

Association between obesity and mental disorders among male secondary school students in Abha, Kingdom of Saudi Arabia: A Predictor based Cross-Sectional Study

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Received: December 2020; Accepted: January 2021; Published: February 1, 2021.

Citation: Mubarak M.A. Alshahrani et al.. Association between obesity and mental disorders among male secondary school students in Abha, Kingdom of Saudi Arabia: A Predictor based Cross-Sectional Study. World Family Medicine. 2021; 19(1): 49-57 DOI:10.5742/MEWFM.2021.93983

Abstract

Background: Obesity-related morbidity continues to increase in Saudi Arabia, especially among school students, who constitute a vulnerable population since they can be highly influenced by the western culture and rapid globalization.

Aim of Study: To examine the relationship between obesity and negative emotional states among male secondary school students.

Methodology: This was a cross-sectional study conducted among male secondary school students in Abha City, Saudi Arabia during the academic year 2019-2020. A multistage cluster sampling technique was followed by the researchers, in order to recruit participants. The standardized Arabic version of Depression Anxiety Stress Scale (DASS-21) was used by the researchers for determining prevalence and levels of depression, anxiety and stress symptoms among participants.

Results: Three hundred and ninety eight students participated in the study. Their mean age (\pm SD) was 16.98 ± 0.93 years. Overweight and obesity was present among 44.2% and 38.4% of participants, respectively. The overall prevalence rates for symptoms of depression, anxiety and stress among participants were 57%, 64.6% and 39.4%, respectively. There were statistically significant associations between obesity and symptoms of depression, anxiety and stress ($p < 0.001$ for all).

Conclusions: The burden of overweight and obesity are high among the male secondary school students. Overweight and obesity are associated with symptoms of depression, anxiety and stress. Therefore, there should be emphasis on implementing interventions to raise awareness about maintaining normal body mass index among the school students and thereby reducing the risk of mental disorders.

Key words: Obesity, Mental disorders, Depression, Anxiety, Stress, School students, Saudi Arabia.

Introduction

Obesity has become a major public health problem, with several associated physical and psychosocial complications. Although it is increasing in all age groups and among all racial groups and educational levels, young adults aged 18 to 29 years experience the highest rate of increase (1). Obesity during adolescence carries with it important psychosocial sequelae. The experience of weight stigma or perceived weight discrimination is associated with several negative emotional states (2).

Obesity has an impact on psychological well-being, which can lead to several mental disorders, e.g., depression, anxiety, stress, eating disorder, or distorted body image (3). As per the research carried out in childhood obesity, anxiety is considered to be both a symptom and a disorder that has been more commonly reported among the child population (4).

Adolescent age group is one of the highly significant stages in human life. At this stage, multifactorial changes that include biological, physiological and psychological changes occur, which mainly cause depression that can affect the academic performance of the students in the school and the colleges. It can also make the adolescents vulnerable to substance abuse which further can increase the risk of suicides among the adolescents (5).

Depression among adolescents is the major public health issue throughout the world in the last few years (6). Prior evidence suggests that depression is often under-diagnosed in a variety of health care organizations inclusive of primary health care centers. Depression among the youth and the teenagers in schools is quite frequently underdiagnosed which further increases the burden of depression in the country (7).

The prevalence rate of depression has severely increased over a period of years across the world and in the developing countries the prevalence rate has sharply increased to 44% (8). Prevalence of depression is quite alarming in the Kingdom of Saudi Arabia (KSA). The predisposing factors that increase the level of depression among the population includes stress, chronic diseases, sedentary life style, social isolation and social stigmas in terms of psychiatric illnesses (9).

A study carried out in the KSA using the 'Depression, Anxiety and Stress Scale (DASS) reported that 59.4% of students had symptoms of at least one of the above-mentioned negative emotional states (10).

Generally, students, especially those at secondary schools, are more prone to have stress mainly due to the heavy academic burden and fears about the future. The students may come across a huge amount of stress due to lack of relaxation time and competitive examinations at the end of the school education (11).

A positive association has been observed between obesity and psychological well-being of the population. Obese persons may be more prone to depression, anxiety, stress, eating disorders and low self-esteem due to disorientation of their body shape (12). However, the association between obesity and mental health problems is very complex in nature and difficult to understand. There are several theories that were framed mainly to link obesity with mental health problems (13).

The systematic review of Luppino et al. described a bidirectional relationship between obesity and depression. They reported that obese individuals were at risk of developing depression, and depressed persons had 58% of increased risk of becoming obese (14). Likewise Garipey et al. found a positive association between obesity and the anxiety disorders (15).

Obesity during adolescence carries with it important psychosocial sequelae, in addition to the medical complications. In KSA, prevalence of obesity continues to increase steadily among adolescents (16). Mouzan et al. (17) reported that the prevalence rate for overweight and obesity was as high as 37.2%. However, there is still limited information on overweight and obesity and its psychosocial impact among Saudi children and adolescents.

Research on the association between obesity and mental disorders among Saudi male secondary school students is so scarce. Therefore, the present study aimed to find the association between obesity and mental disorders among male secondary school students in Abha City, KSA.

Materials and Methods

Following a cross-sectional research design, this study was conducted during the period from August to December 2019 and included 398 male secondary school students in Abha City, KSA.

A multistage cluster sampling technique was applied. Lists of governmental secondary schools for boys in the Abha City were obtained from the Directorate of Education in Aseer Region. Abha city was geographically divided into: central, east, west, north and south administrations and the schools were listed based on these five administrative locations. Two male public secondary schools from each location were randomly selected. To fulfill the required sample size from the 10 randomly selected secondary schools, about 40 students were randomly selected in the study from each selected school (Figure 1).

Inclusion criteria were being a student, aged less than 20 years in the selected governmental secondary schools. On the other hand, students with special needs were excluded. Each participating student was interviewed using a structured self-administered questionnaire, which was developed by the researchers. It contains information about students' socio-demographic characteristics and the anthropometric measurements, including height, weight and body mass index (BMI). Students' weight was

measured using a digital scale and their height was taken by a stadiometer. Students' BMI was calculated by using the formula: (18)

$$\text{BMI (Kg/m}^2\text{)} = \text{Weight (Kg)} / \text{Height (m}^2\text{)}$$

Students were classified based on their BMI as: Normal (BMI = 18.5-24.9 Kg/m²); Overweight (BMI = 25-29.9 Kg/m²); or Obese (BMI = ≥ 30 Kg/m²). (18)

The Depression, Anxiety and Stress, 21-item Scale (DASS-21) was used in the present study to assess the common negative emotional states that include depression, anxiety and stress. Depression was classified based on the scores obtained from the depression anxiety stress scale and it is classified as Normal (0-9), Mild (10-13), Moderate (14-20), Severe (21-27) and extremely severe (≥ 28). Similarly, anxiety was classified based on the scores obtained from the depression anxiety stress scale and it is classified as Normal (0-7), Mild (8-9), Moderate (10-14), Severe (15-19) and extremely severe (≥ 20). Likewise, stress was classified based on the scores obtained from the depression anxiety stress scale and it is classified as Normal (0-14), Mild (15-18), Moderate (19-25), Severe (26-33) and extremely severe (≥ 34). The Arabic version of DASS-21 questionnaire has been already validated as per the Arabic culture (19).

Ethical approval was obtained from the Research Ethics Committee, King Khalid University, Abha, Kingdom of Saudi Arabia. Moreover, verbal consent was obtained from the concerned class teacher and overall head of the school for collecting the data about obesity and mental disorders.

Collected data were analyzed using the Statistical Package for Social Sciences (IBM, SPSS (version 16.0, SPSS Inc. Chicago, IL, USA). Frequency tables were used to describe the socio-demographical characteristics of participants. To test significance of differences the Chi square test was applied for categorical variables. Pearson's correlation between two quantitative variables was applied. Tests of significance were two-tailed and were set at $p < 0.05$.

Results

Table 1 shows that age of 20.1% of students was <17 years, 54.5% were 17 years old, while 25.4% were 18 years old or more (Figure 2). The mean age of the participant students was 16.98 ± 0.93 years. Regarding students' body mass index, 17.3% had normal body mass index (<25 kg/m²), while 44.2% were overweight (25-29.9 kg/m²) and 38.4% were obese (>30 kg/m²), as shown in Figure 3. Students' mean BMI was 29.15 ± 5.84 kg/m².

Table 2 shows participant students' responses regarding DASS-21.

Table 3 shows that secondary school students' average BMI showed a slightly increasing positive trend with their age. The lowest BMI was observed among those aged <17

years (28.5 ± 6.5 kg/m²), while the highest was observed among those aged >18 years (30.2 ± 5.7 kg/m²). However, differences in BMI according to students' age groups was not statistically significant ($p = 0.100$).

Table 4 shows that 57% of participant students had symptoms of depression, with varying severity grades: mild (14.8%), moderate (20.1%), severe (10.1%) or extremely severe (12.1%). About two-thirds of participant students (64.6%) had symptoms of anxiety, with varying severity grades: mild (7.5%), moderate (17.6%), severe (15.1%) or extremely severe (24.4%), while 60.6% had symptoms of stress, with varying severity grades: mild (12.6%), moderate (11.8%), severe (10.3%) or extremely severe (4.8%).

Table 5 shows that prevalence and severity of negative emotional states (depression, anxiety and stress) among male secondary school students differed significantly according to their body mass index ($p < 0.001$ for all comparisons).

Discussion

The present study showed high prevalence rates of overweight and obesity among male secondary school students in Abha City (44.2% and 38.4%, respectively).

This finding is in agreement with those reported by other studies in Saudi Arabia among male students. Farshori et al. (20) in Hail City, reported that prevalence rates of overweight and obesity among male students aged 13-18 years were 48% and 29%, respectively, while Shaikh et al., (21) in Qassim Region, reported that prevalence of overweight and obesity among Saudi intermediate school students, between 12-14 years of age were 55.8% and 21.7%, respectively. However, lower prevalence rates were also reported in Saudi Arabia by Al-Hussaini (22) among male school children aged 6-16 years in Riyadh City (12% and 18.4%), and Abdalla et al. (23) in Majmaah City among primary school students aged 6-14 years (11.2% and 17.6%, respectively).

The lower prevalence rates for overweight and obesity among male secondary school students reported in some studies in Saudi Arabia compared to results of our study may be due to regional or socio-demographic variations.

The present study found that more than half of male secondary school students (57%) had symptoms of depression, while about two-thirds of them had symptoms of anxiety (64.6%) and 60.6% had symptoms of stress. All these three negative emotional states among participants were of variable grades of severity from mild to extremely severe.

This finding is in accordance with that of Hakamy et al. (24) in Jizan, Saudi Arabia, who reported that 50% of secondary school students had symptoms of depression, of whom 17.3% had mild depressive symptoms, 16.5% had moderate symptoms, while severe and extremely severe

Figure 1: Flowchart showing the adopted sampling method in this study

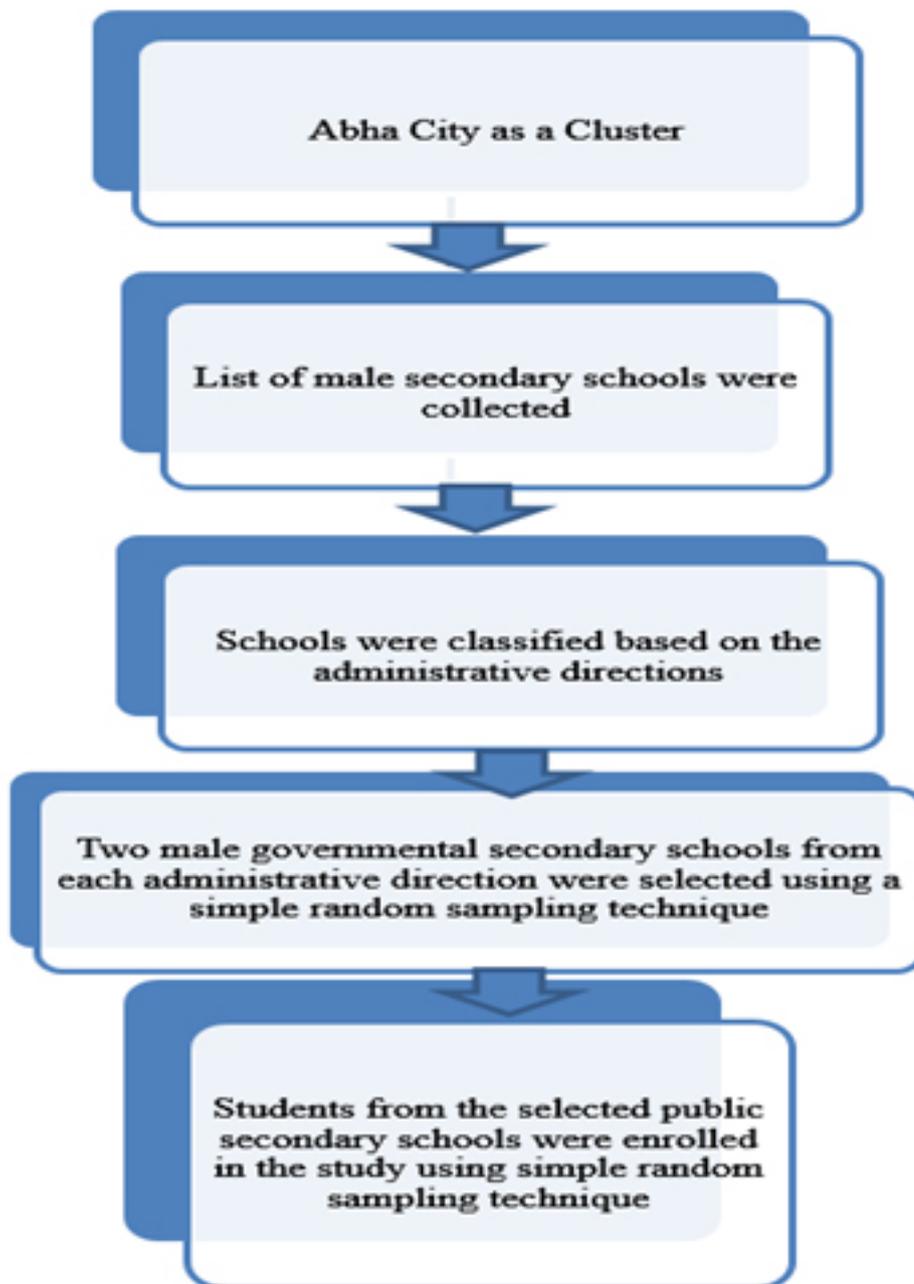


Table 1: Personal characteristics of participant students (n=398)

Characteristics	No. (%)
Age groups	
• <17 years	80 (20.1%)
• 17 years	217 (54.5%)
• ≥ 18 years	101 (25.4%)
• Mean \pm SD	16.98 \pm 0.93
Body mass index	
• Normal (<25 kg/m ²)	69 (17.3%)
• Overweight (25-29.9 kg/m ²)	176 (44.2%)
• Obese (≥ 30 kg/m ²)	153 (38.4%)
• Mean \pm SD	29.15 \pm 5.84

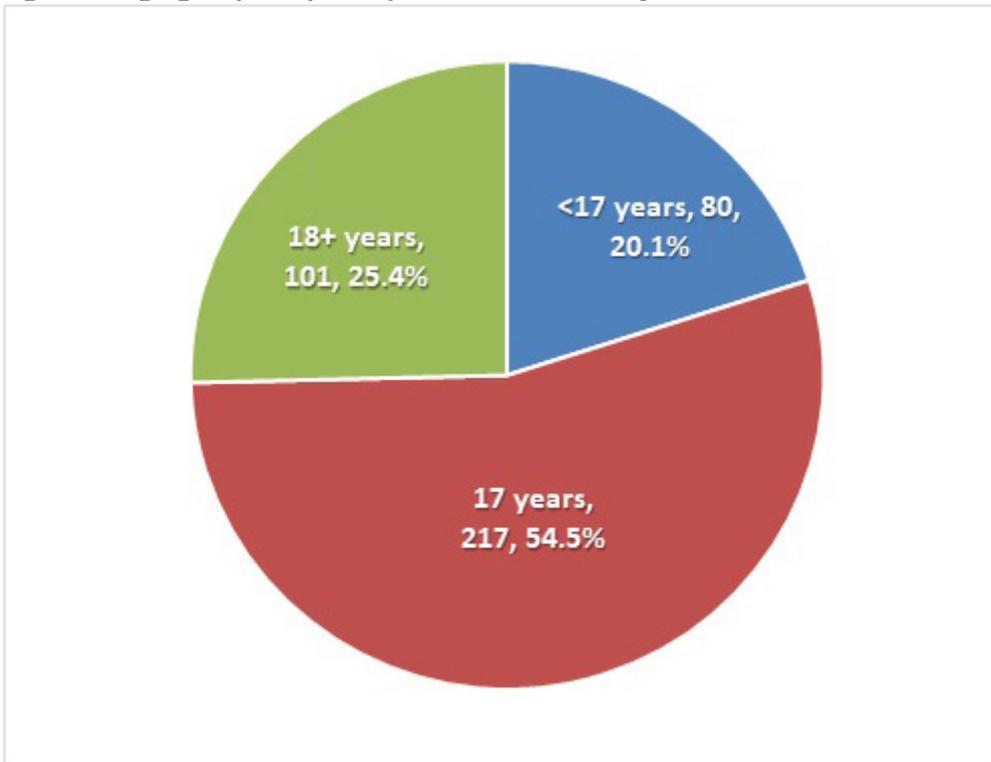
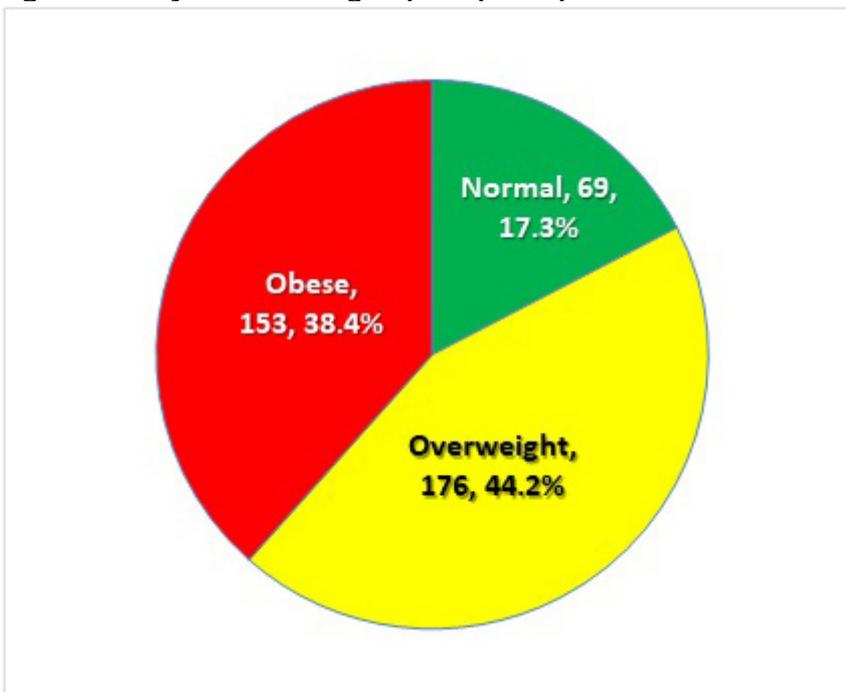
Figure 2: Age groups of participant male secondary school students**Figure 3: Body mass index groups of participant students**

Table 2: Responses of participant students to DASS-21 (n=398)

DASS-21 items	Never	Sometimes	Often	Always
	No. (%)	No. (%)	No. (%)	No. (%)
I found it hard to wind down	196(49.2%)	134(33.7%)	47(11.8%)	21(5.3%)
I was aware of dryness of my mouth	222(55.8%)	123(30.9%)	40(10.1%)	13(3.3%)
I couldn't seem to experience any positive feeling at all	245(61.6%)	85(21.4%)	50(12.6%)	18(4.5%)
I experience breathing difficulty in the absence of physical exertion	255(64.1%)	75(18.8%)	46(11.6%)	22(5.6%)
I find it difficult to work up the initiative to do things	181(45.5%)	123(30.9%)	66(16.6%)	28(7.0%)
I tended to over-react to situations	214(53.8%)	106(26.6%)	43(10.8%)	35(8.8%)
I experienced trembling (e.g. in the hands)	198(49.7%)	106(26.6%)	58(14.6%)	36(9.0%)
I felt that I was using a lot of nervous energy	170(42.7%)	103(25.9%)	77(19.3%)	48(12.1%)
I was worried about situations in which I might panic and make a fool of myself	175(44%)	89(22.4%)	81(20.4%)	53(13.3%)
I felt that I had nothing to look forward to	233(58.5%)	100(25.1%)	42(10.6%)	23(5.8%)
I found myself getting agitated	189(47.5%)	133(33.4%)	54(13.6%)	22(5.5%)
I found it difficult to relax	217(54.5%)	114(28.6%)	35(8.8%)	32(8.0%)
I felt down-hearted and blue	171(43.0%)	116(29.1%)	57(14.3%)	54(13.6%)
I was intolerant of anything that kept me from getting on with what I was doing	206(51.8%)	113(28.4%)	48(12.1%)	31(7.8%)
I felt I was close to panic	259(65.1%)	78(19.6%)	43(10.8%)	17(4.6%)
I am unable to become enthusiastic about anything	202(50.8%)	102(25.6%)	58(14.6%)	36(9.0%)
I felt I wasn't worth much as a person	270(67.8%)	70(17.6%)	42(10.6%)	16(4.0%)
I felt that I was rather touchy	219(55%)	104(26.1%)	41(10.3%)	34(8.5%)
I was aware of the action of my heart in the absence of physical exertion	244(61.3%)	75(18.8%)	51(12.8%)	28(7.0%)
I felt scared without any good reason	245(61.6%)	85(21.4%)	42(10.6%)	26(6.5%)
I felt that life was meaningless	230(57.8%)	88(22.1%)	39(9.8%)	41(10.3%)

Table 3: Participant students' body mass index (Mean±SD) according to their age

Age of students	No.	Mean±SD	P-value
• <17 years	80	28.5±6.5	0.100
• 17 years	217	29.1±5.0	
• ≥18 years	101	30.2±5.7	

Table 4: Grades of negative emotional states (depression, anxiety and stress) according to DASS-21 among participant students

Grades of negative emotional states	No. (%)
Symptoms of Depression	
• Absent	171 (43.0%)
• Present	227 (57.0%)
• Mild	59 (14.8%)
• Moderate	80 (20.1%)
• Severe	40 (10.1%)
• Extremely severe	48 (12.1%)
Symptoms of Anxiety	
• Absent	141 (35.4%)
• Present	257 (64.6%)
• Mild	30 (7.5%)
• Moderate	70 (17.6%)
• Severe	60 (15.1%)
• Extremely severe	97 (24.4%)
Symptoms of Stress	
• Absent	241 (60.6%)
• Present	157 (39.4%)
• Mild	50 (12.6%)
• Moderate	47 (11.8%)
• Severe	41 (10.3%)
• Extremely severe	19 (4.8%)

Table 5: Distribution of participant students' body mass index according to their grades of negative emotional states

Grades of Negative Emotional States	Body mass index (BMI)			P Value
	Normal (n=69) No. (%)	Overweight (n=176) No. (%)	Obese (n=153) No. (%)	
Depression				<0.001*
• Absent	13 (18.8%)	98 (55.7%)	64 (41.8%)	
• Mild	7 (10.1%)	18 (10.2%)	34 (22.2%)	
• Moderate	13 (18.8%)	42 (23.9%)	25 (16.3%)	
• Severe	10 (14.5%)	12 (6.8%)	18 (11.8%)	
• Extremely Severe	26 (37.7%)	6 (3.41%)	8 (5.2%)	
Anxiety				<0.001*
• Absent	42 (60.9%)	68 (38.6%)	35 (22.9%)	
• Mild	4 (5.8%)	12 (6.8%)	14 (9.2%)	
• Moderate	13 (18.8%)	20 (11.4%)	33 (21.6%)	
• Severe	7 (10.1%)	28 (15.9%)	25 (16.3%)	
• Extremely Severe	3 (4.3%)	48 (27.3%)	46 (30.1%)	
Stress				<0.001*
• Absent	24 (34.8%)	117 (66.5%)	104 (68.0%)	
• Mild	7 (10.1%)	26 (14.8%)	17 (11.1%)	
• Moderate	8 (11.6%)	23 (13.1%)	16 (10.5%)	
• Severe	22 (31.9%)	8 (4.5%)	11 (7.2%)	
• Extremely Severe	8 (11.6%)	2 (1.1%)	5 (3.3%)	

* Statistically Significant

grades were present in 11.3% and 4.9% of students, respectively. More than half of students had symptoms of anxiety (59.7%), of whom 22.7% had moderate grade, while severe and extremely severe grades were present in 13.2% and 14.6% of students, respectively. Symptoms of stress were present among 39% of students, with most students having either mild or moderate grades (13.7% for both), while severe and extremely severe grades were present in 9.7% and 1.9% of students, respectively. Similarly, Alenazi et al. (25), in Arar City, Saudi Arabia, reported that prevalence rates of depression, anxiety and stress among male secondary school students were 56.3%, 56%, and 41.9%, respectively.

However, prevalence of depression, anxiety, and stress symptoms among secondary school students in Imphal, Manipur, India, were much lower than those reported in Saudi Arabia (19.5%, 24.4%, and 21.1%, respectively). These reported low prevalence rates of negative emotional states among school students in India may be due to different cultures and traditions practiced in that country, as well as the variations in the socio-demographic features of study samples.

The present study revealed that both prevalence and severity of studied negative emotional states (i.e., depression, anxiety and stress) among male secondary school students differed significantly according to their body mass index.

This finding is in agreement with those reported by several studies. In Abha City, Saudi Arabia, AlQahtani et al. (26) reported a significant association between obesity and levels of depression, anxiety, and stress ($p < 0.001$; $p < 0.001$; and $p = 0.003$, respectively). Moreover, in Amsterdam, Netherlands, von Vuuren et al. (27) reported significant associations between overweight and mental health problems among adolescents. They found that adolescents who were overweight or obese were more likely to suffer from mental health problems in comparison with those with normal body weight. They concluded that overweight and obesity are significantly associated with mental health problems among adolescents. They recommended that mental health should be integrated into prevention programs that address healthy weight development.

Limitations

The present study followed a cross-sectional design, and is based on a self-reported questionnaire. Therefore, there may be some degree of response bias. Moreover, this study has taken place only in selected secondary schools of males in Abha City. Consequently, the generalization of our results cannot be generalized to the wider population of Saudi Arabia.

Conclusions

Prevalence of overweight and obesity among secondary school male students is quite high. Obesity is associated with higher prevalence and more severe negative emotional states. There is a pressing need for having a healthy public policy related to obesity for designing and implementing suitable interventions to control and reduce the burden of obesity among school students. Schools should provide a supportive environment to students for improving their physical activity, which further helps them maintain a normal BMI. The high prevalence of negative emotional states among secondary school students prioritizes the need of planning and implementing counselling sessions to students. Further prospective research is needed, involving both genders and covering a wider range of schools for better understanding the relationship between the obesity and mental disorders.

References

1. Goodman E, Whitaker RC. A prospective study of the role of depression in the development and persistence of adolescent obesity. *Pediatrics* 2002;110:497-504.
2. Williams EP, Mesidor M, Winters K, Dubbert PM, Wyatt SB. Overweight and Obesity: Prevalence, Consequences, and Causes of a Growing Public Health Problem. *Curr Obes Rep* 2015; 4:363-370
3. World Federation for Mental Health, 2010. Mental Health and chronic physical illnesses: The need for continued and integrated care. <http://wfmh.com/wp-content/uploads/2014/02/WMHDAY2010.pdf>.
4. Zipper E, Vila G, Dabbas M, Bertrand C, Mouren-Siméoni MC, Robert JJ, et al. Obesity in children and adolescents, mental disorders and familial psychopathology. *Presse Med* 2001; 30:1489-95.
5. Bhasin S, Sharma R, Saini N. Depression, anxiety and stress among adolescent students belonging to affluent families: A school-based study. *Indian J Pediatr* 2009;77:161-5.
6. Jayanthi P, Thirunavukarasu M. Prevalence of Depression among School Going Adolescents in South India. *International Journal of Pharmaceutical and Clinical Research* 2015;7(1):61-63.
7. Alotaibi T. Combating anxiety and depression among school children and adolescents through student counselling in Saudi Arabia. *Procedia-Social and Behavioral Sciences*;2015:205:18-29.
8. Andersen I, Thielen K, Bech P, Nygaard E, Diderichsen F: Increasing prevalence of depression from 2000 to 2006. *Scand J Public Health* 2011, 39(8):857-863.
9. Hidaka BH. Depression as a disease of modernity: explanations for increasing prevalence. *J Affect Disord* 2012, 140(3):205-214.
10. Al-Gelban KS. Depression, anxiety and stress among Saudi adolescent school boys, *JR Soc Promot Health*; 2007:127(1):33-37.
11. Sohail N. Stress and academic performance among medical students. *J Coll Physicians Surg Pak.* 2013; 23:67-71.

12. World Federation for Mental Health, 2010. Mental Health and chronic physical illnesses: The need for continued and integrated care. <http://wfmh.com/wp-content/uploads/2014/02/WMHDAY2010.pdf>.
13. Gatineau M, Dent M. Obesity and Mental Health. Oxford: National Obesity Observatory; 2011.
14. Luppino FS, de Wit LM, Bouvy PF, Stijnen T, Cuijpers P, Penninx BW, et al. Overweight, obesity, and depression: A systematic review and meta-analysis of longitudinal studies. *Arch Gen Psychiatry* 2010;67:220-9.
15. Garipey G, Nitka D, Schmitz N. The association between obesity and anxiety disorders in the population: A systematic review and meta-analysis. *Int J Obes (Lond)* 2010;34:407-19.
16. Al-Daghri, NM, Aljohani, NJ, Al-Attas OS, Al-Saleh Y, Alnaami AM, Sabico S, et al. "Comparisons in childhood obesity and cardiometabolic risk factors among urban Saudi Arab adolescents in 2008 and 2013." *Child: Care, Health and Development* 2016; 42(5): 652-657.
17. Mouzan MIE, Foster PJ, Herbish ASA, Salloum AAA, Omer AAA, Qurachi MM, et al. Prevalence of overweight and obesity in Saudi children and adolescents. *Annals of Saudi Medicine* 2010; 30(3): 203-208.
18. Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults--The Evidence Report. National Institutes of Health. *Obes Res* 1998; 6 (Suppl 2): S51-S209.
19. Taouk M, Lovibond PF, Laub R. Psychometric Properties of an Arabic Version of the Depression Anxiety Stress Scale (DASS). Available from: <http://www.psy.unsw.edu.au/Groups/Dass/Arabic/htm>, (Accessed June12, 2020).
20. Farshori, MP, Altamimi, N, Alsadery H, Aljaza T, Alazmi S, Almahanaa A, et al. Rapidly rising rates of child obesity in schools of hail region of Saudi Arabia: a comparative analysis. *Integrative Obesity and Diabetes* 2015; 1(5): 163-166.
21. Shaikh MA, Al Sharaf F, Shehzad K, Shoukat F, Naeem Z, Al Harbi S, et al. Prevalence and trends of overweight and obesity amongst Saudi school children, a study done by using three noninvasive methods. *Int J Health Sci.* 2016;10(3):381-7.
22. Al-Hussaini A, Bashir MS, Khormi M, AlTuraiki M, Alkhamis W, Alrajhi M, Halal T. Overweight and obesity among Saudi children and adolescents: Where do we stand today? *Saudi J Gastroenterol.* 2019; 25(4):229-235.
23. Abdalla SM, Alsaif BA, Jasser SJA, Sultan ASA. Prevalence of Obesity and Overweight among Primary School Children in Majmaah, Saudi Arabia. *Majmaah J Heal Sci.* 2017; 5(1): 30-40.
24. Hakamy M, Bahri I, Ghazwani E. Depression, anxiety and stress among Saudi secondary school students in Jizan City, Kingdom of Saudi Arabia. *Int J Curr Res* 2017; 9:59290-7.
25. Alenazi S, Hammad S, Mohamed A. Prevalence of depression, anxiety and stress among male secondary school students in Arar city, Saudi Arabia, during the school year 2018. *Electronic physician* 2019; 11(2):7522-7528.
26. AlQahtani AA, Nahar S, AlAhmari SM, AlQahtani KA. Association between obesity and mental disorders among male students of King Khalid University, Abha, Saudi Arabia. *Saudi J Obesity* 2015; 3:48-54.
27. van Vuuren CL, Wachter GG, Veenstra R. et al. Associations between overweight and mental health problems among adolescents, and the mediating role of victimization. *BMC Public Health* 2019; 19(1): 1-10.