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Overweight and Obesity, and Associated Factors among High School Students in Gondar Town, North West Ethiopia

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Abstract

Introduction: Overweight and obesity are defined as abnormal or excessive fat accumulation in the body that may affect health. The prevalence of overweight and obesity in children is increasing worldwide, and currently 1 child in 10 is overweight or obese. Overweight and obesity are now considered as very important risk factors for many chronic diseases which exploit high cost of medical care.

Objective: To assess the prevalence of overweight and obesity, and associated factors among high school students in Gondar town.

Methodology: Institution based cross-sectional study was conducted from April 12/2012 to April 30/2012 in Gondar town administration. A total of 800 students were included in the study. Multistage sampling strategy was applied to enroll students. Both bivariate and multivariate logistic regression analysis was done to identify associated factors.

Result: The overall prevalence of overweight and obesity in this study was 5.4% and 0.5% respectively. The prevalence of overweight among the adolescents studying in private schools was 10.1% and was higher than those studying in government schools (4%). Overweight was 4.47 times higher among girls [Adjusted Odds Ratio (AOR) =4.47; 95% CI: 1.79, 11.13], and 2.53 times higher among Students of private school [AOR =2.53, 95% CI: 1.33, 4.64]. Consuming sweet food item was significantly associated with overweight. However, moderate or vigorous sport activity for at least 10 minutes continuously was only marginally significant.

Conclusion and recommendation: This study revealed that Overweight and obesity are emerging in Gondar. School type, sex and consuming sweet food item were among the predictors that were significantly associated with overweight. Hence decreasing consumption of sweet food items and doing physical activity could reduce risk of overweight.

Keywords: Obesity and overweight; Students; Prevalence Rates; Ethiopia

Introduction

Overweight and obesity are defined as abnormal or excessive fat accumulation in the body that may affect health [1]. Overweight and obesity are the fifth leading risk for global deaths .Worldwide, about 2.8 million deaths and 35.8 million (2.3%) of global Disability Adjusted Life Years (DALYs) are caused by overweight or obesity. In addition, 44% of the diabetes burden, 23% of the ischemic heart disease burden and between 7% and 41% of certain cancer burdens are attributable to overweight and obesity [2,3].

The prevalence of overweight and obesity in children is increasing worldwide, and currently 1 child in 10 is overweight or obese [4]. Results of longitudinal study in United State suggest that obese adolescents are likely to stay obese into adulthood, and among individuals who were obese as adolescents, incident of severe obesity was 37.1% in men and 51.3% in women [5].

In lower- to middle-income countries, obesity co-exists with under-nutrition where most overweight and obese children being concentrated in urban areas and presents serious social and psychological impacts [6].

Africa is experiencing a shift from underweight to overweight along with rapid socioeconomic and nutritional transition particularly in their urban population. This transformation comes with increased access to energy-dense foods and less strenuous jobs resulting into many people having a positive energy balance and hence becoming overweight or obese [7,8].

In Ethiopia, particularly in the study area, there was no information on the adolescents' overweight and obesity in the school. Hence, this study was able to address the by assessing the prevalence and associated factors of overweight and obesity among high school students.

Methods

Study design and period

To assess the prevalence of overweight and obesity, and associated factors among high school students in Gondar town, institution based cross-sectional study was conducted from February to June 2012.

Sample size and sampling procedure

Multistage random sampling technique was employed to recruit 800 students from the schools. From the twelve high schools in the town; four schools were selected by simple random sampling (SRS). Then from the selected schools, 800 students were randomly selected by simple random sampling. The sample size was computed using single population proportion formula by considering 23% proportion, 95%

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confidence interval, 5% margin of error, 2 design effect and 10% none response rate. The final sample size considered was 800.

Data collection procedure

Self administered questionnaire was deployed to collect socio-demographic, physical activity and dietary data from the students. The questionnaire was first prepared in English and translated in to Amharic and then retranslated back to English to keep the consistency. The data was collected after pretest have been conducted on the 5% of the sample from nearby Gondar town schools using Amharic version questionnaires since the study participants were Amharic speakers. The questionnaires were adapted from the Global Physical Activity Questionnaire (GPAQ) Analysis Guide [9] and WHO steps instrument for chronic disease risk surveillance [10].

Data collection was carried out by Diploma nurses who were given two-day training with practical exercises. One teacher (BSc) for each school was assigned to supervise the data collection process and the overall coordination was handled by the principal investigators.

Measurement

Weight was measured to the nearest 0.1 kg using calibrated digital balance in standing position, and heights was measured to the nearest 0.5 cm using height measuring board in standing position when students were made to remove their heavy clothing and shoes.

Data analysis procedures

Body mass index (BMI) was computed using weight (Kg)/height (m^2). Individual BMI was compared with age and sex specific BMI for age percentile cut off points of CDC growth chart and categorized as follows:-

Under weight: BMI for age less than 5th percentile.

Normal weight: BMI for age ≥ 5th percentile but less than 85th percentile.

Overweight: BMI for age ≥ 85th percentile but less than 95th percentile.

Obesity: BMI for age greater than or equal to 95th percentile [11].

Overweight and obesity were combined in the logistic regression analysis due to the limited number of participants who were classified as obese. Data was entered and analyzed using SPSS version 16. Descriptive statistics was performed. Both bivariate and multivariate logistic regression analyses were conducted. Variables whose p-values are ≤ 0.2 by bivariate logistic regression analysis were fitted to the multivariate logistic regression analysis. The crude and adjusted Odds ratios together with their 95% confidence intervals were computed to measure the association between the response and explanatory variables. A P-value ≤ 0.05 with odds ratio and 95% confidence interval were considered to identify factors associated with overweight and obesity. During the analysis, the Hosmer and Lemeshow's goodness-of-fit test was considered to check model fitness.

Ethical consideration

Ethical clearance was obtained from the Institute of Public Health, University of Gondar Ethical Review Board. A support letter from local authorities (Gondar education office) was obtained and delivered to each selected school. After getting permission from school, verbal informed consent was obtained from each study participants and their parents. Anyone who was not willing to take part in the study and wanted to withdraw from the study was not forced.

Results

Socio -demographic characteristics of the respondents

A total of 791 students were participated in the study with a response rate of 98.9%. More than half of the respondents 423 (53.5%) were females. About 602 (76.1%) of the respondents were from government schools and the rest were from private schools. The mean age of the respondents was 16.5 years with standard deviation of 1.41 years. Most of students 530 (67%) were 9th graders and 261 (33%) were 10th graders (Table 1).

Prevalence of overweight and obesity among students

Out of the total high school students in Gondar town, 43 (5.4%) with 95%CI (4%, 7.2%) were overweight while only 4 (0.5%) with 95%CI (0.2%, 1.2%). The combined prevalence of both overweight and obesity was 5.9%. The overweight prevalence was higher among girls (8.7%) than boys (1.6%); while 0.9% girls and none of the boys were obese.

The prevalence of overweight and obesity among private high school students was 10.1% and 1.6% respectively; while 4.2% and 0.2% public students were overweight and obese respectively.

Eating habits of respondents

Among total respondents, 146 (18.5%) responded that they did not consume fruits, 347 (43.9%) consume fruits one day per week and 296 (37.4%) consume fruits two and more days per week. Eighty one (10.2%) did not consume vegetable, 47 (59.8%) consume vegetables 1-2 days per week, and 236 (29.8%) consume vegetables three and more days per week.

Table 1: Socio demographic characteristics of high school students in Gondar town, North West Ethiopia, April 2012, (N=791).

Variable	Frequency	Percent (%)
Age group		
14-17	628	79.4
18-22	163	20.6
Sex		
Female	423	53.5
Male	368	46.5
School type		
Government	602	76.1
Private	189	23.9
Religion		
Christians	695	87.9
Muslims	93	11.8
Residence		
Urban	714	90.3
Rural	76	9.6
Family size		
< Four	230	29.1
≥Four	556	70.3
Sex of head of house hold		
Male	529	66.9
Female	261	33.0
Occupation of head of house hold		
Government employee	265	33.5
Merchant	263	33.2
Farmer	153	19.3
Other	73	9.2
Daily labor	33	4.2
Education of head of house hold		
Illiterate	155	19.6
Primary education	178	22.5
Secondary education	170	21.5
College and above	286	36.2

Majority, 565 (71.4%), of participants did not consume any animal product food items frequently and the rest (28.6%) consume animal product food item frequently. On the other hand 220 (27.8%) of the students responded that they did not consume any sweet food item, 511 (64.2%) consume one sweet food item per day, and 60 (7.6%) consume two and more sweet food items per day. One hundred forty (17.7%) of participants did not use snack, 550 (69.5%) used snack once per day, 77 (9.7%) used snack two times a day and 24 (3%) used snack three and more times a day (Table 2).

Physical activity characteristics of respondents

Of the total respondents, 340 (43%) were engaged in moderate or vigorous intensity work beside learning, 261 (33%) did not walk or bicycle at least 30 minutes per week, 205 (25.9%) walk or bicycle at least 30 minutes for 5 or more days per week, 380 (48%) do moderate to vigorous intensity sport for at least 10 minutes continuously, however, 125 (15.8%) of participants responded that they spent 3 or more hours sitting and watching TV. Most students, 633 (80%), got to and from school on foot and 158 (20%) traveled by car (Table 3).

In this study, some 77 (9.7%) of respondents had alcohol drinking experience, 14 (1.8%) had smoking experience.

Factors associated with overweight/obesity

Socio demographic (Age, sex, grade, residence, religion, school type, family size, occupation of head of household, education of head of household), eating habit (consumption of sweet food item, frequency of snack, frequency of meal, number of days per week fruits consumed, number of days per week vegetables consumed, frequency of consumption of animal product), and physical activity and sedentary life style (working besides learning, moderate or vigorous sport activity for at least 10 minutes, time spent in watching TV per day, number of walking or bicycling days for at least 30 minutes per week, mode of transportation) factors in relation to overweight/obese were analyzed using bivariate and multivariate logistic regression.

In the bivariate logistic regression analysis, overweight was significantly associated with school type, sex and grade level, number of sweet food item, moderate or vigorous intensity sport and mode of transportation (get to and from school) at a p-value of 0.2.

However in the multivariate analysis which was done to adjust for potentially confounding variables, only three explanatory variables (i.e. school type, sex and number of sweet food item consumed) were significantly associated with overweight, but moderate or vigorous sport activity turned out to be marginally significant at 0.05 significance level (Table 4).

Hosmer and Lemeshow's goodness-of-fit test produce chi-square of 2.95 with p-value of 0.815 hence the model was good for the data.

* Overweight including obesity

Table 2: Eating habits of high school students in Gondar town, North West Ethiopia, April 2012, (N=791)

Variable		Overweight/obesity* Yes n (%)	No n (%)
No of days per week fruits consumed	0 (No intake) 1 day 2 and more	7 (4.8%) 21 (6.1%) 19 (6.4%)	139 (95.2%) 326 (93.9%) 227 (93.6%)
No of days per week vegetables consumed	0 (No intake) 1 day 2 day 3 and more	4 (4.9%) 14 (7.4%) 15 (5.3%) 14 (5.9%)	77 (95.1%) 176 (92.6%) 268 (94.7%) 222 (94.1%)
Use of animal product food frequently	No Yes	29 (5.1%) 18 (8%)	536 (94.9%) 208 (92%)
Number of sweet food item used	0 (not used) 1sweet food item 2 and more sweet food item	8 (3.6%) 29 (5.7%) 10 (16.7%)	212 (96.4%) 482 (94.3%) 50 (83.3%)
Number of serving snack per day	0 or no snack 1times 2 times 3 times and more	13 (9.3%) 29 (5.3%) 2 (2.6%) 3 (12.5%)	127 (90.7%) 521 (94.7%) 75 (97.4%) 21 (87.5%)
Number of meals served per day	1times 2 times 3 times 4 times and more	4 (7.7%) 10 (5.6%) 30 (5.9%) 3 (5.5%)	48 (92.3%) 167 (94.4%) 476 (94.1%) 52 (94.5%)

* Overweight including obesity

Table 3: Physical activity Characteristics of high school students in Gondar town, North West Ethiopia, April 2012

Variable		Overweight/obesity* Yes n (%)	No n (%)
Working besides Learning	No Yes	27 (6%) 20 (5.9%)	422 (94%) 320 (94.1%)
Moderate or vigorous sport activity for at least 10 minutes	No Yes	36 (8.8%) 11 (2.9%)	375 (91.2%) 369 (97.1%)
No of walking or bicycling days for at least 30 minutes per week	0 1-2 3-4 5-7	23 (8.8%) 9 (4.8%) 7 (5.1%) 8 (3.9%)	238 (91.2%) 180 (95.2%) 129 (94.9%) 197 (96.1%)
Time Spent in watching TV per day	<2 2-3 hrs >3hrs	17 (5.2%) 19 (5.7%) 10 (8%)	311 (94.8%) 314 (94.3%) 115 (92%)
Mode of transportation	On foot By car	27 (4.3%) 20 (12.7%)	606 (95.7%) 138 (87.3%)

Discussion

This study disclosed the prevalence and associated factors of overweight and obesity among high school students in Gondar town. Accordingly, the prevalence of overweight and obesity were 5.4% and 0.5% respectively. The sex specific prevalence of overweight was 8.7% among girls and 1.6% among boys, while the prevalence of obesity was 0.9% among girls but none of the boys were obese. The overall prevalence of overweight and obesity in this study is comparable with the prevalence reported in Addis Ababa in 2007 in which 7.6 % and 0.9% of adolescent were overweight and obese respectively [12].

However it was also lower than the prevalence reported from Sudan (14.8% overweight, 10.5% obese) [13], One of the possible reasons for the differences in prevalence of overweight and obesity could be due to cultural difference in dietary intakes.

The prevalence of overweight among the adolescents studying in private schools was 10.1% and was higher than those studying in government schools (4%). This finding in line with the studies in Addis Ababa (12) and Hyderabad, India [14]. This could be due to a difference in income; higher in families of private school students.

The sex specific prevalence of overweight was similar with findings from Nigeria of which 0-8.1% males and 1.3-8.1% females were overweight [15], Ghana and Uganda (10.4% girls, 3.2% boys were overweight while 0.9% females and 0.5% males were obese) [16] and Raichur district, India of which 6.17% of students were overweight in the year 2007 [17].

As can be noted from findings of multivariate analysis, school type had a remarkable impact on overweight. Students from private school were 2.48 times more likely to become overweight as compared to students from government school. This result is consistent with the

*significant at **0.05** level of significance, ** - Overweight including obesity

Table 4: Factors associated with overweight/obesity among high school students, Gondar town, North West Ethiopia, April 2012, (N=791)

Explanatory Variable	Overweight** Yes, n	No, n	Crud OR (95%CI)	Adjusted OR (95%CI)	P-value for AOR
School type					
Private	22	167	3.04 (1.67, 5.53)	2.48 (1.33, 4.64)	0.004
Government	25	577	1	1	
Sex					
Female	41	382	6.46 (2.72, 15.43)	4.47 (1.79, 11.13)	0.001
Male	6	362	1	1	
Grade					
Nine	25	505	0.54 (0.30, 0.97)		
Ten	22	239	1		
sweet food item used					
0 (not used)	8	212	0.19 (0.07, 0.50)	0.32 (0.11, 0.89)	0.029
1sweet food item	29	482	0.30(0.14, 0.65)	0.35(0.16, 0.79)	0.012
2 and more sweet food item	10	50	1	1	
Moderate or vigorous sport					
No	36	375	3.21 (1.61, 6.42)	1.99 (0.95, 4.16)	0.068*
Yes	11	369	1	1	
Mode of transportation					
On foot	27	606	0.31 (0.17, 0.56)		
By car	20	138	1		

study conducted in Hyderabad, India [14]. The possible explanation might be students in private schools came from high socio-economic status family. In addition to this, private schools use bus (service) to transport their students which in turn let students to be more sedentary.

Sex was another variable which was strongly associated with overweight. Female students were 4.47 times at high risk of being overweight as compared to males. This finding was in line with study done in South Africa [18], Jordan [19]. The possible reason for this could be; girls spent most of their time at home and their movement from place to place are much restricted due to cultural influence than boys which result in more sedentary life.

An increase in use of sweet food item had an adverse effect on overweight. Those students who did not use any sweet food item were less likely to become overweight as compared to students who use two and more sweet food items. Likewise, students who use one sweet food item were 65% less likely to become overweight as compared to students who use two and more sweet food items. The result was similar with the study conducted in Turkey [20]. This could be explained as sweet food item are calorie dense food which result in positive energy balance to their consumers.

In this study, moderate or vigorous sport activity for at least ten minutes continuously was marginally significant. Thus, students who did not do any moderate or vigorous sport activity for at least ten minutes continuously were 1.99 times at risk of being overweight than those who did moderate or vigorous sport activity. This in line with the result of most studies in the United States which have found a negative relationship between physical activity, especially of vigorous intensity, and the prevalence of overweight/ obesity [21]. This could be explained as physical activity results in energy expenditure thereby decreasing adiposity in the body. Here a difference in study design (cross-sectional VS longitudinal) could attribute to the marginality in significance.

Diet related factors like use of animal product food item and fruit consumption did not have significant association with overweight. In contrast, previous studies in Turkey [20], Saudi Arabia [22], and in Europe [22,23] revealed that increasing fruit intake and decreasing animal food item were significantly associated with less overweight chance of an individual. This suggests that risk factors for excess body weight should be identified based on the local situation.

Even though this study addresses very important issues, there are also some limitations like; variables which can affect overweight such as parental weight status, family income, nutritional knowledge, use of medication and formula feeding were not addressed in this study. Since the study depends on self report, there might be social desirability bias from respondents. In other way, the study was not out of the limitations of cross sectional study like identifying the temporal relationship.

Conclusion

This study revealed that overweight and obesity are emerging among high school students in Gondar, despite; the observed overall prevalence is low. A high prevalence of overweight was found among students of private schools in the study area. In this study, school type, sex and use of sweet food item were significantly associated with overweight. Thus, Health and nutritional education should be given through school media and schools need to keep students active for most of physical education class time.

Conflict of interest

The authors declare that we have no conflict of interests.

Authors' contribution

Gebremedhin Berhe gebregergs, wrote the proposal, participated in data collection, analyzed the data and drafted the paper. Melkie Endris Yesuf and Taresa Kisi Beyen approved the proposal with some revisions, and participated in analysis. All authors participated in the preparation of the manuscript and approved the final manuscript.

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References

1. Global Strategy on Diet, Physical Activity and Health, World Health Organization (WHO)
2. Overweight and Obesity fact sheet September 2011, World Health Organization
3. Global Health Observatory (GHO), World Health Organization
4. Hazbun OM, Azcona C, Martínez JA, Martí A (2009) Management of overweight and obesity in adolescents: an integral lifestyle approach. Actividad Dietética 13: 153-60.
5. The NS, Suchindran C, North KE, Popkin BM, Gordon-Larsen P (2010) Association of adolescent obesity with risk of severe obesity in adulthood. JAMA 304: 2042-2047.
6. Kelishadi R (2007) Childhood overweight, obesity, and the metabolic syndrome in developing countries. Epidemiol Rev 29: 62-76.
7. Ziraba AK, Fotso JC, Ochako R (2009) Overweight and obesity in urban Africa: A problem of the rich or the poor? BMC Public Health 9: 465.
8. Garenne M (2010) Urbanisation and child health in resource poor settings with special reference to under-five mortality in Africa. Arch Dis Child 95: 464-468.
9. WHO. Global Physical Activity Questionnaire (GPAQ) Analysis Guide
10. WHO steps instrument for chronic disease surveillance.
11. CDC. Using BMI-for-Age Growth charts.
12. Alebachew Z (2009) Prevalence of childhood and adolescent overweight and obesity among elementary school students in Addis Ababa: Double burden of malnutrition in Ethiopia. Addis Ababa University digital library

13. Salman Z, Kirk GD, Deboer MD (2010) High Rate of Obesity-Associated Hypertension among Primary Schoolchildren in Sudan. Int J Hypertens 2011: 629492.

14. Laxmaiah A, Nagalla B, Vijayaraghavan K, Nair M (2007) Factors affecting prevalence of overweight among 12- to 17-year-old urban adolescents in Hyderabad, India. Obesity (Silver Spring) 15: 1384-1390.

15. Akinpelu A, Oyewole O, Oritogun K (2008) Overweight and Obesity: Does It Occur In Nigerian Adolescents in an Urban Community? Int J Biomed Hlth Sci 16: 56-66.

16. Peltzer K, Pengpid S (2011) Overweight and obesity and associated factors among school-aged adolescents in Ghana and Uganda. Int J Environ Res Public Health 8: 3859-3870.

17. Rossouw HA, Grant CC, Viljoen M (2012) Underweight, overweight and obesity among South African adolescents National Youth Risk Behavior Survey. S Afr J Sci 108: 203-207.

18. Khader Y, Irshaidat O, Khasawneh M, Amarin Z, Alomari M, et al. (2009) Overweight and obesity among school children in Jordan: prevalence and associated factors. Matern Child Health J 13: 424-431.

19. GaripaÄŸaoÄŸlu M, Sahip Y, Budak N, Akdikmen O, Altan T, et al. (2008) Food types in the diet and the nutrient intake of obese and non-obese children. J Clin Res Pediatr Endocrinol 1: 21-29.

20. Robert F, Zoeller J (2009) Physical Activity, Sedentary Behavior, and Overweight/Obesity in Youth: Evidence from Cross-sectional, Longitudinal, and Interventional Studies. Am J Lifestyle Med 3: 110-114.

21. Collison KS, Zaidi MZ, Subhani SN, Al-Rubeaan K, Shoukri M, et al. (2010) Sugar-sweetened carbonated beverage consumption correlates with BMI, waist circumference, and poor dietary choices in school children. BMC Public Health 10: 234.

22. de Sa J, Lock K (2008) Will European agricultural policy for school fruit and vegetables improve public health? A review of school fruit and vegetable programmes. Eur J Public Health 18: 558-568.

23. Aggarwal T, Bhatia RC, Singh D, Sobti PC (2008) Prevalence of obesity and overweight in affluent adolescents from Ludhiana, Punjab. Indian Pediatr 45: 500-502.