

ORIGINAL ARTICLE

Metabolic syndrome prevalence in different affective temperament profiles in bipolar-I disorder

Kursat Altinbas,¹ Sinan Guloksuz,^{2,3} E. Timucin Oral⁴

¹Department of Psychiatry, Faculty of Medicine, Canakkale Onsekiz Mart University, Canakkale, Turkey. ²Department of Psychiatry and Psychology, Maastricht University Medical Centre, Maastricht, The Netherlands. ³Department of Psychiatry, Yale University, New Haven, CT, USA. ⁴Department of Psychology, Faculty of Art and Sciences, Istanbul Commerce University, Istanbul, Turkey.

Objective: Temperament originates in the brain structure, and individual differences are attributable to neural and physiological function differences. It has been suggested that temperament is associated with metabolic syndrome (MetS) markers, which may be partly mediated by lifestyle and socioeconomic status. Therefore, we aim to compare MetS prevalence between different affective temperamental profiles for each season in bipolar patients.

Methods: Twenty-six bipolar type-I patients of a specialized outpatient mood disorder unit were evaluated for MetS according to new definition proposed by the International Diabetes Federation in the four seasons of a year. Temperament was assessed using the Temperament Evaluation of Memphis, Pisa, Paris and San Diego - autoquestionnaire version (TEMPS-A).

Results: The proportions of MetS were 19.2, 23.1, 34.6, and 38.5% in the summer, fall, spring, and winter, respectively. Only depressive temperament scores were higher ($p = 0.002$) during the winter in patients with MetS.

Conclusion: These data suggest that depressive temperament profiles may predispose an individual to the development of MetS in the winter.

Keywords: Bipolar disorder; temperament; metabolic syndrome

Introduction

The World Health Organization (WHO) ranked bipolar disorder (BD) seventh among the debilitating diseases in the year 2000.¹ 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.^{2,3} 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 metabolic syndrome (MetS).⁴⁻⁶ Patients with BD have been found to have higher rates of obesity than the general population.^{7,8} The age-adjusted rates of MetS in the United States, 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.⁹ 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.¹⁰ Additionally, researchers have recently started to discuss the overlap

between mood disorders and MetS and its components.¹¹⁻¹³

Affective temperament was defined by Kraepelin many years ago.¹⁴ Later, most authors have agreed that a combination of genetic and environmental factors is essential for the ultimate expression of an individual's temperament.¹⁵⁻¹⁷ Furthermore, temperament is a constitutional factor that contains the earliest biological roots of the patterns of behavior. Thus, temperamental differences reflect individual differences in anatomical and functional patterns of the central nervous system.¹⁸ There have been a number of neurochemical, neurophysiological, genetic, and functional brain imaging studies of temperament and personality,¹⁹⁻²² but only a few studies have investigated the relationship between temperament and weight gain,^{23,24} specific apolipoprotein E (apoE) phenotypes,^{25,26} and MetS.^{27,28} All these studies indicate that there is an association between temperamental features and tendency to metabolic and endocrine disturbances. In the light of such evidence, it can be concluded that there is a relationship between glucose and/or lipid metabolism and affective temperament, which may share a common etiological process.

Thus, taking into account the high prevalence of MetS in BD patients and the possibility of a shared etiological process between temperament, BD, and MetS, we aim to compare the MetS prevalence between different affective temperamental profiles for each season, considering that the seasonality of serum lipids²⁹⁻³² and weight/body mass index^{33,34} may affect MetS prevalence.

Correspondence: Kursat Altinbas, Department of Psychiatry, Faculty of Medicine, Canakkale Onsekiz Mart University, Canakkale, Turkey.

E-mail: kursataltinbas@gmail.com

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Methods

Study population

Twenty-six BD-I patients who were being followed up at the Rasit Tahsin Mood Disorders Outpatient Unit of Bakirkoy Research and Training Hospital for Psychiatry, Neurology, Neurosurgery were recruited consecutively. Patients aged between 18 and 65 years, literate in Turkish, and who accepted to participate in the study were recruited. The diagnosis of BD was confirmed by two different clinicians according to a DSM-IV based interview and the evaluation of standardized medical records that are being used for a nation-wide mood disorder follow-up program named SKIP-TURK.³⁵ Patients were euthymic with total scores of the Young Mania Rating Scale (YMRS) and the 17 items Hamilton Depression Rating Scale (HAMD-17) below 7. Eligible participants were not diagnosed with alcohol and substance use disorder, mental retardation, dementia, or any other impaired cognitive functioning, which may hinder the understanding of the self-rated scales; were not taking cholesterol-lowering medications; and did not have possible causes of underlying chronic medical illness that could have an effect on lipid profile or psychiatric illness (e.g., hypo-/hyperthyroidism, diabetes mellitus, severe liver diseases). The recruitment process was undertaken in the summer season, and patients attended four visits (one in each season) to be evaluated for MetS. Patients were also followed up on a monthly basis by their primary clinicians based on the standardized medical records that are being used for a nation-wide mood disorder follow-up program named SKIP-TURK. During follow-up, bipolar patients who were experiencing a mood episode and prescribed lipid-lowering drugs or antidiabetic drugs by a consultant internal medicine specialist were excluded from the study due to potential effect of the mood episodes and/or drugs on the MetS seasonal pattern. The present study was approved by the local ethics committee and all participants signed informed consent forms before entering the study.

Procedure

The visits were performed in the second half of each season because this period is known to reflect the features of the seasonal index better. Thus, the first, second, third, and fourth visits were performed between July 15 and August 31; October 15 and November 30; January 15 and February 28; and April 15 and May 31; respectively. Height, weight, body mass index (BMI), waist and hip circumferences, waist/hip ratio, blood pressure, 12-hour fasting serum glucose, and lipid profile were measured in each visit. After each visit, the patients were evaluated for MetS according to the new definition proposed by the International Diabetes Federation (IDF). According to the IDF definition, patients with MetS have central adiposity, which is defined as ≥ 94 cm waist circumference for European, Eastern, and Middle-Eastern ethnic groups, plus two or more of the following four factors: 1) raised triglycerides (TG) level: ≥ 150 mg/dL or

specific treatment for this lipid abnormality; 2) reduced concentration of high density lipoprotein (HDL): < 40 mg/dL in men and < 50 mg/dL in women or specific treatment for this lipid abnormality; 3) raised blood pressure: systolic blood pressure ≥ 130 mmHg or diastolic blood pressure ≥ 85 mmHg or treatment of previously diagnosed hypertension; 4) raised fasting plasma glucose concentration ≥ 100 mg/dL or previously diagnosed type 2 diabetes.

Assessment tools

Demographic data and health information were collected by a self-administered survey developed by the researchers. Each patient's clinical features and treatment history of BD were also evaluated.

For the assessment of affective temperament, the Turkish version of the Temperament Evaluation Memphis, Pisa, Paris and San Diego - autoquestionnaire version scale (TEMPS-A)³⁶ was used, and temperament was considered to be a static phenomenon that does not change over time. The scale consists of 100 yes/no questions designed to measure affective temperament traits present in the subjects' whole life. According to the TEMPS-A, there are five different types of temperament: anxious, depressive, cyclothymic, hyperthymic, and irritable.

Statistics

Descriptive analyses were expressed as mean and percentage. The data did not meet the criteria for normal distribution. Thus, the Mann-Whitney U test was used to analyze statistical differences between the TEMPS-A subscale scores of the patients with MetS and without MetS in each season. A p-value less than 0.05 was considered statistically significant. The Bonferroni correction was applied for multiple comparisons, and the significance level was considered to be $p = 0.0125$. Data were analyzed using SPSS for Windows version 13.0.

Results

The characteristics of the study population are presented in Table 1. The treatment of the patients were as follows: 30.8% of them were on mood stabilizer (lithium or valproate) monotherapy, whereas 38.5% were taking mood stabilizer-antipsychotic combination therapy, and the remaining 30.7% were on polypharmacy (combination of three drugs). The proportions of MetS were 19.2, 23.1, 34.6, and 38.5% in the summer, fall, spring, and winter, respectively. Mean weight, BMI, TG and HDL cholesterol are presented in Table 2.

The mean \pm standard deviation of the scores of the TEMPS-A subscales (depressive, cyclothymic, hyperthymic, anxious, and irritable) were 6.0 ± 3.1 , 7.0 ± 4.9 , 8.2 ± 3.1 , 2.9 ± 3.4 , and 5.7 ± 4.8 , respectively. The scores of the TEMPS-A subscales in patients with and without MetS in each season are presented in Table 3. Only

Table 1 Characteristics of the study population

	n=26
Gender, n (%)	
Female	17 (65.4)
Male	9 (34.6)
Age (years), mean \pm SD	36.19 \pm 8.42
Age at onset (years), mean \pm SD	21.65 \pm 5.20
Duration of illness (years), mean \pm SD	14.58 \pm 7.13

SD = standard deviation.

depressive temperament scores in the winter were significantly higher ($Z = -3.04$, $p = 0.002$) in the group of patients with MetS than in the group of patients without MetS. There were no statistically significant differences between the group of patients with MetS and without MetS in terms of TEMPS-A in the other seasons.

Discussion

MetS rates varied from 19.2 to 38.5% in the different seasons during a one-year period and MetS proportions were similar to those in the literature. Different MetS rates for each season may support the studies that indicate seasonality of serum lipid levels.²⁹⁻³² Moreover, the highest MetS rate was in the winter (38.5%), which is consistent with the studies showing higher serum lipid levels in the winter.³² The observation of seasonal variations in blood lipid levels with a peak in the winter for both genders leads to the conclusion that a relative plasma hypervolemia during the summer seems to be linked to increment in temperature and/or physical

activity.³² This seasonal variation in blood lipid levels may explain the discrepant proportions of MetS found in different studies. These findings have implications for lipid screening guidelines. Clinicians should be aware of the season when they measure serum lipid levels or diagnose MetS in patients with BD, because this may cause misdiagnosis.

Conversely, we found that only depressive temperament scores in the winter were significantly higher in the group of patients with MetS than in the group of patients without MetS. Thus, we can speculate that bipolar patients with depressive temperament are susceptible to MetS in the winter. However, there is not any study investigating the relationship between temperament and MetS in different seasons. Researchers from Finland conducted a 3-year follow-up study examining the association of temperament and MetS precursors in children.²⁷ They found that specific temperament profiles of children described by their parents, such as negative emotionality (aggression and anger), responsivity to others, and cooperativeness, were associated with high level of somatic risk.²⁷ More recently, consistent with our results, it has been found that temperament is associated with MetS markers, and this association may be partly mediated by lifestyle factors and socioeconomic status in adulthood.²⁸ Additionally, specific temperament profiles of young men have been found to be related to early development of metabolic cardiovascular syndrome.³⁷ The Cloninger's Temperament and Character Inventory (TCI) was used in these studies.³⁸ However, we preferred to use the TEMPS-A in our study because this scale is mostly used for evaluating affective temperament in patients with mood disorders. To the best of our

Table 2 Weight, body mass index, triglycerides, high density lipoprotein in each season, mean \pm standard deviation

	Summer	Fall	Winter	Spring
Weight (kg)	74.86 \pm 13.88	75.58 \pm 13.71	78.68 \pm 14.07	77.31 \pm 14.25
BMI	27.05 \pm 4.13	27.38 \pm 3.86	28.55 \pm 3.99	27.89 \pm 4.12
TG (mg/dL)	143.96 \pm 160.42	148.81 \pm 186.50	166.35 \pm 173.14	138.35 \pm 102.51
HDL (mg/dL)	46.31 \pm 10.88	44.54 \pm 10.34	46.38 \pm 12.70	37.96 \pm 5.81

BMI = body mass index; HDL = high density lipoprotein; TG = triglycerides.

Table 3 Scores of the TEMPS-A subscales in patients with and without metabolic syndrome in each season, mean \pm standard deviation

Season/Diagnosis of metabolic syndrome	Depressive	Cyclothymic	Hyperthymic	Irritable	Anxious
Summer					
With MetS (n=5)	7.6 \pm 3.8	8.8 \pm 4.4	10.0 \pm 2.6	6.0 \pm 6.0	7.6 \pm 5.7
Without MetS (n=21)	5.6 \pm 2.9	6.6 \pm 5.1	7.8 \pm 3.2	2.2 \pm 2.0	5.3 \pm 4.6
Fall					
With MetS (n=6)	7.8 \pm 1.5	7.8 \pm 3.3	8.0 \pm 2.8	6.3 \pm 5.6	10.0 \pm 4.9
Without MetS (n=20)	5.5 \pm 3.3	6.8 \pm 5.4	8.3 \pm 3.3	1.9 \pm 1.4	4.5 \pm 4.1
Winter					
With MetS (n=10)	8.3 \pm 1.5	8.3 \pm 3.9	8.3 \pm 3.7	5.0 \pm 4.9	7.4 \pm 4.9
Without MetS (n=16)	4.8 \pm 3.1	6.4 \pm 5.5	8.2 \pm 3.1	1.8 \pm 1.5	4.9 \pm 4.6
Spring					
With MetS (n=9)	7.1 \pm 3.2	6.8 \pm 4.1	8.7 \pm 2.8	4.5 \pm 4.9	7.2 \pm 5.3
Without MetS (n=17)	5.3 \pm 3.0	7.2 \pm 5.6	7.9 \pm 3.4	1.9 \pm 1.4	4.9 \pm 4.4

MetS = metabolic syndrome; TEMPS-A = Temperament Evaluation Memphis, Pisa, Paris and San Diego - autoquestionnaire version scale.

knowledge, this is the first study evaluating MetS rates in different seasons associated with seasonality of serum lipids and BD.

Despite the fact that different scales were used for the evaluation of temperament, all these studies suggest that negative emotions seem to be related to MetS, which is in agreement with our findings. In line with this evidence and considering that central obesity is the main diagnostic criterion for MetS, two studies showed that temperament and fast weight gain in infants are related. One study found that irritable behavior in 12-week-old infants was related to levels of fat in childhood, whereas the other study showed that 6-month-old infants with fast weight gain were more likely to have negative mood.^{39,40} Weight gain in infants is an indicator of health, especially in the first year. Slow weight gain in infancy has been related to adverse physical and psychological outcomes, while fast weight gain has been related to obesity and health problems in later life.⁴¹ The results emphasize that different temperament domains influence slow and fast weight gain. In addition, the data suggest that infant temperament plays a part in physical development in early infancy.⁴¹ Consistent with these results, it has been demonstrated that overweight children had distinct patterns of temperament and character that were related to the specific psychopathology.⁴² Thus, any relationship between temperament and weight gain could be important. A study evaluating temperament in overweight college students found that overweight women showed lower activity levels, whereas overweight men showed higher emotional distress levels and lower fear levels.⁴³ Using the TCI, it has been reported that obese women, regardless of the presence of an eating disorder, had higher novelty seeking and harm avoidance in the temperament dimension and lower self-directedness and cooperativeness in the character dimension in comparison with healthy subjects.⁴⁴ Although these studies have different designs, tools, and study samples from our study, all in all, they suggest a relation between temperament and biological difference.

Some limitations of our study should be mentioned, such as relatively small sample size, absence of a healthy control group, and inadequate evaluation of other factors that may influence MetS rates and temperament scores, namely recurrent mood episodes (particularly depressive), diet-physical activity habits, and treatment of patients in each season. In spite of these limitations, we believe that the present study provides grounds to suggest a biological basis for individual differences in temperament. Furthermore, our findings indicate that there is indeed a relationship between variations in MetS rates and temperament in bipolar patients.

In sum, to the best of our knowledge, this is the first study to mention the MetS seasonal pattern and its relationship with affective temperament among bipolar patients. In the future, large sample-sized prospective studies are required to confirm our results showing that the prevalence of MetS may vary in different seasons and patients with depressive temperament are prone to develop MetS in the winter.

Disclosure

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