

The prevalence of obesity in a sample of Egyptian psychiatric patients

Ahmed Kamel^a, Hesham Abuhegazy^a, Ali Ismail^a, Khalid Sherra^b,
Mohammed Ramadan^a, Abdullah Mekky^a, Ali Al Nabawy^a

^aDepartment of Psychiatry, Faculty of Medicine, Al-Azhar University, Cairo, ^bDepartment of Psychiatry, Faculty of Medicine, Mansoura University, Mansoura, Egypt

Correspondence to Ahmed Kamel, MD, Department of Psychiatry, Faculty of Medicine, Al-Azhar University, Cairo, 81461, Egypt, Tel: 00966547454322; fax: 00966165334685; E-mail: ak.awdy@yahoo.com

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Background

The relationship between mental health and obesity has been studied in different types of research studies as it is considered very important. A lot of research studies have proposed several theories and mechanisms on how the two are linked, which should be reviewed and considered in the management plan of psychiatric disorders.

Objectives

The aim of this study was to find out the prevalence and correlates of obesity and overweight in a sample of psychiatric patients (inpatients and outpatients) with no history of pharmacological treatment in Al-Hussein University Hospital.

Patients and methods

This cross-sectional study was conducted during a 6-month-period on 130 psychiatric patients who were subjected to a semistructured clinical interview according to DSM-IV-TR criteria to diagnose psychiatric disorders. Obesity assessment was carried out by measuring the weight (kg) using a scale and measuring the height (m) to calculate the BMI, which is based on the BMI equation $Wt (kg)/Ht^2 (m^2)$.

Results

The prevalence of obesity and overweight in psychiatric patients was 66.93% (22.31% were obese, and 44.62% were overweight). The prevalence of obesity was highest in bipolar disorder (41.38%), followed by depression (37.93%), schizophrenia (10.34%), anxiety disorder (6.9%), and finally substance abuse disorder (3.45%), but the difference was not statistically significant. There was a significant correlation between sociodemographic characteristics of patients and obesity and the distribution of psychiatric disorders.

Conclusion

The prevalence of obesity and overweight in psychiatric patients was relatively high, and this can occur with most psychiatric disorders, especially mood disorders, and were supposed to be due to other several mechanisms and risk factors other than the effect of psychotropic medications on the weight of psychiatric patients. Moreover, there are some demographic and social factors that may moderate or mediate the association between obesity and psychiatric disorders; thus, identification of overweight and obesity, associated risk factors, and efforts to prevent weight gain should begin at the initiation of mental health treatment.

Keywords:

obesity, overweight, psychiatric disorders

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Introduction

Obesity was defined differently in the literature. Obesity refers to an excess amount of body fat (National Institutes of Health, 1998). The American Obesity Association (2002, 2003) defines obesity as 'a complex, multifactorial chronic disease involving environmental (social and cultural), genetic, physiologic, metabolic, behavioral, and psychological components'. However, the most commonly used definitions of obesity are based on BMI, which is defined as weight in kilograms divided by height in meters squared. In adults, obesity is generally defined as a BMI of 30.0 or greater (Ogden *et al.*, 2006).

Obesity has become a major contributor to the global burden of chronic disease and disability. It is a complex condition with serious social and psychological dimensions, affecting virtually all ages and socio-economic groups (WHO, 2010).

The most recent report on the epidemiology and burden of obesity was updated in June 2016 and

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revealed that, worldwide, obesity has more than doubled since 1980; more than 1.9 billion adults 18 years and older were overweight in 2014, over 600 million were obese, and 39% of adults aged 18 years and over were overweight, and 13% were obese. Most of the world's population live in countries where overweight and obesity kills more people compared with underweight (WHO, 2016).

In the Eastern Mediterranean Region, some research studies confirmed that overweight has reached an alarming level. During adulthood, women showed a higher prevalence of obesity (35–75%) compared with men (30–60%) (Musaiger, 2004). In an Egyptian study, the prevalence of central obesity among adults was 24.1 and 28.7% based on the waist circumference and waist-to-hip ratio indicators, respectively (Abolfotouh *et al.*, 2008).

The relationship between obesity and psychiatric disorders has continuous complex relations that still are debated by researchers and clinicians (Gatineau and Dent, 2011). A lot of research studies proposed several theories and mechanisms on how the two are linked. Some researchers suggest that obesity can lead to common psychiatric disorders, whereas others have found that psychiatric patients are more prone to obesity (Kim *et al.*, 2007; Mather *et al.*, 2008). Other researchers did not find any association between the two (Carpenter *et al.*, 2000; Roberts *et al.*, 2003). Obesity and mental illness have a bidirectional linear correlation and both predispose to metabolic syndrome and its complication leading to the severity and poorer outcome if not addressed and managed properly Zaraa (2016). The relationship between mental health and obesity has been studied in different types of research studies as it is considered very important. In community-based studies, obesity was positively associated with several mental disorders, especially mood disorders and anxiety disorders (Stunkard *et al.*, 2003); another survey among male university students in Abha, Saudi Arabia, found that the prevalence of overweight and obesity is considerably high and suggested that obesity is associated with depression, anxiety, and stress (Al-Qahtani *et al.*, 2015).

The psychotropic medication has a strong relation in the development of obesity in psychiatric patients, which was confirmed by many studies (Baptista, 1999; Allison and Casey, 2001; Schwartz *et al.*, 2004; De Hert *et al.*, 2011). It is considered a very important risk factor in developing obesity in psychiatric patients; therefore, in the present study, we aimed to determine the prevalence of obesity and overweight in patients with psychiatric disorders who

had no previous treatment with psychotropic medication to exclude the effects of medication on weight and BMI, to examine the associations and correlation between sociodemographic characteristics and obesity in psychiatric patients and also to establish whether demographic variables (sex, age, marital status, and work status) moderate any associations observed.

Patients and methods

This cross-sectional study was conducted in the Department of Psychiatry, Al-Hussein University Hospital, and was approved by the Ethics Committee of Al-Azhar University, Faculty of Medicine.

Our sample included psychiatric patients who attended outpatient clinics (OPD) and also patients who were admitted in the psychiatric ward during a 6-month period (July–December 2015), provided the patients had no history of previous pharmacological treatment with psychotropic medications, to exclude the effect of medication on weight and BMI of participants.

The total sample size was 145 patients. Fifteen patients were excluded from the study (three patients refused to complete participation in the study, one patient suffered from hypothyroidism, and 11 patients were diagnosed as epileptic patients comorbid with psychiatric illness). Informed consent was obtained from the participants after a full explanation of the study design before participation.

Inclusion criteria of the sample

All psychiatric patients (acute and chronic) who attended OPD, or those who were admitted in the psychiatric ward, with no history of previous pharmacological treatment with psychotropic medications and in the age range of 18–55 years were included.

Exclusion criteria of the sample

Psychiatric patients with a history of previous treatment with psychotropic medications or using appetite suppressants, those with any organic disease related to obesity, concurrent neurological illnesses, or epilepsy, pregnant women, and patients with a history of obesity surgery were excluded.

Tools

The remaining 130 patients (61 male and 69 female) were subjected to the following:

- (1) *Psychiatric assessment*: Semistructured clinical interview according to DSM-IV-TR criteria for diagnosing the psychiatric disorders.

(2) *Obesity assessment:* BMI is a simple index of weight-for-height that is commonly used to classify overweight and obesity in adults. It is defined as a person's weight in kilograms divided by the square of his or her height in meters (kg/m^2). Weight (kg) is measured using a scale and height (m) is measured with the patient standing erect barefooted against a metered wall. Men and women were considered to be underweight if their BMI was less than 18.5, normal weight if their BMI was between 18 and 24.9, overweight if their BMI was between 25 and 29.9, obese if their BMI was equal to or greater than $30 \text{ kg}/\text{m}^2$. Obesity is further subdivided into class I obesity ($\text{BMI}=30\text{--}34.9$), class II obesity ($\text{BMI}=35\text{--}39.9$), and class III obesity ($\text{BMI}\geq 40$) (World Health Organization, 2000). Personal and sociodemographic characteristics such as age, sex, marital status, and occupation were collected for each participant.

Statistical analysis

Statistical Package for Social Sciences (SPSS; International Business Machines Corporation (IBM) company, New York, United States) software version 19.0 was used for data entry and analysis, and comparisons were made using Student's *t*-test. Qualitative variable comparisons were made using the χ^2 -test. The statistical significance level was set at *P* value less than 0.05.

Descriptive statistical analyses were performed to describe patient demographics and clinical variables.

Results

The results of our study are presented in Table 1.

The prevalence of obesity ($\text{BMI}\geq 30 \text{ kg}/\text{m}^2$) in psychiatric patients was 22.31%. According to BMI categories we found that the prevalence of overweight category was the highest in our sample (58 patients; 44.62%), followed by normal weight in 42 patients (32.31%), first degree of obesity in 23 patients

(17.69%), second degree in four patients (3.08%), and third degree in two patients (1.54%). The incidence was lowest in underweight category (one patient; 0.77%).

Psychiatric disorders and obesity

The distributions of psychiatric disorders in our sample according to DSM-IV-TR criteria were as follows: the highest prevalence was seen in depressive disorders (major depressive disorder and dysthymia) (45 patients; 34.62%), followed by bipolar disorders (bipolar disorder I or II) (39 patients; 30%), schizophrenia (25 patients; 19.23%), anxiety disorders (social phobia, obsessive compulsive disorder, generalized anxiety disorder, post-traumatic stress disorder, and panic disorder) (17 patients; 13.08%), and lastly substance abuse disorder (four patients; 3.08%) (Table 1).

The prevalence of obesity ($\text{BMI}\geq 30 \text{ kg}/\text{m}^2$) in psychiatric disorders in our sample was highest in bipolar disorder (41.38%), followed by depression (37.93%), schizophrenia (10.34%), anxiety disorders (6.9%), and finally substance abuse disorder (3.45%), but the difference was not statistically significant.

Demographic characteristics of the study sample is presented in Tables 2 and 3. This study was conducted on 130 patients [61 male (46.92%) and 69 female (53.08%)].

The prevalence of obesity was higher in female patients (79.31%) than in male patients (20.69%). Moreover, the incidence of depressive disorders was higher in female patients (47.83%), and that of schizophrenia was higher in male patients (31.15%), with a highly statistically significant difference ($P<0.001$).

Further, the most common age group of participants was 26–40 years (56.15%), and this age group was more obese compared with other groups, with a statistically significant difference. The incidence of depression was

Table 1 Distribution of obesity and psychiatric disorders in the sample according to BMI

Semistructured clinical interview	Nonobese patients [N (%)]				Obese patients [N (%)]				Total
	Underweight	Normal weight	Overweight	Sum	Class I	Class II	Class III	Sum	
Schizophrenia	0 (0.00)	9 (21.43)	13 (22.41)	22 (21.78)	2 (8.70)	1 (25.00)	0 (0.00)	3 (10.34)	25 (19.23)
Depression	0 (0.00)	12 (28.57)	22 (37.93)	34 (33.66)	9 (39.13)	0 (0.00)	2 (100.00)	11 (37.93)	45 (34.62)
Anxiety disorder	1 (100.00)	6 (14.29)	8 (13.79)	15 (14.85)	2 (8.70)	0 (0.00)	0 (0.00)	2 (6.90)	17 (13.08)
Bipolar disorder	0 (0.00)	13 (30.95)	14 (24.14)	27 (26.73)	9 (39.13)	3 (75.00)	0 (0.00)	12 (41.38)	39 (30)
Substance abuse	0 (0.00)	2 (4.76)	1 (1.72)	3 (2.97)	1 (4.35)	0 (0.00)	0 (0.00)	1 (3.45)	4 (3.08)
Total [N (%)]	1 (0.77)	42 (32.31)	58 (44.62)	101 (77.69)	23 (17.69)	4 (3.08)	2 (1.54)	29 (22.31)	130 (100.00)
χ^2		55.111							
<i>P</i> value		0.804							

Table 2 Demographic characteristics of the study sample (sex and age)

Sex [n (%)]	Nonobese patients			Obese patients			Total	χ^2 and P value	
	Underweight	Normal weight	Overweight	Class I	Class II	Class III			Sum
	Sum	Sum	Sum	Class I	Class II	Class III			Sum
Male	0 (0.00)	28 (45.90)	27 (44.26)	5 (8.20)	1 (1.64)	0 (0.00)	23 (79.31)	$\chi^2=17.546P=0.004$	
Female	1 (1.45)	14 (20.29)	31 (44.93)	18 (26.09)	3 (4.35)	2 (2.90)	6 (20.69)		
Total	1 (0.77)	42 (32.31)	58 (44.62)	23 (17.69)	4 (3.08)	2 (1.54)	29 (22.31)		
Age [n (%)]								$\chi^2=50.644P=0.042$	
18-25	1 (3.33)	16 (53.33)	12 (40)	0 (0.00)	1 (3.33)	0 (0.00)	1 (3.44)		
26-40	0 (0.00)	24 (32.87)	32 (43.83)	13 (17.8)	3 (4.1)	1 (1.36)	17 (58.62)		
41-55	0 (0.00)	2 (7.40)	14 (51.85)	10 (37.03)	0 (0.00)	1 (3.70)	11 (37.93)		
Total	1 (0.77)	42 (32.31)	58 (44.62)	37.03 (17.69)	4 (3.08)	2 (1.54)	29 (22.31)		

higher in the age group 41-55 years compared with other groups (48.14%), but no significant correlation was found between age groups and distribution of psychiatric disorders.

As regards marital status (Tables 4 and 5), the incidence of obesity was higher in married individuals and represented 75.86% of obese patients with a statistically significant difference. Moreover, the incidence of depression was higher in widows, but no significant correlation was found between marital status and distribution of psychiatric disorders.

Finally, as regards employment status, our sample showed that the incidence of obesity was higher in unemployed patients (82.76%), and depression was the most common disorder in those patients, with a statistically significant difference ($P<0.01$) (Tables 3-5).

Discussion

Our study was conducted on patients who attended outpatient clinics (OPD) and also on patients who were admitted in the psychiatric ward. Thus, it is considered a clinical trial concerned with psychiatric cases to determine the association of obesity with psychiatric disorder, especially those who have no history of previous pharmacological treatment with psychotropic medications, to exclude one of the most important risk factors that was implicated in the development of obesity in psychiatric patients.

Our study showed that the prevalence of obesity and overweight in psychiatric patients was 66.93% (22.31% were obese and 44.62% were overweight), and these findings are considered higher than the prevalence of obesity in general populations in most countries according to the WHO, 2016 report, which revealed that 39% of adults aged 18 years and over were overweight, and 13% were obese (World Health Organization, 2016).

Our findings are in agreement with those reported by Saiga *et al.* (2013), who found that the prevalence of obesity was high in outpatients with mental disorders and was 47.2% in all patients, 42.4% in male, and 54.8% in female patients.

Moreover, our figure is comparable to that reported in a lot of studies conducted in different regions that showed that obesity rates are higher in psychiatric patients and exceeded that found in the general

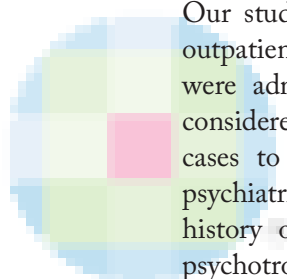


Table 3 Demographic data of the sample (sex and age) and relation with psychiatric disorders

	Schizophrenia	Depression	Anxiety disorder	Bipolar disorder	Substance abuse	Total	χ^2 and <i>P</i> value
Sex [<i>n</i> (%)]							
Male	19 (31.15)	12 (19.67)	8 (13.11)	18 (29.51)	4 (6.56)	61 (46.92)	$\chi^2=37.157P=0.000$
Female	6 (8.70)	33 (47.83)	9 (13.04)	21 (30.43)	0 (0.00)	69 (53.08)	
Total	25 (19.23)	45 (34.62)	17 (13.08)	39 (30)	4 (3.08)	130 (100)	
Age [<i>n</i> (%)]							
18–25	6 (20.00)	10 (33.33)	5 (16.66)	7 (23.33)	2 (6.66)	30 (23.07)	$\chi^2=86.053P=0.627$
26–40	16 (21.91)	22 (30.13)	9 (12.32)	25 (34.24)	1 (1.36)	73 (56.15)	
41–55	3 (11.11)	13 (48.14)	3 (11.11)	7 (25.92)	1 (3.70)	27 (20.76)	
Total	25 (19.23)	45 (34.62)	17 (13.08)	39 (30)	4 (3.08)	130 (100)	

population (Haddad *et al.*, 2006) and vary according to psychiatric diagnosis. Schizophrenic patients have a 2.8–3.5 increased likelihood of being obese, and those with major depressive disorder (MDD) or bipolar disorder have a 1.2–1.5 increased risk (Coodin, 2001; McIntyre *et al.*, 2006).

In contrast to this finding, Marthoenis and colleagues found that the rate of overweight and obesity among psychiatric inpatients in Indonesia was relatively low compared with the rates in the general population, as the incidence of obesity among psychiatric inpatients was 5% (95% confidence interval=2.6–8.5%), and that in overweight patients was 8% (95% confidence interval=5.1–12.4). However, they attributed their findings to the fact that the participants included in their study were inpatients only and had limited access to food and only ate meals that were provided to them by the hospital (Marthoenis *et al.*, 2014).

As regards clinical assessment according to DSM-IV-TR criteria for diagnosing the psychiatric disorders, this study found that the most common psychiatric disorder in patients was depression (34.62%), followed by bipolar mood disorder (30%), schizophrenia (19.23%), anxiety disorders (13.08%), and finally substance abuse disorder (3.08%), but the difference was not statistically significant. This may be due to our classification of mood disorder patients into two groups, one for depressive disorders and the other group for bipolar disorder. The goal of this subdivision was to more clearly differentiate the different types of mood disorders, resulting in smaller sample sizes of each group, and therefore the difference was nonsignificant. Moreover, most of the previous studies considered mood disorders as one group as compared with other psychiatric disorders. These findings are in agreement with some studies that found the relationship between obesity and psychiatric disorders as nonsignificant (Faith *et al.*, 2001), or negative (Jorm *et al.*, 2003). Moreover, Bruffaerts *et al.*, (2008) and McLaren *et al.*, (2008)

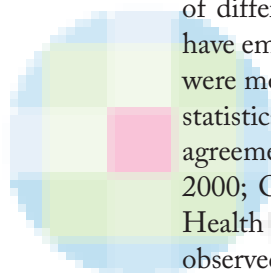
did not find an association of overweight with having mood disorders.

This result is in contrast with that reported by a previous research, which suggests that obesity may be significantly associated with mood disorders (Faith *et al.*, 2002; Jorm *et al.*, 2003; Stunkard *et al.*, 2003; Blaine, 2008; Bruffaerts *et al.*, 2008; Gadalla, 2009), and also with the study by Simon *et al.*, (2006), who investigated the relationship between obesity and mental disorder in a nationally representative sample of the US population and reported significant positive associations between obesity and a range of mood and anxiety disorders. They also found that substance use disorders were associated with a significantly lower risk for obesity and reported that nearly one quarter of the cases of obesity in the general population are attributable to mood disorders.

Moreover, our findings are contradictory to one of the most important surveys that was conducted by Scott *et al.*, (2008) among 13 countries, conducted as a part of the World Mental Health Surveys. They found statistically significant relationships between obesity and depressive disorder, and between obesity and anxiety disorder, in pooled analyses across countries. However, these research studies have no way of distinguishing the direction of the causal relationship between obesity and psychiatric disorders or the possibility that unmeasured common causes induce an association between them. As we mentioned before, differences in measurement and methodology between our study and previous research studies may account for the different findings. Demographic characteristics of the study sample show that the prevalence of obesity was higher in women (79.31%) than in men (20.69%), with a highly statistically significant difference. This is in agreement with the findings of previous studies (Friedman and Brownell, 1995; Carpenter *et al.*, 2000; Barry *et al.*, 2002; Onyike *et al.*, 2003; McIntyre *et al.*, 2006; Lin *et al.*, 2013) and with a Tunisian study (Ezzaher *et al.*, 2013), which found that obesity was significantly more frequent in bipolar I women than in

Table 4 Demographic characteristics of study sample (marital status and employment status)

Marital status [n (%)]	Nonobese patients				Obese patients				Total	χ^2 and P value	
	Underweight	Normal weight	Overweight	Sum	Class I	Class II	Class III	Sum			
	Single	1 (1.82)	26 (47.27)	23 (41.82)	50 (49.50)	3 (5.45)	1 (1.82)	1 (1.82)			5 (17.24)
Married	0 (0.00)	15 (22.73)	29 (43.94)	44 (43.56)	18 (27.27)	3 (4.55)	1 (1.52)	22 (75.86)	66 (50.77)		
Widow	0 (0.00)	0 (0.00)	1 (50.00)	1 (0.99)	1 (50.00)	0 (0.00)	0 (0.00)	1 (3.45)	2 (1.54)		
Divorced	0 (0.00)	1 (14.29)	5 (71.43)	6 (5.94)	1 (14.29)	0 (0.00)	0 (0.00)	1 (3.45)	7 (5.38)		
Total	1 (0.77)	42 (32.31)	58 (44.62)	101 (77.69)	23 (17.69)	4 (3.08)	2 (1.54)	29 (22.31)	130 (100)		
Work [n (%)]										$\chi^2=13.573P=0.000$	
Employed	1 (1.67)	26 (43.33)	28 (46.67)	55 (54.46)	5 (8.33)	0 (0.00)	0 (0.00)	5 (17.24)	60 (46.15)		
Unemployed	0 (0.00)	16 (22.86)	30 (42.86)	46 (45.54)	18 (25.71)	4 (5.71)	2 (2.86)	24 (82.76)	70 (53.85)		
Total	1 (0.77)	42 (32.31)	58 (44.62)	101 (77.69)	23 (17.69)	4 (3.08)	2 (1.54)	29 (22.31)	130 (100)		



men. Scott *et al.*, (2008) also found that the associations between total obesity and both depressive and anxiety disorders are more common in female patients but not in male patients. These findings were explained by Scott and colleagues, who reported that this may be due to the fact that women are more emotionally affected and are more troubled by obesity compared with men and also due to lack of exercise in women. They also experience more stigma in association with obesity (Brownell, 1991; Chen and Brown, 2005) and are under more pressure to be thin, and experience greater body dissatisfaction (Striegel-Moore *et al.*, 1986; Sobal and Stunkard, 1989; Striegel-Moore, 1993; Smolak and Striegel-Moore, 2002).

In contrast to our result, Gadalla (2009) found significantly elevated levels of obesity in men compared with women. Moreover, our findings are contradictory to the study by Simon *et al.*, (2006), who revealed that the associations between obesity and psychiatric disorders did not vary between men and women and they explained that the sex difference sometimes observed in prior research may be a function of differences in statistical power (because fewer men have emotional disorders), and also depressive disorders were more common in women (47.83%), with a highly statistically significant difference ($P<0.001$). This is in agreement with several US surveys (Carpenter *et al.*, 2000; Onyike *et al.*, 2003) and New Zealand Mental Health Survey (NZMHS) (Scott *et al.*, 2008) that have observed positive associations between obesity and depression among women and either negative or no associations among men.

In contrast, the US survey from the WMH group (the National Comorbidity Survey-Replication: NCS-R) (Simon *et al.*, 2006) found significant associations between obesity and a number of mental disorders, but they did not find a difference in the strength of association between men and women.

As regards age and obesity, we found that the incidence of obesity was higher in the age group 26–40 years compared with other age groups, with a statistically significant difference. These findings are in agreement with the studies in the Eastern Mediterranean Region that found that obesity was more prevalent in people who were young (30–50 years) and in women (Musaiger and Mistery, 2000; Musaiger, 2003). This finding is contradictory to that by Gadalla (2009), who reported that the prevalence of obesity was positively associated with advancing age (50–64 years). However, we found no significant correlation between age groups and distribution of psychiatric disorders, and this is

Table 5 Demographic characteristics of study sample (marital status and employment status) and relation with psychiatric disorders

	Schizophrenia	Depression	Anxiety disorder	Bipolar disorder	Substance abuse	Total	χ^2 and <i>P</i> value
Marital status [n (%)]							
Single	20 (36.36)	13 (23.64)	6 (10.91)	14 (25.45)	2 (3.64)	55 (42.31)	$\chi^2=40.010P=0.425$
Married	4 (6.06)	27 (40.91)	11 (16.67)	22 (33.33)	2 (3.03)	66 (50.77)	
Widow	0 (0.00)	2 (100)	0 (0.00)	0 (0.00)	0 (0.00)	2 (1.54)	
Divorced	1 (14.29)	3 (42.86)	0 (0.00)	3 (42.86)	0 (0.00)	7 (5.38)	
Total	25 (19.23)	45 (34.62)	17 (13.08)	39 (30)	4 (3.08)	130 (100.00)	
Work [n (%)]							
Employed	12 (20)	16 (26.67)	11 (18.33)	17 (28.33)	4 (6.67)	60 (46.15)	$\chi^2=31.437P=0.003$
Unemployed	13 (18.57)	29 (41.43)	6 (8.57)	22 (31.43)	0 (0.00)	70 (53.85)	
Total	25 (19.23)	45 (34.62)	17 (13.08)	39 (30)	4 (3.08)	130 (100)	

comparable to that reported in other studies, which found no significant interaction between age and obesity in the odds of psychiatric disorders (Simon *et al.*, 2006; Scott *et al.*, 2008).

As regards marital status, the incidence of obesity was higher in married participants than in others, with a statistically significant difference. This is in agreement with several previous research studies (Sarlio-Lähteenkorva and Lahelma, 1999; Simon *et al.*, 2006), which found that obese individuals were more frequently married and less frequently divorced.

In our sample, the incidence of obesity was higher in unemployed patients, and also depression was the most common disorder in those patients, with a statistically significant difference. These findings are in agreement with previous research studies (Sarlio-Lähteenkorva and Lahelma, 1999; Ezzaher *et al.*, 2013; Arafaa *et al.*, 2014), which reported that unemployed patients are more vulnerable to obesity compared with employed ones, as staying at home may lead to lack of physical activity, and hence they may be more susceptible to various stressors.

Although we excluded the effect of psychotropic medications on the weight of participants in our study, we found that the prevalence of obesity and overweight in psychiatric patients was higher compared with the prevalence in general populations. This means that obesity in psychiatric patients has several mechanisms and multiple risk factors other than medication side effects.

As we mentioned before, a lot of research studies proposed several mechanisms that may explain the relationship between obesity and psychiatric disorders, but they did not presuppose any particular direction in this relationship.

Scott *et al.* (2008) concluded that, pathways from both obesity to emotional disorders which proposed by previous researches were explained by different theories

and mechanisms [e.g. through the effects of stigma (Puhl and Brownell, 2003)], or obesity-related disability (Houston *et al.*, 2005; Lidstone *et al.*, 2006) and from emotional disorder to obesity [e.g. through psychologically-mediated disordered eating (Blair *et al.*, 1990; McGuire *et al.*, 1999; Linde *et al.*, 2004), reduced physical activity (Stunkard *et al.*, 2003) or the effects of psychotropic medication that were excluded in our study (Schwartz *et al.*, 2004). Moreover, the association may be a function of other factors altogether, either biological (Hasler *et al.*, 2005), genetic (Faith *et al.*, 2002), or environmental (Stunkard *et al.*, 2003).

This study had some limitations. First, the study was of cross-sectional type that does not allow us to distinguish between causal mechanisms or examine how they might differ across sociodemographic variables. Hence, there is a need for more longitudinal research studies, which will include further assessment of patients in follow-up visits that would give more information to clarify the relationship between obesity and psychiatric disorders. Second, the small sample size of study population may limit the generalizability of these findings, and hence we suggest multicenter studies or surveys. Third, our study included a heterogeneous sample of different psychiatric disorders; hence, there is a need for studies examining more clearly each psychiatric disorder alone and its relation with obesity, as well as the biological, psychological, and sociodemographic moderators and mediators of this important relationship. Fourth, our study addressed few sociodemographic moderators. This indicates the need for clarifying the social and cultural influences on the relationship between obesity and psychiatric disorders. However, further research is needed to identify the direction of causality between obesity and psychiatric disorders.

Conclusion

Although the effect of psychotropic medications on the weight of psychiatric patients were excluded in our sample,

overweight and obesity prevalence are considerably high among psychiatric patients. This can occur with most of the psychiatric disorders, especially mood disorders; this means there are several other mechanisms and risk factors that are still not well understood. Moreover, demographic and social factors may moderate or mediate the association between obesity and psychiatric disorder, and hence we recommend that identification of overweight, obesity, and associated risk factors and adding BMI as a routine work-up for each psychiatric patient should be considered in the management plan of psychiatric disorders.

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Conflicts of interest

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