

**Prevalence of depression and anxiety and their association with body mass index among high school students in Qazvin, Iran, 2013-2014**Maryam Javadi<sup>1,2</sup>, Zinat Jourabchi<sup>3</sup>, Ali Akbar Shafikhani<sup>4</sup>, Esra Tajik<sup>5,6</sup>

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**Abstract**

**Background:** Evidence shows that mental disorders among adolescents are associated with suicide, drug abuse, acute infectious diseases and low educational performances.

**Objective:** To determine the prevalence of depression and anxiety and their associations with body mass index (BMI) among high school students in Qazvin, Iran in 2013-2014.

**Methods:** A descriptive and analytical cross-sectional study using cluster-sampling method recruited 1,040 students among high schools in Qazvin, Iran from March 2013 to April 2014. Data were collected using questionnaires including demographic, Beck depression inventory and Beck anxiety inventory, and were analyzed with SPSS-19 by descriptive analyses, t-test, Chi-square and Pearson correlation.

**Results:** The prevalence of depression and anxiety was 31.8% and 14.9%, respectively and these amounts were significantly higher in girls than in boys ( $p < 0.05$ ). Respondents showed 23.75% and 11.07% mild to moderate symptoms of depression and anxiety, respectively as well as 8.08 and 3.75% severe symptoms of depression and anxiety, respectively. There was a positive and significant association between depression and anxiety ( $r = 0.256$ ,  $p < 0.001$ ) and between depression and body mass index (BMI) ( $r = 0.333$ ,  $p < 0.001$ ), however there was an inverse association between anxiety and BMI ( $r = 0.086$ ,  $p < 0.006$ ).

**Conclusion:** The current study made a significant step forward in assessment of mental disorders and BMI to show the significance of depression and anxiety among adolescents in Qazvin. Therefore, effective interventions are necessary to improve this situation as well as the evaluation of the effectiveness of the interventions.

**Keywords:** Mental disorders; Anxiety; Depression; Adolescent, Body mass index

**1. Introduction**

Adolescence is one of the important and crucial life stages and usually, this period comes with mental and spiritual changes (1). The social issues to cope with sex roles are thoughts which dramatically increase simultaneously with advancing toward maturity (1, 2). This restriction can reduce opportunities and choices among adolescents,

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especially girls (3). According to previous studies, girls have more behavioral restrictions than boys at this stage (4, 5). These situations in early adolescence may lead to formation and intensity of anxiety and depression (2, 3). Stressful experiences can sensitize future tensions in mental and biological systems in adolescents, and may lead to an increase in reaction to depression and anxiety (6). Since reaction to stress is related to problem solving disorders, depression and anxiety can cause destruction in social and job performance, and the outcome can have a negative effect on life environment (4, 5). Studies show that depression in this period is associated with suicide, drug abuse, acute infectious diseases and low academic performance (7-9). Therefore, the identification of influenced people and offering the proper interventions is crucial. Studies show that demographic characteristics such as gender (10, 11), age, academic level (12, 13) and body mass index are associated factors for depression and anxiety, however the results of various studies are contradictory in this matter (7). These disorders have interference with intellectual, emotional and behavioral methods in adolescents, and if untreated can lead to unsuccessful education and life (3). Studies indicate that obesity is related to risk of depression and other mental disorders (14, 15), however there is prospective evidence for an association between obesity and anxiety disorder (16). Since obesity and common mental diseases such as anxiety and depression are the greatest public health challenges, clarity of the causes of these relationships are very important (17). Previous studies on anxiety, depression and their risk factors revealed an inequality in geographical and variety of data (18), therefore, to reach epidemiologic objectives, further studies in various regions are necessary. Usually, schools are the first stage to recognize life-threatening behaviors, so identification and determination of prevalence of anxiety and depression and also the proper interventions to reduce these factors seems to be essential. This study is aimed to determine the prevalence of anxiety and depression and their associations with BMI among high school students in Qazvin, Iran in 2013-2014.

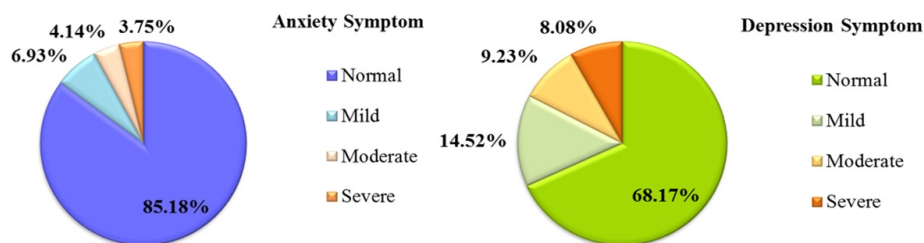
## 2. Material and Methods

This cross-sectional study was a descriptive and analytical study in high schools in Qazvin, Iran (March 2013 to April 2014). Through a cluster sampling, 1,079 high school students were recruited from four different regions in the city. After a short briefing about the goals of the study and collecting the consent forms, participants were asked to fill the questionnaires. Out of 1,079 respondents, 39 left the study for personal reasons such as sickness and living place changes. Finally, the total number of 1,040 15 to 19 year-old students attended the study with the response rate of 96.3%. This study was approved by the ethical committee of Qazvin University of Medical Sciences and there were no harmful effects on respondents. The data collection was based on the self-administrative questionnaires. The questionnaire had two parts including demographic information (name, gender, age, educational status, height, weight and BMI) and assessing mental health status (Beck depression inventory and Beck anxiety inventory). The Beck depression inventory had 21 questions with multiple choice answers. The questions rated on a 4-point scale ranging from 0 to 3 based on the severity. The maximum total score was 63 of which 0 to 25 were considered as normal, 26 to 38 as mild depression, 39 to 55 as moderate depression and 56 to 63 as severe depression (19). Moreover, the Beck anxiety inventory questionnaire had 21 questions that had multiple-choice answers. The questions rated on a 4-point scale ranging from 0 to 3. The questionnaire had a four factors structure to reveal anxiety symptoms including neurophysiological, autonomic symptoms, subjective, and panic. The highest score was 63 which 0 to 7 was normal, 8 to 15 was mild anxiety, 16 to 25 was moderate anxiety and 26 to 63 was severe anxiety. Reliability and validity of the questionnaire was determined in previous studies and indicated as a strong instrument to measure anxiety (20). Height and weight of all respondents were measured using accurate and calibrated scales to calculate Body Mass Index ( $BMI = \text{weight (kg)} / \text{height}^2 \text{ (m)}$ ). BMI was categorized according to classification of the Center for Disease Control (CDC, 2015) (21). Data were analyzed after data collection using SPSS-19. Descriptive analyses such as frequency and percentage for categorical variables and Mean  $\pm$  SD for continuous variables were used. Moreover, t-test was conducted to compare continuous variables and Chi-square was used for comparison of categorical variables. Pearson correlation analysis was conducted to show the correlation between variables, and p-values less than 0.05 were considered statistically significant.

## 3. Results

The current study had a response rate of 96.3% and data was analyzed for 1,040 students. The mean age of respondents was  $16.52 \pm 1.09$  years old. Table 1 shows the demographic information and mental health status of respondents in males and females. The table indicated that 499 (48%) were females and 541 (52%) were males. There was no significant difference in mean of age ( $p=0.0614$ ) between males ( $16.51 \pm 1.09$  years old) and females ( $16.54 \pm 1.1$  years old). The highest number of students were in class 2 (35.3%) and it was followed by class 3 (35%) and class 1 (29.7%), and the difference was not significant for genders ( $p>0.05$ ). Moreover, Table 1 indicates that 61% of the respondents were at normal range for BMI, and it was followed by 14.7% underweight and 24.3% overweight and obesity. Being underweight was significantly higher in females while being obese was significantly

higher in males ( $p=0.014$ ). In addition, Table 1 indicates that the prevalence of depression symptoms and anxiety symptoms were 31.8% and 14.9%, respectively. According to the results, depression symptoms in females (39.9%) were significantly higher than males (24.4%) ( $p<0.001$ ). In addition, anxiety symptoms in females were higher than in males (17.2% vs. 12.8%, respectively) ( $p=0.026$ ). Figure 1 demonstrates that about one-fourth of the respondents (23.75%) had mild-moderate depression symptoms and 8.08% were in severe range. The data for anxiety symptoms shows 11.07% mild-moderate and 3.75% severe. According to Table 2, students with depression symptoms which simultaneously had anxiety symptoms, obesity/overweight and underweight were 11.2%, 16.9% and 1.5% of all respondents. Moreover, the table shows almost the same results for anxiety symptoms which means respondents who had anxiety symptoms with depression symptoms were 11.2%, with obesity/overweight were 4.5% and with underweight were 1.9%. Table 3 shows the significant and positive correlation between depression symptoms and anxiety symptoms ( $r=0.256$ ,  $p<0.001$ ) and between depression and BMI ( $r=0.333$ ,  $p<0.001$ ), but there was a negative and significant correlation between anxiety and BMI ( $r=-0.086$ ,  $p=0.006$ ).



**Figure 1:** Anxiety and Depression Level in respondents.

**Table 1:** Demographic characteristics and mental health status of students [presented as number (%)]

Variables		Male; Mean±SD or n (%)	Female; Mean±SD or n (%)	Total; Mean±SD or n (%)	p-value
Age (year)		16.51±1.09	16.54±1.1	16.52±1.09	0.614
Educational level	Level 1	153 (28.3)	156 (31.3)	309 (29.7)	0.491
	Level 2	191 (35.3)	176 (35.3)	367 (35.3)	
	Level 3	197 (36.4)	167 (33.4)	364 (35)	
BMI (kg/m <sup>2</sup> )	Underweight	62 (11.4)	91 (18.2)	153 (14.7)	0.014*
	Normal	343 (63.4)	291 (58.3)	634 (61)	
	Overweight	82 (15.2)	78 (15.7)	160 (15.4)	
	Obese	54 (10)	39 (7.8)	93 (8.9)	
Depression symptom	Yes	132 (24.4)	199 (39.9)	331(31.8)	<0.001*
	No	409 (75.6)	300 (60.1)	709 (68.2)	
Anxiety symptom	Yes	69 (12.8)	86 (17.2)	155 (14.9)	0.026*
	No	427 (87.2)	413 (82.8)	885 (85.1)	

\* Significant p-value at the level of  $p < 0.05$

**Table 2:** Depression and anxiety of respondents simultaneously with different levels of BMI

Variables	n	%
Depression symptom	331	31.8
Depression symptom and anxiety symptom	116	11.2
Depression symptom and obesity/overweight	175	16.9
Depression symptom and underweight	16	1.5
Anxiety symptom	155	14.9
Anxiety symptom and depression symptom	116	11.2
Anxiety symptom and obesity/overweight	47	4.5
Anxiety symptom and underweight	20	1.9

**Table 3:** Correlation between depression, anxiety and BMI among respondents.

Variables	Depression symptom		Anxiety symptom		BMI	
	r	p-value	r	p-value	r	p-value
Depression	-	-	0.256	<0.001*	0.333	<0.001*
Anxiety	0.256	<0.001*	-	-	-0.086	0.006*
BMI	0.333	<0.001*	-0.086	0.006*	-	-

\* Significant p-value at the level of  $p < 0.05$

#### 4. Discussion

The current study showed 31.8% depression symptoms among high school students, which means about one-third of them had depression symptoms of varied intensity. The prevalence of depression among adolescents ranged from 4% to 8% (22). The results of the current study are comparable with the previous study by Zakeri et al. (23) which reported 29.7% and 11.5% the prevalence of depression and anxiety, respectively among students. In this study, there was a simultaneity for depression and anxiety and it was in line with the study by Assarian et al. (2006). They indicated that the simultaneity for depression and anxiety may be caused by several factors such as genetic, neurophysiology, neurochemistry, moods and mechanisms of interaction (24, 25). In the current study, mental disorder (anxiety and depression) was higher in girls compared to boys and the result was comparable with other studies with almost the same results (7, 8). These results were expectable according to the literature which showed that gender is not a risk factor for depression in childhood, however increasing age and reaching adolescence can increase depression among females but not in males. And also, being male was not the risk factor for depression along with increasing age and even showed a slight reduction in depression (22). The usage of cosmetic products and cosmetic surgery are high in a country where the consequences of appearance and sex roles are main risk factors for mental disorder (7). Women and men respond to the same stressors differently, and women are more vulnerable because of the sex differences in biological responses (sex hormones especially estrogen and progesterone), self-confidence and coping (26). In the current study, the prevalence of overweight was higher than other studies in Iran and some countries such as China and Pakistan (27, 28). In Iranian students, the prevalence of overweight and obesity among students was 12.3% and 8.5%, respectively (29). Moreover, in another study among Iranian students, the prevalence of underweight, overweight and obesity was 16.2%, 8.6% and 1.5%, respectively and the prevalence of underweight was almost the same and comparable with the current study (30). In addition to gender, BMI had association with depression and anxiety. There was a poor and positive correlation between depression and BMI and also, the results presented that depression symptoms in obesity were higher than in underweight students. In line with this study, several researches showed that higher BMI may affect and increase the risk of depression (15, 31). The hypothesis in this context is based on biological mechanisms such as inflammation, hormonal system disorder and the risk of somatic diseases which may lead to secondary effects on the mental system (17). Moreover, obesity can apply its negative role through self-concept especially in females (16). On the other hand, results showed a very poor and negative correlation between anxiety symptoms and BMI, and thin students had higher anxiety symptoms compared to obese ones. In line with this study, other studies also confirmed the same results, and reported inconsiderable relation between obesity and anxiety (16, 32). Studies indicated that high BMI may affect the risk of suicide directly. This may be due to the effect of high BMI on several hormones such as testosterone, neurotransmitters such as leptin as well as the serotonin levels. Since depression and other mental diseases are strong risk factors for suicide, their assessment and their association with demographic characteristics are very considerable (33, 34). According to results, BMI in boys was significantly higher than in girls but it was expected because Iranian boys attendance of weight loss programs is one-fourth of girls' attendance. Studies also showed that boys are less vulnerable than girls in the psychological consequences of obesity. In addition, in developing countries, increasing weight in boys compared to girls is more accepted for mothers (23, 35). Some limitations in the current study should be taken into consideration. The present study results are not generalized throughout the country and participants were selected in one district. Additionally, it is suggested to assess the association of some factors related to weight gain or weight loss with depression and anxiety among adolescents.

#### 5. Conclusions

This study made a significant step forward in the report of mental disorder, and obviously showed that the prevalence of depression and anxiety is high among students. This study also indicated that gender and BMI have a significant effect on psychological symptoms. Therefore, effective interventions are necessary to improve these disorders. The effectiveness of the interventions should be assessed through self-report measures. One of the appropriate solutions is cognitive and behavioral therapies that need assessment of associated factors; however, the current study tried to consider this necessity.

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**Conflict of Interest:**

There is no conflict of interest to be declared.

**Authors' contributions:**

All authors contributed to this project and article equally. All authors read and approved the final manuscript.

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