

Research Article

Relation between obesity and depression in a sample of patients in Isfahan, Iran

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ABSTRACT

Background: Obesity and depression are two widely spread problems which are associated with many other health problems and major public health implications. Because of their high prevalence and the fact that they are both associated with common health problems such as cardiovascular disease, diabetes mellitus, low bone mineral density and many others, a possible relation between obesity and depression has been tested repeatedly. In this study, the relationship between these two complications was examined among patients who visited the psychiatry department in Khorshid hospital in Isfahan, Iran.

Methods: A cross-sectional study was conducted between 2006 and 2008 on patients in the psychiatry department in Khorshid hospital in Isfahan, Iran. The patients were interviewed by an experienced psychiatrist for the diagnosis of major depression. They were also interviewed by an experienced nurse for the collection of other relevant information.

Results: 1093 patients in total were examined during the study. The mean age (standard deviation) of the patients was 32.7 (12.6). 208 (18.8%) were diagnosed with major depression. 24.3% of patients with major depression were obese, versus only 13.8% of patients without major depression. Using a binary logistic regression model, major depression was associated with higher body mass index in men but not in women when other variables considered.

Conclusion: These findings indicate that higher body mass index is associated with major depression, but this association is gender dependent. Further studies are needed to investigate the complexity of this relationship.

Keywords: Obesity, Major depression, Body mass index

INTRODUCTION

According to World Health Organization media centre,¹ worldwide obesity has nearly doubled since 1980. Obesity is associated with hypertension, dyslipidemia, diabetes mellitus, coronary heart disease, stroke, as well as increased all-cause mortality.² Depression is also associated with increased risk of coronary heart disease, myocardial infarction, heart failure in patients with systolic hypertension, low bone mineral density, and increased mortality.³⁻⁸ Because both complications share

common health problems, it has been suggested that there are interactions and common pathways between them, although thus far, population-based studies of the association between obesity and depression have yielded inconsistent results.^{9,10} Some studies found an association,¹¹⁻¹⁶ but others did not.¹⁷⁻¹⁹ Some found an association between obesity and higher rates of depression in women but not in men;^{13,14} others reported inverse associations between obesity and depression in both women^{20,21} and men.^{15,18,20,21}

In this work data from the psychiatry department in Khorshid hospital in Isfahan, Iran have been used to assess the relationship between obesity and depression.

METHODS

Study area

This study was conducted in Isfahan, a very large city situated in central Iran, located at a height of 1590 m above the sea level, between latitudes 30° and 34° north of the equator and longitude 49°-55° east, with a population of approximately 1.8 million [1799180 in 2004 (men 926134, women 873046)]. The total area is 15,263 km². The climate is dry and temperate, with quite wide temperature differences between the summer and the winter with a mean daily temperature of 2.8°C in January and February, 29.5°C in July and August, and 19.1°C in September and October.

Subjects

Between 2006 and 2008, 1093 patients visited the psychiatry department in Khorshid hospital in Isfahan, Iran. 575 (52.6%) were females and 518 (47.4%) were males. The mean age (standard deviation) of the patients was 32.7 (12.60). 24.3% of patients with major depression were obese, versus only 13.8% of patients without major depression. The youngest patient was 14 and the oldest 85 years old. 206 (18.8%) of the patients were diagnosed with major depression.

Measurements

Height and weight were measured by an experienced nurse and were used to calculate the Body Mass Index (BMI) which is an index of weight-to-squared height (Kg/m²). BMI was classified into four categories: Underweight (BMI <18.5 kg/m²), Normal weight (BMI 18.5–24.9 kg/m²), Overweight (BMI 25.0-29.9 kg/m²) and Obesity (BMI >30.0 kg/m²).²² All depression measures were binary (0 = no depression, 1 = depression). The diagnosis has been made by an experienced psychiatrist and using interviews. The diagnosis requires the persistence of depressed mood for at least two weeks in the patient. The diagnosis is not made if the respondent attributes the symptoms to another illness, medicines, or bereavement or if there is no social or occupational impairment. Socioeconomic status was measured using education, income and job status which are widely used in studies to create the socioeconomic variable.^{23,24} A factor analysis technique in this study also showed that all of these three factors load significantly on the latent variable which was assumed to be the socioeconomic status. Other variables such as gender, age, marital status, number of children and whether the patient is currently smoking cigarettes were also collected using a questionnaire which was administered by an experienced nurse.

Statistical Analysis

Statistical analysis was carried out using SPSS for Windows (SPSS Inc., Chicago, IL, USA). Statistical methods used included the Chi-square test and stepwise binary logistic regression. Age-adjusted means were calculated and compared using general linear models. All tests for statistical significance were two-tailed, with the level of significance at P <0.05.

RESULTS

Characteristics of 206 (18.8%) patients diagnosed with major depression and 887 (81.2%) not diagnosed with major depression are shown in Table 1. Patients with and without major depression did not differ significantly in terms of gender, education, socioeconomic and employment status. However, patients diagnosed with major depression were older, had higher BMI and more children, and were more likely to be married, educated and obese. 24.3% of patients with major depression were obese, versus only 13.8% of patients without major depression. The distribution of BMI categories is shown in Figure 1.

Table 1: Age-adjusted characteristics of patients by with and without major depression (n=1093).

Variable	With major depression mean (SE) (n=206)	Without major depression mean (SE) (n=887)	Significance
Age (years)	36.9 (13.62)	31.8 (12.16)	***
BMI (kg/m²)	26.14 (0.37)	24.87 (0.18)	**
No. of children	1.66 (0.09)	1.43 (0.04)	*
	%	%	
Gender			
Male	46.1	47.7	
Female	53.9	52.3	
Married	69.4	54.3	***
Socioeconomic status			
Good	7.4	10.3	
Upper moderate	22.2	27.0	
Lower moderate	36.7	31.1	
Poor	33.7	31.6	
Education			
Univ. degree	9.2	12.6	
High school	50.0	61.6	***
Primary school	25.7	19.5	
Uneducated	15.1	6.3	
BMI (kg/m²)			
Under weight	7.3	6.8	
Normal weight	46.1	53.4	**
Over weight	22.3	26.0	
Obese	24.3	13.8	
Employed	75.7	71.0	
Smoker	22.4	32.5	**
*P <0.05, **P <0.01, ***P <0.001			

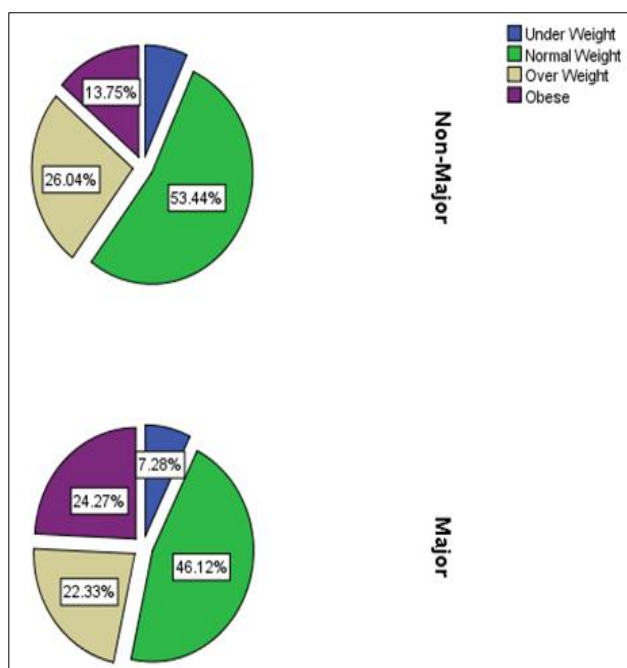


Figure 1: Distribution of BMI categories among patients.

Table 2: Adjusted odds ratios for the association between obesity and depression from binary logistic regression (n=1093).

Variable	OR	95% CI	Significance
Age (years)	1.01	(0.99, 1.03)	
BMI (kg/m ²)	1.04	(1.01, 1.07)	*
BMI (kg/m²)[†]			
Normal weight	1.00	-	
Under weight	1.41	(0.74, 2.07)	
Over weight	0.85	(0.56, 1.28)	
Obese	1.35	(0.85, 2.14)	
No. of children	1.08	(0.96, 1.21)	
Gender			
Female	1.00	-	
Male	1.45	(0.96, 2.19)	
Socioeconomic status			
Poor	1.00	-	
Lower moderate	0.97	(0.51, 1.87)	
Upper moderate	1.14	(0.60, 2.17)	
Good	1.25	(0.65, 2.41)	
Education			
Uneducated	1.00	-	
Primary school	0.70	(0.38, 1.27)	
High school	0.59	(0.32, 1.09)	
University degree	0.57	(0.25, 1.27)	
Employed	0.99	(0.64, 1.55)	
Married	1.20	(0.73, 1.96)	
Smoker	0.53	(0.34, 0.82)	**

*P <0.05, **P <0.01, ***P <0.001
[†]Odds ratios only calculated for categorical BMI

To determine the independent predictors of factors associated with major depression, stepwise binary logistic regression was used and the results are shown in Table 2. BMI was entered into the model first as a continuous variable and then as a categorical variable. Patients with major depression were more likely to have a higher BMI but less likely to be smokers. When BMI was entered as a categorical variable, patients with major depression were more likely to be obese, although this association did not achieve statistical significance. Patients with major depression were more likely to have more children, be males, have better socioeconomic status, be more educated and married, but these findings also did not achieve statistical significance.

In an effort to separate the effect of gender on the results, adjusted odds ratios for the association between obesity and depression for males and females were calculated using stepwise binary logistic regression and the results are shown in Table 3. While men with major depression were more likely to have a higher BMI, this association was not significant among females. There was no significant difference between patients with and without major depression when BMI was entered as a categorical variable. Also, women with major depression were less likely to be smokers.

Table 3: Adjusted odds ratios for the association between obesity and depression by gender from binary logistic regression (n=1093).

Variable	Males OR (95% CI) (n=518)	Females OR (95% CI) (n=575)
Age (years)	1.01 (0.9, 1.04)	1.01 (0.98, 1.03)
BMI (kg/m ²)	1.06 (1.01, 1.11)*	1.03 (0.99, 1.07)
BMI (kg/m²)[†]		
Normal weight	1.00	1.00
Under weight	1.07 (0.38, 3.00)	1.87 (0.71, 3.96)
Over weight	0.90 (0.48, 1.70)	0.86 (0.49, 1.52)
Obese	2.00 (0.96, 4.20)	1.12 (0.61, 2.04)
No. of children	1.14 (0.89, 1.45)	1.07 (0.93, 1.23)
Socioeconomic status		
Poor	1.00	1.00
lower moderate	1.68 (0.51, 5.52)	0.67 (0.30, 1.52)
upper moderate	2.24 (0.69, 7.25)	0.76 (0.34, 1.68)
Good	2.55 (0.77, 8.43)	0.75 (0.33, 1.72)
Education		
Uneducated	1.00	1.00
Primary school	0.42 (0.14, 1.25)	0.81 (0.38, 1.72)
High school	0.45 (0.16, 1.26)	0.60 (0.27, 1.36)
University degree	0.64 (0.19, 2.20)	0.37 (0.11, 1.12)
Employed	1.23 (0.71, 2.13)	0.44 (0.16, 1.21)
Married	1.12 (0.55, 2.29)	1.02 (0.48, 2.12)
Smoker	0.62 (0.37, 1.20)	0.28 (0.08, 0.96)*

*P <0.05, **P <0.01, ***P <0.001
[†]Odds ratios only calculated for categorical BMI

DISCUSSION

In this work, the association between obesity and depression in a sample of patients in Isfahan, Iran was studied. The findings suggest that higher BMI, in general, is associated with major depression. These findings are consistent with findings from some previous studies of the relationship between obesity and depression in Iran.^{25,26}

However, some other studies did not find any significant relationship.²⁷

The current study has several strengths not found in many previous cross-sectional studies of depression and obesity in Iran: depressive symptoms were measured and diagnosis was made by an experienced psychiatrist and conducting interviews; the sample size is large and representative with a wide age range and high response rate and a range of covariates was adjusted for.

However, this study has also several limitations that should be addressed. Perhaps the most important limitation is the nature of the study, which is cross-sectional, and did not allow to determine whether depression preceded obesity or vice versa, a necessary criterion for determining causality. Another limitation is the sample, which is taken from a hospital. Those patients who were not diagnosed with major depression could have been suffering from other mental diseases at the time, and this may well lead into biasness of the estimates. This might explain the contradictory finding that patients with major depression were less likely to smoke, which is in contrast to many previous studies.²⁸

Some studies showed that categorization of continuous variables may lead into less power and other methodological challenges.^{29,30} In this study, BMI was entered into the analysis as a continuous and a categorical variable to investigate this loss of power.

This should be also mentioned that some studies showed that antidepressants can lead to weight gain by affecting either appetite or metabolism.^{31,32} Therefore, there is a possibility that the higher BMI among people with major depression is caused by the consumption of this type of medicines. Further studies are needed to more investigate this problem.

CONCLUSION

In conclusion, this was shown that higher BMI and depression are associated among the patients in this study, but this association is gender dependent. Males with major depression are more likely to have higher BMI, but the association did not achieve statistical significance among females. This study highlights the complexity of the relationship between obesity and depression, and the need for further research to more investigate this complexity.

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