The prevalence of metabolic syndrome in patients with mood disorders

Reda Roshdy[a], Shereen M. Abdelmawella[b] and Hoda A. Bayoumy[b]

[a]Department of Psychiatry, Faculty of Medicine, Azhar University and [b]Department of Psychiatry, Faculty of Medicine, Cairo University, Cairo, Egypt

Correspondence to Hoda A. Bayoumy, MD, Department of Psychiatry, Faculty of Medicine, Cairo University, Cairo, Egypt
Tel: +20 111 255 5561;
e-mail: hoda.aliaa2007@gmail.com

Received 5 April 2016
Accepted 28 January 2017

Middle East Current Psychiatry
2017, 24:156–160

Introduction
Obesity and metabolic disorders cause significant economic burden and affect the quality of life in both the general population and patients with mood disorder. The metabolic syndrome (MetS) and bipolar disorder (BD) appear to share common risk factors. Several studies discovered that the rate of MetS in patients with BD was twice as high as in the general population. In addition, bipolar patients with MetS often had more complicated metabolic and cardiac problems, more adverse outcomes and poor response to treatment.

Aim
This study was conducted to detect the MetS and its association with sociodemographic and clinical variables in a sample of patients with mood disorders admitted to Kuwait Center for Mental Health.

Patients and methods
The sample consisted of 157 adult patients having mood disorders according to the Diagnostic and Statistical Manual of Mental disorders – text revised – and were admitted in Kuwait Center for Mental Health in the period from April 2013 to September 2013. The Third Adult Treatment Panel (ATP III) of the National Cholesterol Education Program, the American Heart Association (ATP III-A) and International Diabetes Federation criteria were used to define MetS.

Results
The prevalence of MetS among BDs patients was 37.6% ($n=57$). The prevalence of MetS among major depressive disorder patients was 17.1%. The prevalence of MetS increased with age and duration of illness.

Conclusion
The prevalence of the MetS among BDs patients is high (37.6%). Although this study found that the prevalence of MetS in BDs patients was according to ATP III (24.8%), it is increased when ATP III-A (35.0%) and International Diabetes Federation (36.3%) were taken into account. There are statistically significant differences between patients with MetS and those without MetS as regards age and duration of the illness.

Keywords:
bipolar disorders, metabolic syndrome, mood disorders

Middle East Curr Psychiatry 24:156–160

2090-5408

Introduction

There are still many uncertainties, doubts and controversies related to metabolic syndrome (MetS) and bipolar disorder (BD). Some researchers have very critical opinions, who are trying to challenge MetS as an independent diagnostic entity [1,2]. Research dealing with the relationship of MetS and BD is very rare. Some researchers found that MetS occurs in 8–56% of patients suffering from BD. There is also an increase in the frequency of cardiovascular disease compared with the general population and diagnosed MetS in 56% of those suffering from BD [3]. In a study from the USA [4], MetS was diagnosed in 30% of those suffering from BD.

Metabolic disorders also affect a significant portion of this population. Obesity and metabolic disorders cause significant economic burden and impair quality of life in both the general population and patients with BD. The MetS and BD appear to share common risk factors, including endocrine disturbances, dysregulation of the sympathetic nervous system and behaviour patterns, such as physical inactivity and overeating [5]. In addition, many of the commonly used pharmacological treatments for BD may intensify the medical burden in bipolar patients by causing weight gain and metabolic disturbances, including alterations in lipid and glucose metabolism, which can result in an increased risk for diabetes mellitus, hypertension, dyslipidaemia, cardiovascular disease and the MetS. These medical comorbidities and obesity have been associated with a worse disease course and likely contribute to the premature mortality observed in bipolar patients [6].

MetS is a cluster of symptoms with higher prevalence in psychiatric patients compared with the general

 DOI: 10.1097/01.XME.0000513072.95633.f7

population [7–9]. One study combined and analysed the data of 19 previous research studies from 13 countries to examine the association between BD and MetS. They discovered that the rate of MetS in patients with BD was twice as high as in the general population. In addition, bipolar patients with MetS often had more complicated metabolic and cardiac problems, more adverse outcomes and responded less well to treatment. It also found that MetS also complicates mental health issues, worsens depression and even increases the rate of suicide [6].

This study was conducted with the aim to detect the prevalence of the MetS and its association with sociodemographic and clinical variables in a sample of patients with mood disorders admitted to Kuwait Center for Mental Health.

Patients and methods

The present study was conducted in patients admitted in Kuwait Center for Mental Health after taking approval from scientific and ethics committee of the hospital. It is a cross-sectional study involving a sample of 186 adult patients aged 18 years or more who were recruited in the period from April 2013 to September 2013. Totally, 14 patients were excluded because they did not agree to sign the informed consent; pathology or other data were incomplete for another 15 patients. Finally, the study included 157 patients. The exclusion criteria were substance use disorder, dementia, mental retardation, being currently pregnant or a history of pregnancy in the past 6 months (to avoid metabolic disturbance) and lack of capacity to give written informed consent.

Psychiatric diagnosis was carried out according to Diagnostic and Statistical Manual of Mental disorders – text revised [10]. Sociodemographic data, history of psychiatric and medical illness and current medications were collected from medical records and semistructured interview with the patients. Metabolic syndrome was defined by (a) The ATP III of the National Cholesterol Education Program [11]; (b) the American Heart Association (ATP III-A) [12]; and (c) International Diabetes Federation (IDF) criteria [13] (definitions of MetS are presented in Tables 1–3). Height, body weight, waist circumference and blood pressure (BP) were measured for every patient. Fasting blood samples were collected to assess glucose and lipid profile.

Statistical methodology

Data were collected and coded and then entered into an IBM-compatible computer, using the statistical package for the social sciences version 22 for Windows (SPPS; SPSS Inc., Chicago, Illinois, USA). Entered data were checked for accuracy and then for normality, using Kolmogorov–Smirnov and Shapiro–Wilk tests, and proved to be normally distributed. Qualitative variables were expressed as number and percentage, whereas quantitative variables were expressed as mean and SD.

The arithmetic mean was used as a measure of central tendency, whereas the SD was used as a measure of dispersion.

The following statistical tests were used:

(1) Independent samples *t*-test was used as a parametric test of significance for comparison between two sample mean, after performing the Levene's test for equality of variances.
(2) The χ^2-test (or likelihood ratio) was used as a nonparametric test of significance for comparison between the distribution of two qualitative variables.

A 5% level is chosen as a level of significance in all statistical significance tests used.

Results

Regarding demographic data of the patients, 85 (54.1%) patients were men and 72 (45.9%) were women. The mean age of the patients was 43.04 ± 14.34 years: 46.9 ± 16.2 years for men and 38.4 ± 10.1 years for women, with a statistically significant difference between men and women. Regarding duration of illness, there was a statistically significant difference between men and women, as the mean duration of illness was 14.9 ± 9.2 years for men and 9.3 ± 7.9 years for women. The mean waist circumference of patients was 100.35 ± 18.8 cm for men and 96.65 ± 21.8 cm for women, with no significant difference between them. The mean systolic BP of the patients was 127.3 ± 16.97 mmHg for men and 123.2 ± 10.2 mmHg for women, with no statistically significant difference between them. The mean diastolic BP of the patients was 79.00 ± 7.4 mmHg for men and 78.4 ± 6.0 mmHg for women, with no significant difference between them. The mean triglyceride level was 1.56 ± 1.1 mmol/l for men and 1.15 ± 0.7 mmol/l for women,

Table 1 Definitions of the metabolic syndrome

Criteria	ATP III[a](NCEP)	ATP III A[a] (AHA)	IDF[b]
Waist (cm)	M > 102, F > 88	M > 102, F > 88	M ≥ 94, F ≥ 80 Obligatory criterion
BP[c]	≥ 130/85	≥ 130/85	≥ 130/85
HDL (mg/dl)	M < 40, F < 50	M < 40, F < 50	M < 40, F < 50
TG (≥ 150 mg/dl) or ≥ 1.695(mmol/l)	≥ 150 or ≥ 1.695	≥ 150≥ or ≥ 1.695	≥ 150 or ≥ 1.695
Glucose (mg/dl) or mmol/l)[d]	≥ 110 or ≥ 6.1	≥ 100 or ≥ 5.6	≥ 100 or 5.6

AHA, the American Heart Association; BP, blood pressure; HDL, high density lipoprotein; IDF, International Diabetes Federation; Mets, metabolic syndrome; NCEP ATP III, The Third Adult Treatment Panel of The National Cholesterol Education Program; TG, Triglycerides.
[a]MetS if 3 of 5 criteria are met.
[b]MetS if additional 2 criteria are met (waist is obligatory).
[c]Or if treated with antihypertensive medication.
[d]Or if treated with insulin or hypoglycemic medication.

Table 2 Frequencies distribution of age &duration of illness of subjects and indices of metabolic syndrome NO = 157

Variable	NO of subject (%)
Age (years):	
18–30	34 (21.5)
31–45	60 (38.3)
46–79	63 (40.2)
Mean (SD) 43.04 ± 4.34	
Duration of illness (years)	
1–5	51 (32.5)
6–10	34 (21.6)
11–20	48 (30.6)
21–33	24 (15.3)
Mean (SD) 12.3 ± 9.04	
Height of patients (cm)	
144–160	82 (52.2)
161–170	56 (35.7)
171–180	19 (12.1)
Mean (SD) 161.1 ± 7.7	
Weight of patients (kg)	
46–70	40 (25.5)
71–90	72 (45.8)
91–110	35 (22.3)
111–150	10 (6.4)
Mean (SD) 81.1 ± 20.02	
Waist circumference of patients (cm)	
65–80	33 (21.0)
81–90	29 (18.5)
91–110	51 (32.5)
111–147	44 (28.0)
Mean (SD) 98.65 ± 20.3	
Hip circumference of patients (cm)	
73–90	39 (24.9)
91–110	66 (42.0)
111–150	52 (33.1)
Mean (SD) 105.04 ± 19.98	
Triglycerides level (mmol/l)	
0.41–1.68	111 (70.9)
1.69–6.01	46 (29.1)
Mean (SD) 1.4 ± 0.96	
HDL level (mmol/l)	
0.38–1.00	90 (57.0)
1.1–1.50	58 (37.0)
1.51–2.01	9 (6.0)
Mean (SD) 1.01 ± 0.32	
Systolic BP of patients (mmHg)	
100–120	85 (54.2)
125–140	64 (40.8)
145–185	8 (5.0)
Mean (SD) 125.4 ± 14.04	
Diastolic BP of patients (mmHg)	
70–80	124 (79.0)
85–90	30 (19.1)
95–100	3 (1.9)
Mean (SD) 78.7 ± 7.15	
Fasting blood glucose level (mmol/l)	
3.4–5.5	98 (62.3)
5.6–6.1	12 (7.7)
6.2–8.00	25 (16.0)
8.1–17	22 (14.0)
Mean (SD) 6.09 ± 2.6	

HDL, high-density lipoprotein; PB, blood pressure; SD, standard deviation.

Table 3 Demographic and clinical characteristics of the patients *N* = 157

Variable	*N* (%)
Age (years, Mean ± SD)	43.04 ± 14.34
Sex	
Male	85 (54.1)
Female	72 (45.9)
Marital state	
Single	43 (27.4)
Married	84 (53.5)
Other (widowed, divorced)	30 (19.1)
Education level	58 (36.9)
No formal education	42 (26.8)
Primary school	36 (22.9)
Secondary/intermediate school University	21 (13.4)
Occupation	
Unemployed	94 (59.9)
Student	6 (3.8)
House wife only	34 (21.7)
Junior work	14 (8.9)
Middle level work	3 (1.9)
Senior level work	6 (3.8)
Nationality	
Kuwaiti	101 (64.3)
Non Kuwaiti	16 (10.2)
Other Arabs	31 (19.7)
Other country	9 (5.8)
Diagnosis	
Bipolar Mood Dis	122 (77.7)
Major Depressive Dis	35 (22.3)
Illness duration (years, mean ± SD)	12.3 ± 9.04
On treatment of Hypertension	
Yes	37 (23.6)
No	120 (76.4)
Mean (SD) 1.76 ± 0.42 On treatment Diabetes	
Yes	49 (31.2)
No	108 (68.8)
Mean (SD) 1.68 ± 0.46	

with a significant difference between them. The mean high-density lipoproteins level was 1.00 ± 0.24 mmol/l for men and 1.03 ± 0.40 mmol/l for women, with no significant difference between them. The mean fasting blood glucose level was 5.9 ± 1.8 for men and 6.3 ± 3.3 mmol/l for women, with no significant difference between them. The prevalence of the MetS among BD patients is high (37.6%). Although this study found that the prevalence of MetS in BDs patients was according to ATP III (24.8%), it is increased when ATP III-A (35.0%) and IDF (36.3%) were taken into account. The prevalence of MetS among major depressive disorder patients was 17.1%. There are statistically significant differences between patients with MetS and those without MetS as regards age and duration of the illness; the prevalence of MetS increased with age and duration of illness.

Discussion

The WHO ranked BD seventh among the debilitating diseases in the year 2000. Patients with BD are known to suffer from a considerable number of associated pathologies that may manifest at an earlier age and more frequently than in the general population. In recent years, great interest has been aroused in the study of comorbidities associated with psychiatric disorders because of the increased prescription rates of second-generation antipsychotics, which may cause metabolic and endocrine disturbance, particularly MetS. Patients with BD have been found to have higher rates of obesity than the general population. The age-adjusted rates of MetS in the USA, derived from the National Health and Nutrition Examination Survey (NHANES) III (1988–1994) and from the NHANES 1999–2000, were 24.1 and 27.0%, respectively. It has been reported that the MetS rate was 32% among patients with BD in a Turkish sample, and this rate was higher than in the general population, which is similar to previous findings on BD. In addition, researchers have recently started to

discuss the overlap between mood disorders and MetS and its components [14].

In this sample of BD patients, 37.6% fulfilled criteria for the MetS as defined by MetS guidelines. This rate is high compared with the rate of 18% found among healthy Kuwaiti adults [15] and 21.4% found among the USA general population during the Third NHANES III, 1988–1994 [16]. In this study, the MetS prevalence in BDs patients was 24.8% ($N = 39$) according to National Cholesterol Education Program (NCEP)-ATP III, 35.0% ($N = 55$) according to AHA (ATP III-A) and 36.3% ($N = 57$) according to IDF.

Our result also agree with the result of Vancampfort *et al*. [17], who found that the main prevalence rate of the MetS (defined with standardized criteria) in BD patients was 37.3%. This result, based on a meta-analysis involving 37 studies with 6983 unique patients with BDs, also agrees with one study in Brazil [18], which found the prevalence rate of MetS in BD patients to be 38%.

Our results were different from the results of other studies in the following manner: our result was higher than the result of van Winkel *et al*. [19], who found that MetS prevalence in BDs patients was 16.7% according to ATP III, 18.3% according to ATP III-A and 30.0% according to IDF, respectively. It was also higher than the results of Lee *et al*. [20], who found that the prevalence of the MetS in patients who took medication for BD ($N = 152$) according to the different definitions was 27.0% (ATP III-A) and 25.7% (IDF). It is also higher than the result of Garcia-Portilla *et al*. [21], who found that the prevalence of the MetS in BD patients in Spain ($N = 194$) was 22.4% according to modified NCEP ATP III criteria (ATP III-A), and higher than the result of Ezzaher *et al*. [22] who found that the prevalence of the MetS in bipolar I disorders in Tunisian patients ($N = 130$) was 26.1% according to modified NCEP ATP III criteria (ATP III-A). There might be several reasons for the high prevalence rate of MetS in our study. The first reason might be the high mean age of our patients (43.04 ± 14.34). Another reason might be the difference in lifestyle factors. Moreover, it has been reported that, within the general public, regional differences may have an impact on the MetS rate. In addition, Jakovljević *et al*. [8] detected MetS in 24.6–50% of bipolar patients.

On the other hand, Cardenas *et al*. [23] found that the prevalence rate of the MetS in BDs patients ($N = 98$) was 49%, with a mean age of 50 years. In addition, Shahda *et al*. [24] found that the prevalence rate of the MetS in BD patients was 44.2% according to modified NCEP ATP III criteria (ATP III-A); all of these results seem to be lower than our results.

In another study that was conducted to detect the prevalence rate of the MetS in BD patients, it was reported that the prevalence is about 55% according to IDF criteria, with a mean age of 58 ± 12.3 years [25]. There might be several reasons for the low prevalence rate of MetS in our study, which can be explained by the fact that 29.3% of our patients met only two positive criteria for a diagnosis of MetS and, thus, were not diagnosed with MetS. Moreover, this difference may be explained by the difference in sample characteristics, as we only evaluate the inpatient group.

As regards clinical diagnosis, we found that 43.4% of bipolar patients had MetS in comparison with17.1% of major depressive patients. This is in agreement with the result of Hung *et al*. [26], who found that prevalence of MetS in bipolar one patients was 46.7%, in bipolar II patients it was 25% and in major depression patients it was 22%. Two possibilities were assumed to explain the lack of a significant relationship between depressive states and MetS. First, the process of forming MetS might require a longer duration, such as several months or years; however, depressive severity might change within a shorter time, such as several days or weeks. Second, the impact of pharmacotherapy or other factors might be greater than that of depressive severity [26].

When we compared patients with MetS with those without MetS, there were statistically significant differences between the two groups as regards the items of all sociodemographic data ($P = 0.000$).

As regards age, when we compared patients with MetS with those without MetS, we found that the patients with MetS have higher mean age (43.4 ± 9.5 years) and that the frequency of MetS increased consistently with age. Our results were supported by the result of Hung *et al*. [26] and Garcia-Portilla *et al*. [21], who found that the prevalence of MetS increased significantly with age. It is also in agreement with studies that have shown that patients with BDs with MetS are older than those without MetS [23].

However, Fagiolini and colleagues [4,22,27] did not detect a significant difference in the prevalence of MetS among sex and age. Unfortunately, the influence of sex and other sociodemographic data on MetS and/or its components has been neglected in patients with BD. Yumru *et al*. [27] have analysed the influence of sex on MetS (but not its components), failing to find a statistically significant association.

In this study, durations of illness in patients with MetS were longer than in patients without MetS ($P = 0.000$); this is in agreement with van Winkel *et al*. [19], who found that bipolar patients with MetS had a significantly longer illness duration. Our results disagree with the result of Vancampfort *et al*. [17], who found differences in prevalence rates of Mets in different studies in bipolar patients that could not be explained by illness duration.

Study limitation

First, the study was a cross-sectional study, and thus we cannot study the relationship between total number of lifetime episodes, overall severity of illness, received medications and the prevalence of MetS.

Second, there is a lack of data on lifestyle and dietary habits of patients that may affect the prevalence of MetS. In addition, other limitations include lack of a control group. Despite these limitations, our findings are consistent with high rates of the MetS in BDs.

Conclusion and recommendations

The prevalence of MetS among patients with mood disorders was high. There is a need to have studies with larger sample size from various ethnic backgrounds and from different countries to have a better estimate of the problem. Further, with the current effort to unify the definition of MetS, it is important to use ethnic-specific criteria to define MetS. Future studies should include preferably drug-naive patients with a longitudinal study design to evaluate the role of various types of medications on the prevalence of MetS and should include both inpatients and outpatients. Inclusion of a healthy control group will help to study the psychosocial and economic impact of MetS in patients with mood disorder. Considering the high prevalence of MetS in patients with mood disorders, routine screening for MetS is indicated. Waist circumference and raised BP should be routinely measured, and depending on the cost involved the laboratory investigations should be performed. Attempts should be made to change unhealthy lifestyle such as inactivity, overeating, smoking and use of alcohol, and appropriate psychoeducational programs in this regard need to be developed.

Conflicts of interest

There are no conflicts of interest.

References

1 Bakker SJL, Gansevoort RT, de Zeeuw D. Metabolic syndrome: a Fata Morgana? Nephrol Dial Transplant 2007; 22:15–20.

2 Reaven GM. The metabolic syndrome: requiescat in pace. Clin Chem 2005; 51:931–938.

3 Babić D, Maslov B, Martinac M, Nikolić K, Uzun S, Kozumplik O. Bipolar disorder and metabolic syndrome: comorbidity or side effects of treatment of bipolar disorder. Psychiatr Danub 2010; 22:75–78.

4 Fagiolini A, Frank E, Scott JA, Turkin S, Kupfer DJ. Metabolic syndrome in bipolar disorder: findings from the bipolar disorder center for Pennsylvanians. Bipolar Disord 2005; 7:424–430.

5 Fagiolini A, Chengappa KN, Soreca I, Chang J. Bipolar disorder and the metabolic syndrome: causal factors, psychiatric outcomes and economic burden. CNS Drugs 2008; 22:655–669.

6 Jones J. Bipolar patients twice as likely to have metabolic syndrome. Available at: *http://psychcentral.com/news/2010/06/24/bipolar-patients-twice-as-likely-to-have-metabolic-syndrome/14945.html* [Accessed 29 February 2016].

7 Britvic D, Maric NP, Doknic M, Pekic S, Andric S, Jasovic-Gasic M, Popovic V. Metabolic issues in psychotic disorders with the focus on first-episode patients: a review. Psychiatr Danub 2013; 25:410–415.

8 Jakovljević M, Crncević Z, Ljubicić D, Babić D, Topić R, Sarić M. Mental disorders and metabolic syndrome: a fatamorgana or warning reality? Psychiatr Danub 2007; 19:76–86.

9 Vuksan-Cusa B, Sagud M, Jakovljevic M, Mihaljevic Peles A, Jaksic N, Mihaljevic S, *et al*. Association between C-reactive protein and homocysteine with the subcomponents of metabolic syndrome in stable patients with bipolar disorder and schizophrenia. Nord J Psychiatry 2013; 67:320–325.

10 American Psychiatric Association. *Diagnostic and statistical manual of mental disorder, 4th ed text revision*. Washington, DC: American Psychiatric Association; 1994.

11 Cleeman JI. Executive summary of the third report of the National Cholesterol Education Program (NCEP) expert panel on detection, evaluation and treatment of high blood cholesterol in adults (adult treatment panel III). JAMA 2001; 285:2486–2497.

12 Grundy SM, Cleeman JI, Daniels SR, Donato KA, Eckel RH, Franklin BA, *et al*. Diagnosis and management of the metabolic syndrome: an American Heart Association/National Heart, Lung and Blood Institute Scientific Statement. Circulation 2005; 112:2735–2752.

13 International Diabetes Federations. *The IDF consensus worldwide definition of the metabolic syndrome*. International Diabetes Federations. Available at: *http://www.idf.org/webdata/docs/metabolic_syndrome_definition.pdf*.

14 Altinbas K, Guloksuz S, Timucin E. Oral metabolic syndrome prevalence in different affective temperament profiles in bipolar-I disorder. Rev Bras Psiquiatr 2013; 35:131–135.

15 Badr HE, Al Orifan FH, Amasha MMF, Khadadah KE, Younis HH, Abdul Sabour Se'adah M. Prevalence of metabolic syndrome among healthy Kuwaiti adults: Primary health care centers based study. MEJFM 2007–2008; 5:8–11.

16 Ford ES, Giles WH, Dietz WH. Prevalence of the metabolic syndrome among US adults. Findings from the third National Health and Nutrition Examination Survey. JAMA 2002; 287:356–359.

17 Vancampfort D, Vansteelandt K, Correll CU, Mitchell AJ, De Herdt A, Sienaert P, *et al*. Metabolic syndrome and metabolic abnormalities in bipolar disorder: a meta-analysis of prevalence rates and moderators. Am J Psychiatry 2013; 170:265–274.

18 Paulo JRT, Fabio LR. The prevalence of metabolic syndrome among psychiatric inpatients in Brazil. Rev Bras Psiquiatr 2007; 29:330–336.

19 Van Winkel R, de Hert M, van Eyck D, Hanssens L, Wampers M, Scheen A, *et al*. Prevalence of diabetes and the metabolic syndrome in a sample patients with bipolar disorder. Bipolar Disord 2008; 10:342–348.

20 Lee NY, Kim SH, Cho B, Lee YJ, Chang JS, Kang UG, *et al*. Patients taking medications for bipolar disorder are more prone to metabolic syndrome than Korea's general population. Prog Neuropsychopharmacol Biol Psychiatry 2010; 34:1243–1249.

21 Garcia-Portilla MP, Saiz PA, Benabarre A, Sierra P, Perez J, Rodriguez A, *et al*. The prevalence of metabolic syndrome in patients with bipolar disorder. J Affect Disord 2008; 106:197–201.

22 Ezzaher A, Haj Mohamed D, Mechri A, Neffati F, Douki W, Gaha L, Najjar MF. Metabolic syndrome in Tunisian bipolar I patients. Afr Health Sci 2011; 11:414–420.

23 Cardenas J, Frye MA, Marusak SL, Levander EM, Chirichigno JW, Lewis S, *et al*. Modal subcomponents of metabolic syndrome in patients with bipolar disorder. J Affect Disord 2008; 106:91–97.

24 Shahda M, Elsayed O, El-Boraie A. Study of the prevalence of metabolic Syndrome among psychiatric patients and its correlation with diagnosis and medications. Egypt J Psychiatry 2010; 31:17–24.

25 Gubbins A, Lally J, McDonald C. Metabolic syndrome in patients attending psychiatric day centres: prevalence and associations. Psychiatrist 2012; 36:326–331.

26 Hung CI, Liu CY, Hsiao MC, Yu NVV, Chu CL. Metabolic syndrome among psychiatric outpatients with mood and anxiety disorders. BMC Psychiatry 2014; 14:185.

27 Yumru M, Savas HA, Kurt E, Kaya MC, Salek S, Savas E, *et al*. Atypical antipsychotics related metabolic syndrome in bipolar patients. J Affect Disord 2007; 98:247–252.