

Influence of gender on the association of body mass index with anxiety score in medical students

Dinesh Jethabhai Parmar, Balaji Wasudeo Ghugare, Bharat Chavda¹, Ravindra Ninama, Himanshu Chauhan, Mukesh Dinkar

Department of Physiology, GMERS Medical College, Gotri, Vadodara, ¹Department of Physiology, PDU Medical College, Rajkot, Gujarat, India

Abstract

Background and Aim: Anxiety disorders are the most prevalent mental disorders in developed countries, especially in adolescent and young adult population. High body mass index (BMI) is a risk factor for depression or anxiety disorders. However, there are no clear evidences supporting their association. Therefore in the present study, we intended to determine the relationship between obesity and anxiety level among medical students.

Methods: A cross-sectional study was conducted on 300 (117 male and 183 female) medical students after initial screening and BMI determination. The students were assessed using Zung self-rating anxiety scale and to determine the association between BMI and anxiety score. Odds ratio for the distribution of anxiety score among study population was assessed using Fisher exact probability test.

Results: Of the 300 students, 288 has normal anxiety score, and only 12 had mild to moderate anxiety score. None of the students had moderate to severe or extreme severe anxiety score. Out of 117 male students, 3 (2.6%) had mild anxiety score and out of 183 female students, 9 (4.9) had mild anxiety score. Odds ratio analysis between gender and anxiety demonstrated odds ratio of 0.51 at 95% confidence interval of 0.1348-1.9195.

Conclusion: The association of anxiety score with BMI was found to be significantly high in males, whereas there was no statistically significant association between anxiety score and BMI in females. Thus, results of the present study suggest that males are more prone to anxiety compared to females, especially in subjects with high BMI.

Key words: Anxiety, body mass index, medical students, Zung self-rating anxiety scale

Received: 17th June, 2014; Revised: 26th July, 2014; Accepted: 5th August, 2014

INTRODUCTION

Obesity is a growing public health concern in modern societies. Recent studies indicate that between 10% and 23% of adults in Europe and between 22% and 35% of adults in the United States are classified as obese, that is, have a body mass index (BMI) of 30 kg/m² or higher.^[1] As of 2008, the world health organisation (WHO) estimates that at least 500 million adults (> 10%) are obese, with higher rates among women than men.^[2]

Obesity has reached epidemic proportions in India in the 21st century, with morbid obesity affecting 5% of the country's population.^[3] The prevalence of obesity is expected to rise with urbanization and lifestyle shift towards reduced physical activity.^[4] Obesity is associated with type 2 diabetes, cardiovascular, cerebrovascular, psychological diseases and cancer.^[4] Anxiety disorders are the most prevalent mental disorders in developed countries. Depression, anxiety or somatoform disorders might be related to overweight and obesity but there are no clear evidences supporting their association.^[5]

Anxiety is an expression of mood. When it becomes a mental disorder, that is, characterized by excessive, uncontrollable and often irrational worry about everyday things that is disproportionate to the actual source of worry, it is diagnosed as generalized anxiety disorder (GAD). GAD occurs without an identifiable triggering stimulus. It is called generalized because the

Access this article online	
Quick Response Code:	Website: www.ijcep.org
	DOI: 10.4103/2348-8093.143486

Address for correspondence: Dr. Dinesh J. Parmar, GMERS Medical College, Gotri, Vadodara - 390 021, Gujarat, India.
E-mail: parmardinesh1982@gmail.com

remorseless worries are not focused on any specific threat; they are, in fact, often exaggerated and irrational.^[6] The connection between obesity and depression is an important public health issue because both of these conditions are so common and have a significant impact on our health care systems. Especially medical students are more prone to anxiety and its related disorders due to the intense curriculum, high demand and expectation of performance. Also, while anxiety can lead to decreased appetite and weight loss in some individuals, others tend to eat more and gain weight.

Metabolic changes are influenced by the stress system. They include a high cortisol excretion, which might play a role in the relationship of stress and depressive disorders.^[7] Brain processes in response to stress and the hypothalamic-pituitary-adrenal axis could explain the increase in BMI.^[7] Therefore, the present study has assessed the combination of obesity and the stress of medical education in medical students.

MATERIALS AND METHODS

After clearance from the Institutional Ethical Committee and obtaining written informed consent, 300 healthy 1st year and 2nd year medical students of GMERS Medical College, Gotri, Vadodara, aged between 17 and 21 years were recruited into the study. Students with the history of endocrine disorders, long-term steroid therapy and congenital heart diseases were excluded from the study. Body weight was measured while the subject was minimally clothed and without shoes and the height was measured by instructing the subject to stand in erect position with bare feet on flat floor against a vertical scale and with heels touching the wall and head straight. BMI was calculated using the formula: Weight in kg/height in m² (Quetelet index). Using body weight classification system recommended by WHO, BMI was categorized as underweight (BMI < 18.5), normal BMI (18.5 ≤ BMI < 24.9) or high BMI (≥25).^[2] Later students were given Zung self-rating anxiety questionnaire, and they were be allowed to complete the questionnaire within the duration of 10 min.^[8] The anxiety scores were quantified into normal (20-44), mild to moderate anxiety (45-59), moderate to severe anxiety (60-74), extreme severe anxiety (75-80).^[8]

Statistical analysis of data

Statistical tool EpiinfoTM version 3.5 (Statistics program for public health, center for disease control and prevention, Atlanta, Georgia, USA, 1996) was used for data analysis. Student's *t*-test and one-way ANOVA test were used appropriately for the comparison between groups. Odds ratio for the distribution of anxiety score among study population was assessed using Fisher exact

probability test (available from <http://www.vassarstats.net/odds2x2.html>).^[9] *P* < 0.05 was considered to be statistically significant.

RESULTS

Table 1 depicts the demographic characteristics of the total 300 students including 117 male and 183 female students participated in this study. Out of total 300 students, 288 has normal anxiety score, and only 12 had mild to moderate anxiety score. None of the students had moderate to severe or extreme severe anxiety score. Out of 117 male students, 3 (2.6%) had mild anxiety score and out of 183 female students, 9 (4.9) had mild anxiety score [Table 2]. The odd ratio analysis between sex and anxiety with odd ratio value 0.51 and confidence interval 0.1348-1.9195 as depicted in Table 2. There was statistically significant (*P* = 0.003) difference between anxiety score and BMI in males, whereas this difference was not found in females [Table 3]. Using Student's *t*-test the difference in anxiety score between male and female was found to be statistically significant in the high BMI group as depicted in Table 3.

DISCUSSION

In the present study, we observed that, out of 300 medical students, 288 has normal and only 12 had mild to moderate anxiety score. None of the students had moderate to severe or extreme severe anxiety score. Out of 117 male students, 3 (2.6%) had mild anxiety score and out of 183 female students, 9 (4.9%) had mild anxiety score. Odd ratio analysis [Table 2] in the present

Table 1: Gender-wise distribution of mean values for age, height, weight, BMI and anxiety score

Parameters	Male (n=117)	Female (n=183)	P
Age (years)	18.67±3.15	18.77±0.97	0.689
weight (kg)	51.28±8.08	51.41±8.9	0.898
BMI (kg/m ²)	21.17±3.15	20.66±3.5	0.202
Anxiety score	31.83±6.05	31.43±5.43	0.552

Data expressed as mean±SD. *P*<0.05 was considered statistically significant. Statistical analysis was done by Student's unpaired *t*-test. BMI: Body mass index, SD: Standard deviation

Table 2: Distribution of normal and mild to moderate anxiety score among study population with odds ratio

	Normal anxiety score	Mild to moderate anxiety score	Odds ratio	95% CI	
				Upper limit	Lower limit
Male (117)	114	03	0.51	1.919	0.135
Female (183)	174	09			
Total (300)	288	12			

Statistical analysis was done by Fisher exact probability test. CI: Confidence interval

Table 3: Anxiety score in different BMI groups

Parameters	Underweight		Normal BMI		High BMI	
	Male (n=27)	Female (n=62)	Male (n=70)	Female (n=93)	Male (n=20)	Female (n=28)
Anxiety score	33.15±4.64	32.48±6.51	30.97±5.80	31.80±6.77	36.64±5.16 ^{###}	31.46±4.70 ^{***}

BMI: Body mass index. Statistical analysis was done by Student's *t*-test to compare the difference in anxiety score among gender. ^{***}*P*<0.001 was considered statistically significant. Statistical analysis was done by one-way ANOVA test followed by post-hoc Tukey test among 3 BMI groups. [#]Comparison with normal BMI in males, ^{###}*P*<0.001

study population reveals that females are protected against stress and its related disorders compared to age, and BMI matched [Table 1] males. This was further supported by the increased anxiety score in males compared with females in high BMI group. However, there was no statistically significant difference in gender in the underweight and normal BMI groups. The anxiety score was found significantly increased in high BMI group among males compared with normal BMI subjects, whereas there was no statistically significant difference between anxiety score and BMI in females [Table 3]. Thus, results of the present study suggest that males are more prone to anxiety compared to females and therefore the risk for future morbidities could be more in high BMI subjects.

Rohini *et al.* observed that out of 136 students, mild-moderate anxiety score was evident in 10 (7.4%) with remaining students showing normal anxiety score.^[10] This could be due to the majority of male students (94.3% [*n* = 50]) included in the study population than the females (91.6% [*n* = 76]). There was no association between overweight and anxiety scores. Although, expect the high BMI group in males, the other BMI groups did not appear to be related with anxiety score, with odd ratio of 0.51, it is suggested that males were more prone for development of anxiety as compared to females [Table 2]. Further, Kharche *et al.* found no statistical significance in anxiety score between normal BMI group and overweight group.^[8]

Obesity is associated with several problems such as lower self-concept, negative self-evaluation, decreased self-image, anxiety, and depression. Various studies^[11-13] have demonstrated that children and adolescents at the highest quartiles of BMI had a higher prevalence of concurrent depression, suggesting that associations between these two conditions was more likely to exist in individuals with more severe obesity and also found that increased anxiety and depression were associated with emotional over-eating and loss of control over eating. Jorm *et al.* observed that obesity had association with anxiety, depression and emotional well-being in different age groups.^[14] Warschburger found that obese children and adolescents might experience significant restriction in their emotional well-being.^[15] As such this young population is more vulnerable to obesity, due to lack of time and opportunity for regular exercise and eating

more unhealthy food to avoid the internal stress.^[16,17] The novelty of the present study is that the level of anxiety has been assessed in medical students having BMI in the obesity range, which has not been reported earlier. At present, in India stress in medical students is high due to increased demand of study in the changed curriculum. Therefore, the present study will focus on the need to reduce anxiety in medical students, especially in males. Furthermore, the effect of gender on the anxiety score adds to the newness of the study.

Limitations of the study

Self-assessment anxiety scale used might not give the appropriate data because subjects tend to respond in socially desirable way. Objective parameters like serum or salivary cortisol have not been assessed, moderate sample size in each BMI groups and differences in their demographic variable are the other limitations of the study.

CONCLUSION

This preliminary report indicates presence of stress in the form of increased anxiety score in medical students. Association of anxiety score with BMI was found to be significantly high in males whereas, there was no statistically significant association between anxiety score and BMI in females. Thus, results of the present study suggest that males are more prone to anxiety compared to females, especially in subjects with high BMI. Further studies should be done to assess if the level of anxiety can be reduced in medical students and the stress related problems can be treated by yoga and naturopathy.

ACKNOWLEDGMENTS

We sincerely acknowledge the technical and statistical help offered by Mrs. Shraddha D Parmar. We are also thankful for medical students who voluntarily participated in the study.

REFERENCES

1. Bruffaerts R, Demyttenaere K, Vilagut G, Martinez M, Bonnewyn A, De Graaf R, *et al.* The relation between body mass index, mental health, and functional disability: A European population perspective. *Can J Psychiatry* 2008;53:679-88.

2. Obesity and overweight. World Health Organization. Available from: www.who.int/mediacentre/factsheets/fs311/en/index.html. [Last retrieved on 2009 Apr 08].
3. Ng M, Fleming T, Robinson M, Thomson B, Graetz N, Margono C. Global, regional, and national prevalence of overweight and obesity in children and adults during 1980-2013: A systematic analysis for the Global Burden of Disease Study 2013. *Lancet* 2014;384:766-81.
4. Yanovski SZ, Yanovski JA. Obesity. *N Engl J Med* 2002;346:591-602.
5. 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.
6. Schacter DL. *Psychology*. 2nd ed. New York: Worth Publishers; 2011. p. 559.
7. Chrousos GP. The role of stress and the hypothalamic-pituitary-adrenal axis in the pathogenesis of the metabolic syndrome: Neuro-endocrine and target tissue-related causes. *Int J Obes Relat Metab Disord* 2000;24:S50-5.
8. Kharche JS, Pranita A, Joshi AR. Measurement of anxiety in young obese students using zung self rating anxiety scale inventory. *Paripex Indian J Res* 2013;2:288-9.
9. Vassar Stats: Website for Statistical Computation. Available from: <http://www.vassarstats.net/odds2x2.html>. [Last accessed on 2014 Sep 10].
10. Rohini HN, Kudachi P, Goudar S. Association of overnutritional status with anxiety in medical students. *Natl J Physiol Pharm Pharmacol* 2012;2:123-7.
11. Onyike CU, Crum RM, Lee HB, Lyketsos CG, Eaton WW. Is obesity associated with major depression? Results from the Third National Health and Nutrition Examination Survey. *Am J Epidemiol* 2003;158:1139-47.
12. Anderson SE, Cohen P, Naumova EN, Must A. Association of depression and anxiety disorders with weight change in a prospective community-based study of children followed up into adulthood. *Arch Pediatr Adolesc Med* 2006;160:285-91.
13. Goossens L, Braet C, Van Vlierberghe L, Mels S. Loss of control over eating in overweight youngsters: The role of anxiety, depression and emotional eating. *Eur Eat Disord Rev* 2009;17:68-78.
14. Jorm AF, Korten AE, Christensen H, Jacomb PA, Rodgers B, Parslow RA. Association of obesity with anxiety, depression and emotional well-being: A community survey. *Aust N Z J Public Health* 2003;27:434-40.
15. Warschburger P. The unhappy obese child. *Int J Obes (Lond)* 2005;29:S127-9.
16. John U, Meyer C, Rumpf HJ, Hapke U. Relationships of psychiatric disorders with overweight and obesity in an adult general population. *Obes Res* 2005;13:101-9.
17. Whitaker RC. Mental health and obesity in pediatric primary care: A gap between importance and action. *Arch Pediatr Adolesc Med* 2004;158:826-8.

How to cite this article: Parmar DJ, Ghugare BW, Chavda B, Ninama R, Chauhan H, Dinkar M. Influence of gender on the association of body mass index with anxiety score in medical students. *Int J Clin Exp Physiol* 2014;1:196-9.

Source of Support: Nil, **Conflict of Interest:** Nil.

Author Help: Online submission of the manuscripts

Articles can be submitted online from <http://www.journalonweb.com>. For online submission, the articles should be prepared in two files (first page file and article file). Images should be submitted separately.

1) **First Page File:**

Prepare the title page, covering letter, acknowledgement etc. using a word processor program. All information related to your identity should be included here. Use text/rtf/doc/pdf files. Do not zip the files.

2) **Article File:**

The main text of the article, beginning with the Abstract to References (including tables) should be in this file. Do not include any information (such as acknowledgement, your names in page headers etc.) in this file. Use text/rtf/doc/pdf files. Do not zip the files. Limit the file size to 1 MB. Do not incorporate images in the file. If file size is large, graphs can be submitted separately as images, without their being incorporated in the article file. This will reduce the size of the file.

3) **Images:**

Submit good quality color images. Each image should be less than 4096 kb (4 MB) in size. The size of the image can be reduced by decreasing the actual height and width of the images (keep up to about 6 inches and up to about 1800 x 1200 pixels). JPEG is the most suitable file format. The image quality should be good enough to judge the scientific value of the image. For the purpose of printing, always retain a good quality, high resolution image. This high resolution image should be sent to the editorial office at the time of sending a revised article.

4) **Legends:**

Legends for the figures/images should be included at the end of the article file.