Hosmer Leeshawn goodness of fit test. Thus, the P-value for the Hosmer and Leeshawn chi-square was insignificant ($P > 0.05$) which indicated the fitness of the model. and multi-collinearity was checked using Variance Inflation Factor (VIF).

Data quality assurance

Questionnaires from English were translated to Amharic and again back-translated to English and for the assurance of data quality 5% pre-test was performed at semen bench high school adolescent girls (15 adolescent girls) to check consistency, validity, and completeness of the data collection tool before the actual data collection period. The training was given to supervisors and data collectors. Continuous and supportive supervision was given. Both the supervisor and principal investigator were checking the completeness of collected data on daily basis. For additional better data quality management data was entered into Epi data 3.1 by preparing double entry verification. Weight Calibration was done every morning and before every weight measurement, the data collectors assured the scales reading exactly at zero.

Ethical approval and consent to participants

Ethical clearance was obtained from the Ethical Review Board of Jimma University (Reference number IRB00059/2020). After explained the advantage of the study to each study participant, we obtained written and signed informed consent from 18 - 19-year-old study participants and For adolescents < 18 years their parents/guardians gives their informed written and signed voluntary assent allowing their daughter to be part of the study one day before the data collection date. Privacy, confidentiality, and voluntarism were maintained at each step of the study process and it was given a unique code number.

Result

Socio-demographic characteristics

A total of 281 were interviewed in this study, which yielded a 95.9% response rate. The mean age of the respondents was 15.85 ± 1.74 years. Of these, 86 (30.5%) were found in the early adolescence age group and 66 (23.5%) of the respondents were found in the late adolescence age group. Almost all (95.4%) of respondents were from government schools. Forty-two (14.9%) of the adolescent girls were married. One hundred fifty-two (54.16%) of the adolescent girls were living with their parents. Regarding the religion of respondents, 103 (36.7%) of them were Orthodox followed by protestant 83 (29.5%).

Regarding parental education level, three fourth (29.9%) of adolescent girl fathers were attained college and above followed by high school (25.1%). And three fourth (29.5%) of adolescent girl mothers were attained high school level, seventeen (25.5%) adolescent girls' mothers were college and above and 31 (11.3%) of adolescent girl's mothers have no formal education.

Regarding the occupation of parents, 48% of fathers of adolescent girls were government employees, 34.2% of them were merchants and 7.4% of fathers were daily laborers. Around half (53.5%) of mothers were housewives, whereas 37.1% of mothers were government employees. Eighty-five (30.2%) of adolescent girls' parents were with higher wealth status and 118 (42%) were with low wealth status (Table 1).

Variables	Category	Frequency	Percentage (%)
Age category	Early adolescence	86	30.6
	Middle adolescence	129	45.9
	Late adolescence	66	23.5
Type of school	Governmental	268	95.4
	Private	13	4.6
Religion	Orthodox	103	36.7
	Muslim	64	22.8
	Protestant	83	29.5
	Catholic	31	11.0
Ethnicity	Bench	82	29.2
	Amhara	73	26.0
	Oromo	63	22.4
	Keffa	52	18.5
	Others*(Hadiya Gurage and Wolayta)	11	3.9

Living arrangement	Living with parents	151	54.1
	Living with relative	96	34.5
	Living with a friend	34	11.4
Marital status	Single	239	85.1
	Married	42	14.9
Educational status of Father	Illiterate	27	9.6
	Read and write	45	16
	Primary school	57	20.3
	Secondary school	68	24.2
	College and University	84	29.9
Educational status of Mother	Illiterate	34	12.1
	Read and write	41	14.6
	Primary school	55	19.6
	Secondary school	81	28.8
	College and University	70	24.9
Occupation of Father	Daily labor	21	7.5
	Merchant	101	35.9
	Government Employed	139	49.5
	Farmer	20	7.1
Occupation of Mother	Housewife	151	53.7
	Merchant	28	10
	Government Employed	102	36.3
Family size	>5	115	40.9
	≤ 5	166	59.1
Wealth index	Poor	117	42.0
	Medium	78	27.8
	Rich	86	30.2

Table 1: Distribution of socio-demographic and economic characteristics among high school adolescent girls in Mizan Aman Town, Southwest Ethiopia, 2020 (N = 281).

Dietary habits and meal pattern of the high school adolescent girls students

One hundred twenty-seven (45.2%) of adolescent girls consumed three times per day and three fourth (27.7%) of respondents girls eaten two and less times per day. From the total adolescent girl students, 184 (65.5%) took breakfast daily, 79 (28.1%) took breakfast sometimes and 18 (6.4%) never took breakfast at all. The majority (75.8%) of adolescent girls took lunch daily and fifty-one (18.1%) took lunch sometimes, while 17 (6%) never took lunch. Two hundred seventy-six (62.6%) took dinner regularly, Eighty-one (28.8%) took dinner sometimes and twenty-four (8.5%) never took dinner. Fast food and visible fat in meat were taken frequently one hundred-seven

(37.2%) and sixty-one (18.9%) respectively of the participants. Two hundred twenty- two (79.0%) respondent girls drank coffee/tea from those they drink at the time of right after consumed meals 118 (53.2%) followed by 104 (46.8%) drank during a meal. Regarding food 226(80.4%) adolescent girls consumed starchy foods. More than half of the respondents consumed fruits, vegetables, eggs, and meat, and Thirty-five (23.1%) of individuals consumed sweets (Table 2).

Variables	Category	Frequency	Percent
Meal frequency	Less than two times	72	27.7
	Three times	127	45.2
	More than three	82	29.1
Breakfast	Never	18	6.4
	Sometimes	79	28.1
	Daily	184	65.5
Lunch	Never	17	6.0
	Sometimes	51	18.1
	Daily	213	75.8
Dinner	Never	24	8.5
	Sometimes	81	28.8
	Daily	176	62.6
Drinking coffee/tea	Yes	222	79.0
	No	59	21.0
The average cup of coffee/tea drink	Two and less cups	107	48.2
	Three and more cups	115	51.8
Time of drink coffee/ tea	During meal	104	46.8
	Right after meal	118	53.2

Table 2: Dietary habits and Meal pattern among high school adolescent girls in Mizan Aman Town, Southwest Ethiopia, 2020 (n = 281).

Physical activity, sleep duration, and depression of participants

Regarding physical activity status related to sport and recreation, 82 (29.2%) of the participants reported that they do vigorous physical exercise; whereas 165 (58.7%) reported doing moderate level physical activities. 249 (88.6%) of the adolescents go to and come back from school on foot and 32 (11.4%) traveled by car. Concerning the time spent resting like watching TV, playing video games, or browsing on the internet, 59 (21.0%) respondents report that they spend an average time of 120 minutes and more a day, while 222 (79.0%) reported spending at least less than 120 minutes per a day.

The sleep duration reported by the participants were more than half (54.1%) of the participant reported they have normal sleep duration additionally, short and long sleep duration was seventy-one (25.3%), fifty-eight (20.6%) respectively (Table 3).

Variables	Level	Frequency	Percent (%)
Vigorous exercise	Yes	82	29.2
	No	199	70.8
Moderate exercise	Yes	165	58.7
	No	116	41.3
Mode transportation to/ from school	On Foot	249	88.6
	Car	32	11.4
Time spent watching TV and playing games or browsing the Internet	<120minutes a day	222	79.0
	>=120minutes a day	59	21.0
Sleep duration	Short duration(<8hours)	71	25.3
	Normal (8-10 hours)	152	54.1
	Long duration(>10hours)	58	20.6

Table 3: Physical activity, sleep duration, and depression among high school adolescent girls in Mizan Aman Town, Southwest Ethiopia, 2020 (n = 281).

The overall magnitude of depression, anxiety, and stress was found to be 13.2%, 17.4%, and 12.9%, respectively. Thirty-seven (13.2%) respondents had moderate and no severe depression reported. Similarly, thirty-six (12.8%) respondents had moderate anxiety and thirteen (4.6%) had severe anxiety. Twenty-six (9.3%) respondents had moderate stress and ten (3.6%) had severe stress (Figure 1).

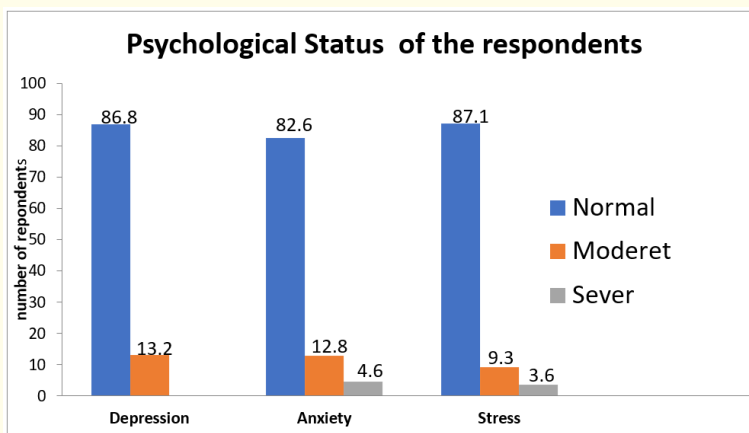


Figure 1: Psychological Status of high school adolescent girls in Mizan Aman Town, Southwest Ethiopia, 2020.

Prevalence of overweight and obesity among adolescent girls

The prevalence of overweight/obesity among high school adolescent girls in Mizan Aman high school was 18% from this 13% was overweight and 5% were obese (Figure 2).

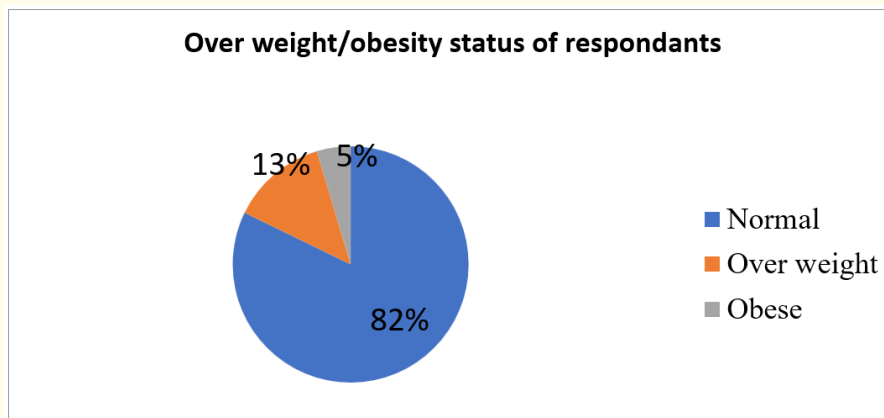


Figure 2: Prevalence of overweight and obesity among high school adolescent girls in Mizan Aman Town, Southwest Ethiopia, 2020.

Factors associated with overweight/obesity

Variables like family size, father education, mother education, Living arrangement, and father occupation, frequency of breakfast, lunch dinner, dietary diversity score, tea/coffee consumption, wealth status, vigorous or moderate exercise, depression anxiety, and sleep duration were entered in binary logistic regression analysis. From this In bivariate analysis with P-value < 0.25, Father education, Living arrangement, mother education, Wealth index, IDDS, vigorous, moderate exercise, depression anxiety, and sleep duration were significantly associated with overweight/obesity among adolescent girls attending high school. Multivariable logistic regression analysis with P-value < 0.05 indicated that Wealth index, vigorous or moderate exercise, depression, anxiety, and sleep duration were significant predictors of overweight/obesity among adolescent girls attending high school.

Adolescents who did not do any physical exercise were three times at risk of being overweight/obese than those who did physical exercise (AOR = 2.68; 95% CI:1.02,7.04; p = 0.008). Adolescent girl students having a short duration of sleep were two times more likely to develop overweight/obesity than those who sleep normal duration (AOR = 2.03;95% CI: 1.16, 8.49; p = 0.024). Adolescent girls from poor wealth status families were 2.3 times more likely to be overweight/obese compared to those girls who had rich wealth status families (AOR = 2.30;95% CI:1.02,5.16; p = 0.044). The odds of having overweight/obesity were five times higher among adolescent girls having depression compared to normal Adolescent girls students (AOR = 4.90;95% CI:1.86,12.88; p = 0.001). Additionally, the odds of having overweight/obese were three times higher among adolescent girls who had anxiety compared to normal Adolescent girls students (AOR = 2.54; 95% CI:1.53,4.58; p = 0.001) (Table 4).

Predictor	Category	Overweight / Obesity Status		COR 95%CI	AOR 95%CI	P-value
		Yes (%)	No (%)			
Father Education	Illiterate	9 (33.3)	18 (66.7)	0.40 (0.15,1.07)**	0.3 (0.08, 1.19)	0.089
	Reade and write	8 (17.8)	37 (82.2)	0.93 (0.36,2.41)	1.03 (0.29,3.62)	0.967
	Primary school	9 (15.8)	48 (84.2)	1.07 (0.43,2.66)	0.97 (0.28,3.28)	0.964
	Secondary school	10 (14.7)	58 (85.3)	1.16 (0.48,2.81)	1.24 (0.41,3.73)	0.697
	Collage and Above	14 (16.7)	70 (83.3)	1	1	

Mother Education	Illiterate	11 (32.4)	23 (67.6)	0.27 (0.10,0.75)**	0.28 (0.08, 1.06)	0.060
	Reade and write	8 (19.5)	33 (80.5)	0.53 (0.18,1.55)**	1.07 (0.26, 4.39)	0.924
	Primary school	7 (12.7)	48 (87.3)	0.89 (0.30,2.61)	1.17 (0.29, 4.70)	0.823
	Secondary school	16 (19.7)	65 (80.3)	0.52 (0.21,1.31)**	0.74 (0.24, 2.29)	0.602
	Collage and Above	8 (11.4)	62 (88.6)	1	1	
Living arrangement	Living with relatives	21 (21.7)	76 (78.3)	0.61 (0.32,1.19)*	1.71 (0.49, 5.87)	0.395
	Living with friend	7 (21.9)	25 (78.1)	0.60 (0.23,1.57)	0.93 (0.27, 3.18)	0.911
	Live with parents	22 (14.5)	130 (85.5)	1	1	
IDDS	Low	20 (25.3)	59 (74.7)	0.56(0.27,1.4)*	0.82 (0.35,1.92)	0.643
	Medium	12 (13.5)	77 (86.5)	1.22(0.55,2.8)	1.10 (0.44, 2.78)	0.839
	High	18 (16.0)	95 (84.0)	1	1	
Wealth Index	Low	17 (15.9)	96 (84.1)	2.13 (1.07,4.22)*	2.30 (1.02,5.16)**	0.044
	Medium	7 (9.6)	66 (90.4)	3.55 (1.44,8.74)*	2.92 (0.94, 8.24)	0.052
	High	26 (17.4)	69 (72.6)	1	1	
Vigorous Exercise	No	43 (21.6)	156 (78.4)	1	1	
	Yes	7 (7.5)	75 (91.5)	2.95 (1.27,6.86)*	2.68 (1.02,7.04)**	0.008
Moderate Exercise	No	27 (23.3)	89 (76.7)	1	1	
	Yes	23 (13.9)	142 (86.1)	1.87 (1.01,3.47)*	0.658 (0.32,1.35)	0.254
Sleep Duration	Normal	21 (13.8)	131 (86.2)	1	1	
	Short	20 (28.2)	51 (71.8)	0.41 (0.22,0.98)*	2.03 (1.16,8.49)**	0.024
	Long	9 (15.5)	49 (84.5)	0.87 (0.49,2.14)	1.26 (0.22, 3.51)	0.290
Depression	Normal	38 (15.6)	206 (84.4)	1	1	
	Moderate	12 (32.4)	25 (67.6)	0.38(0.18,0.83)*	4.90 (1.86,12.88)**	0.001
Anxiety	Normal	34 (14.7)	198 (85.3)	1	1	
	Moderate	9 (25.0)	27 (75.0)	0.52 (0.22,1.19)*	2.54 (1.53,4.58)**	0.001
	Sever	7 (53.8)	6 (46.2)	0.15 (0.47,0.47)	3.41 (0.69,6.84)	0.132

Table 4: Bivariable and Multivariable logistic regression model predicting of overweight/obesity among adolescent high school girls in Mizan Aman, Southwest Ethiopia, 2020.

Key * = candidate variables at $p \leq 0.25$ in Bivariate logistic regression ** predictor variables in Multivariate logistic regression at $p < 0.05$.

Discussion

The determinant predictors of overweight/obesity among adolescent girls attending high school were Wealth index, vigorous or moderate exercise, depression, anxiety, and sleep duration. The overall magnitude of overweight and obesity among adolescent girls in Mizan

Aman high school students was eighteen percent, from this thirteen percent accounted for overweight and five percent accounted for obesity. This prevalence was comparable to reports of studies in urban communities of Hawassa and Bahir Dar, which was 15.6% [22], and 16.7% [23] respectively. However, it was higher than the finding of a study done in Ghana [6] and Addis Ababa [4], which was 13.0% and 9.4%, respectively. This might be due to changes in the lifestyle factors of the community throughout time.

In the World Bank wealth classification of 2015, household wealth status was a statistically significant association with overweight and obesity. Adolescents' girls from the richest wealth status family were more disposable to become overweight/obese compared to those from the poorest wealth status of the adolescents family. The odds of overweight/obesity were 2.3 times higher among adolescent girls whose families are under the richest wealth status than those who had the poorest wealth status, families. This finding also similar to a study conducted in Egypt [24], Hawassa [22], and Bahir Dar [23]. This might be due to, the pattern of high energy expenditure from low socio-economic status, were engaging in any work besides learning contributes to reducing the prevalence of overweight and obesity. In the Ethiopian context, weight gain in adolescent girls is considered a sign of healthiness and high social class.

Physical activity was another independent predictor that is statistically associated with overweight/obesity. Adolescents who did not do any vigorous or moderate exercise for at least ten minutes were three times at risk of being overweight/obese than those who did vigorous or moderate exercise. This is consistent with the study done in Bahir Dar and China which also showed that lack of physical activity had a positive association with overweight /obesity [25,26]. A similar report from Pakistan revealed that lack of physical activity was found to be significantly associated with overweight/obesity in adolescent girls [27]. Another study in Kuwait also reported that regular physical exercise was an important factor in preventing the prevalence of overweight /obesity [28]. The possible reason might be due to lower energy expenditure caused by decreased vigorous or moderate physical exercise.

Another interesting finding of this study is sleep duration was also found to be an independent predictor of overweight/obesity among adolescent girl students, sleep duration was strongly associated with overweight/obesity. Adolescents with insufficient sleep behaviors are occurred due to an increase in social, hormonal changes, and the use of caffeine or stimulants [9]. This finding showed that adolescent girl students having a short duration of sleep were two times more likely to develop overweight/obesity than those who sleep normal duration. This finding was consistent with the result from Korea and Sweden where they revealed that sleeping short duration significantly increased the risk of being overweight/obese among adolescents [8,9]. A similar report from southern Italy showed that short sleep duration was significantly associated with obesity for school children [29]. The possible Cause of overweight/obesity among short sleep duration of adolescents might be due to staying a long time at night with academic reading.

Another result indicating that depression and anxiety also determinant factors for the occurrence of overweight/obese adolescents girls. Adolescent girls who had depression were five times more likely to be overweight/obesity and Adolescent girls who had anxiety were three times more likely to be overweight/obese as compared to those adolescent girls who were normal. Similar to this situation in foreign countries in China [30], and Sweden [31]. Because of the particularity of the education model in different countries, parents pay more attention to their children's academic performance and often ignore their psychological activities. This leads to having high learning pressure and little physical activity, which is one of the reasons why obese adolescent girls were increasingly showing depressive and anxiety disorders. However, findings on the association between depression and obesity are bidirectional and manifold. Among girls but not boys, depression predicted increased obesity, and obesity predicted increased depression. In particular, obese women who later developed depression were those with difficulty completing activities of daily living such as walking moderate distances and climbing stairs, less social support and more social dysfunction, and who coped with negative emotions by eating more (emotional eating). At the same time, depressed women who later developed obesity were those with more physical impairment and emotional eating [32,33]. Some studies also found that overweight/obese children have a slightly increased risk of depression and anxiety symptoms [34]. Com-

pared with non-obese adolescents. Several studies found that obese adolescents girls have less depression and anxiety symptoms) than non-obese adolescents girls [30,35,36].

Conclusion

Magnitude of overweight and obesity among high school adolescents of Mizan Aman Town were high. Wealth index, depression, vigorous or moderate exercise, anxiety, and short sleep duration were significant determinant factors of the overweight/obesity. therefore, the collaboration among health sectors and educational sectors to reduce problems of adolescent overweight/obesity is very crucial. Increasing awareness of the adolescent's adequate duration of sleep at night should be considered as an important preventive mechanism.

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Availability of Data and Materials

We declare that we can provide all materials; questionnaires and data are available upon request from the principal investigator.

Authors' Contributions

All authors' contributions to the conception of the research idea, study design, proposal development, and data analysis. After the GBB drafting of the manuscript, and MST critically reviewed the manuscript. Then after the authors gave final approval of the paper to be published, GBB the corresponding author had the responsibility to submit the manuscript for publication.

Consent for Publication

Not applicable.

Conflicts of Interest

The authors declare have not conflicts of interest.

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