Received: 29 November 2023 | Revised: 18 January 2024 | Accepted: 19 January 2024
DOI: 10.48309/JMPCR.2024.432985.1073
Journal of Medicinal and Pharmaceutical Chemistry Research
SAMI

FULL PAPER

Metabolic syndrome prevalence and association in bipolar disorder patients

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This study delves into the prevalence of metabolic syndrome among patients with bipolar disorder at NGHA, Riyadh, recognizing the particular challenges posed by the coexistence of mental health conditions and metabolic syndrome. Metabolic syndrome is a grave concern on its own, but its impact is exacerbated in individuals with bipolar disorder, given the complexities involved in providing treatment. Metabolic syndrome can lead to severe consequences, including diabetes, stroke, and various cardiovascular diseases. Therefore, a cautious and well-informed approach is crucial when dealing with this intricate condition. It is worth noting that there is a scarcity of published studies focusing on this specific cohort and setting. The study involved the examination of medical records from 191 adult patients, consisting of 66 males and 125 females. These medical charts contained information about the assessment and referrals related to metabolic syndrome in these individuals. The key variables studied were bipolar disorder and metabolic syndrome. Data were collected using standardized forms and data analysis was conducted using SAS with statistical significance defined as $p \leq 0.05$. Among the 191 patients, 85 were diagnosed with diabetes, 89 had hypertension, and 130 were classified as obese. The study identified metabolic syndrome in 79 patients, accounting for 41.4% of the sample (comprising 29 males, or 43.9%, and 50 females, or 40%). This study sheds light on an elevated prevalence and clarifies that individuals with bipolar disorder have a higher prevalence of metabolic syndrome, emphasizes the importance of addressing this dual challenge comprehensively.

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KEYWORDS

Metabolic syndrome; bipolar disorder; prevalence.

Introduction

Bipolar disorder, also referred to as manic depression, is a chronic and complex mental health condition characterized by abrupt and significant mood swings. Individuals with bipolar disorder experience episodes of excessively elevated mood, referred to as manic states or hypomania, characterized by high energy and heightened emotions. In contrast, they also go through depressive episodes marked by low moods, sadness, and

feelings of helplessness. These rapid mood shifts can significantly impact cognitive abilities, judgment, and sleep patterns [1]. Bipolar disorder often manifests at an early age and can be categorized into bipolar I disorder, bipolar II disorder, and cyclothymic disorder. Bipolar I involves severe mood swings, shifting between depression and mania, while bipolar II is characterized by milder hypomanic episodes alongside depressive episodes.

The second form of bipolar disorder is cyclothymic disorder, where individuals briefly experience hypomanic symptoms alternating with brief bouts of depressive symptoms, with durations shorter than observed in complete hypomanic or depressive episodes [2]. A cross-sectional study across eleven countries revealed 2.4% of the lifetime prevalence of bipolar disorders, with 0.6% and 0.4% of people with bipolar type I and type II illnesses, respectively. The typical age of onset for bipolar disorder is around 25 years. It is a chronic and debilitating condition that affects a significant number of people globally. In 2013, an estimated 49 million people worldwide had bipolar disorder, resulting in 9.9 million years of life adjusted for disability (DALY) [3]. People who have been diagnosed with bipolar disorder or other serious mental health conditions are more likely to have untreated medical conditions compared to the general population [4]. This often leads to premature mortality, with individuals suffering from bipolar disorder dying 10 to 30 years earlier than mentally healthy individuals, mostly because of physical ailments, stroke, and heart disorders. Nearly 60% of these deaths are attributed to such causes [5].

According to the International Diabetes Federation (IDF), metabolic syndrome encompasses a cluster of risk factors that increase the likelihood of heart disease, stroke, and type 2 diabetes. These factors High blood pressure, high triglyceride levels, poor HDL cholesterol, and high blood sugar are among the contributing factors, and excess visceral fat [6]. Effective management of metabolic syndrome and its prevention rely on reliable data reporting [7]. Notably, the factors contributing to the onset of bipolar disorder and metabolic syndrome share similarities, including endocrine disorders, irregular sympathetic nervous system function, and unhealthy lifestyle choices such as overeating, alcohol abuse, smoking, and physical inactivity [8]. In addition, certain psychotropic drugs used to treat bipolar disorder can interfere with normal glucose and lipid metabolism, leading to weight gain. Individuals with bipolar disorder are at an increased risk of developing cardiovascular disease, which can significantly reduce their life expectancy by 25-30 years. The precise mechanisms underlying the development of metabolic syndrome in people with bipolar disorder patients remain unclear, but anomalies related to the HPA axis (hypothalamic-pituitary-adrenocortical) and immune systems have been proposed as potential causes. Metabolic syndrome is highly in the MENA (Middle East and North Africa) region, with studies reporting rates as high as 45.5% in countries like Tunisia based on IDF criteria [9].

Despite recognizing the association between metabolic syndrome and bipolar disorder, there is a notable dearth of research on individuals in Gulf Cooperation Countries (GCC) who have both conditions. The purpose of this study is to fill this knowledge gap by examining the metabolic syndrome prevalence among NGHA, Riyadh patients with bipolar illness.

Methods

This study employed a retrospective cross-sectional design, which was deemed appropriate because the data had previously been collected and documented in the patient's medical records. This study focused on adult patients with bipolar disorder and aimed to investigate the association between

metabolic syndrome and bipolar illness. The data used in the study was sourced from King Abdulaziz Medical City in Riyadh, which served as the primary source of patient records. In this study, patient records were retrieved for both male and female individuals diagnosed with bipolar disorder who were 18 years old or older. As mentioned previously, bipolar disorder is characterized by dramatic mood swings that can significantly impact an individual's level of activity, concentration, and daily functioning. The sample size for this study was determined using a convenient non-probability sampling technique, resulting in a total of 191 participants, comprising 66 males and 125 females. The inclusion criteria for selecting these patient records stipulated that they should have been documented between March 2015 and December 2020. The choice of this period was made due to the availability and consistency of data in the medical records system during that period.

Data Collection process

The medical records that were examined by the researchers were stored in the BESTCare system. The King Abdullah International Medical Research Centre's (KAIMRC) Institutional Review Board (IRB) granted approval for the study under IRB #SP21R/247/05. The IDF's definition of metabolic syndrome has been used to diagnose the condition.

Data analysis

Data, which had been coded for entry, were analysed using SAS (Version 9.4) and the chi-squared test as well as the Wilcoxon two-sample test for two-level continuous variables. Data on categorical variables are shown as percentages and frequencies. A criterion of $p < 0.05$ was established for statistical significance.

The data analysis was performed using SAS (Version 9.4), a widely recognized statistical software. The choice of statistical methods was guided by the nature of the variables under investigation. Categorical variables, such as the prevalence of metabolic syndrome and its individual components, were analysed using the chi-squared test. This test is appropriate for examining associations between categorical variables in cross-sectional studies. Continuous variables, including body mass index (BMI) and blood pressure, were analysed using the Wilcoxon two-sample test. The Wilcoxon test is a non-parametric test suitable for comparing two independent groups when the assumptions for parametric tests are not met. A criterion of $p < 0.05$ was established for statistical significance. These chosen methods were deemed appropriate for the study's design and the distributional characteristics of the data, ensuring robust and reliable analyses.

Results

Analyses were performed on the data of 191 patients (of whom 125 were female and 66 were male). The average body mass index (BMI) for patients who were male was 33.39, and for patients who were female, it was 33.76. The overall mean BMI for all patients was 33.63. The range of BMI values spanned from 17.67 to 63.54. According to the criteria outlined by the IDF, these mean values fall within the ''obese'' category. Obesity was more prevalent among female patients (n=89; 71.2%) compared to male patients (n=41; 62.1%). In total, 130 (68.1%) of all patients were categorized as obese. The mean systolic blood pressure (SBP) for all 191 patients was 129.47, with female patients having a slightly lower mean SBP of 128.42, as opposed to the mean value of 131.44 observed in male patients. The mean SBP number seems normal for female patients but greater than normal for male patients, per IDF guidance. Increased blood pressure was more common in male patients (n = 35; 53%) than in females (n = 54; 43.2%). Overall, 89 (46.6%) of the patients

exhibited elevated SBP, with SBP values ranging from 81 to 198. Fasting blood sugar (FBS) ranged from 2.60 to 40.30, with an overall mean of 7.04. Males had a mean FBS value of 7.74, whereas females had a mean value of 6.68. The mean values for both men and women were elevated based on IDF criterion. A total of 29 (52.7%) males and 56 (51.9%) females had elevated FBS, indicating that 85 (52.2%) of the cohort were affected.

In contrast to the other variables, there exists an inverse relationship between high-density lipoprotein (HDL) values and metabolic syndrome, where higher values are more favorable. The mean HDL value for all patients was 1.14 (range 0.54-2.16), with male patients having a lower mean value compared to female patients (0.97 vs. 1.22). A total of 109 out of 174 (62.6%) patients exhibited low HDL levels, with 41 (67.2%) being male patients and 68 (60.2%) being female patients. Although IDF recognizes gender-based differences in healthy HDL values, the mean values observed in this study were lower than those recommended by IDF.

For male patients, the mean triglyceride level was 1.86, while for female patients, it was 1.38. The overall mean value for each patient was 1.55. The male mean value was seen as high by IDF standards. While the female value fell within normal limits. Elevated triglyceride levels were observed in 26 (44.1%) male patients and 25 (23.8%) female patients, resulting in 51 out of 164 patients (31.1%) having high triglyceride levels. The recorded triglyceride values ranged from 0.25 to 5.25.

In addition, aside from the five variables used by IDF as diagnostic criteria for metabolic syndrome, this study also included whole cholesterol and LDL as they are part of the lipid profile test from which HDL and triglyceride data are derived. To sum up, the mean cholesterol value for male patients was 4.64, while for females, it was 4.55 (overall patient mean=4.58; range 2.15–9.02). The mean LDL for males was 2.98, while for females, it was 2.82 (overall patient mean=2.88; range 0.84-6.92). Tables 1-3 provide an overview of the mean values and prevalence of all these variables.

TABLE 1 The average, the lowest, and the maximum values of each variable for every patient (N = 191)

Variables	Mean ± SD	Minimum	Maximum
BMI	33.63 ± 7.64	17.67	63.54
Cholesterol	4.58 ± 1.11	2.15	9.02
FBS	4.58 ± 1.11	2.15	9.02
HDL	1.14 ± 0.29	0.54	2.16
LDL	2.88 ± 1.00	0.84	6.92
Systolic BP	129.47 ± 23.93	81	198
Triglyceride	1.55 ± 0.93	0.25	5.25

TABLE 2 Comparison of mean, minimum, and maximum values of the sexes (males n=66; females n=125)

Variables	Mean ± SD (Males)	Mean ± SD (Females)	Minimum (Males)	Maximum (Males)	Minimum (Females)	Maximum (Females)
BMI	33.39 ± 8.15	33.76 ± 7.39	19.72	63.54	17.67	51.08
Cholesterol	4.64 ±1.31	4.55 ±0.99	2.53	9.02	2.15	7.00
FBS	7.74 ±5.73	6.68 ±3.17	2.60	40.30	4.10	21.10
HDL	0.97 ±0.24	1.22 ±0.28	0.54	1.69	0.67	2.16
LDL	2.98 ±1.18	2.82 ±0.89	0.84	6.92	0.90	4.88
Systolic BP	131.44 ± 21.07	128.42 ± 25.34	84	193	81	198
Triglyceride	1.86 ±1.02	1.38 ±0.83	0.72	5.25	0.25	5.15

TABLE 3 Prevalence of metabolic syndrome symptoms in both gender bipolar disorder patients

Variable	n (Males)	%	n (Females)	%	n (Total)	%
Elevated BMI	41	62.1 (Males) 21.47 (Total)	89	71.2 (Females) 46.60 (Total)	130	68.06
Elevated FBS	29	52.73 (Males) 17.79 (Total)	56	51.85 (Females) 34.36 (Total)	85	52.15
Elevated SBP	35	53.03 (Males) 18.32 (Total)	54	43.2 (Females) 28.27 (Total)	89	46.59
Elevated triglycerides	26	44.07 (Males) 15.83 (Total)	25	23.81 (Females) 15.24 (Total)	51	31.07
Reduced HDL	41	67.21 (Males) 23.56 (Total)	68	60.18 (Females) 39.08 (Total)	109	62.64
Metabolic syndrome	29	40 (Females) 26.18 (Total)	50	40 (Females) 26.18 (Total)	79	41.36

Out of the 191 patient records examined, 79 individuals (41.4%) were diagnosed with metabolic syndrome, with 29 of them being male (43.9%) and 50 being female (40%). Interestingly, apart from BMI, for every diagnostic variable, male patients had higher mean values and percentages. Thus, it is anticipated that the prevalence of the metabolic syndrome will be highest among male patients. However, it is crucial to emphasize that obesity is the most important factor influencing the development of metabolic syndrome, based on the IDF criteria.

Discussion

This is the first study that particularly looks into the connection between metabolic syndrome and bipolar disorder in Saudi Arabia, as far as we are aware. Alosaimi *et al.* (2017) [10] investigated the metabolic syndrome prevalence in Saudi Arabian

individuals suffering from psychiatric problems. In recent years, the economic growth of Saudi Arabia has had a significant impact on the dietary habits of its population, leading to a rise in obesity. According to Ng *et al.* (2011) [11], obesity affects 66% to 75% of the population, with a higher prevalence among females than males. Additionally, metabolic syndrome is more common among females than males as stated by Mabry *et al.* (2010) [12] in the Middle East and North Africa (MENA) region, which includes Saudi Arabia.

Saudi Arabia has a high frequency of metabolic syndrome with rates ranging from 29.6% to 36.2% in males and 36.1% to 45.9% in females. The country also faces a high prevalence of diabetes mellitus and hypertension. This high prevalence of metabolic syndrome in Saudi Arabia is attributed to lifestyle choices, including a sedentary lifestyle with limited physical activity and unhealthy dietary habits, Dunstan *et al.* (2005) [213] and Malik and Razig (2008) [14] suggest that population aging, inadequate education, and high economic status contribute to the problem. Studies from other countries, such as Brazil [15], have also revealed that, in line with the general community, bipolar individuals have a notable frequency of metabolic syndrome.

According to Vancampfort *et al.* (2013) [16], those with bipolar disorder who take antipsychotic medications have a higher chance of developing metabolic syndrome than people who do not. Additionally, compared to patients who solely use mood stabilizers, individuals who take atypical antipsychotic drugs or a combination of antipsychotics and mood stabilizers are more likely to have metabolic syndrome. Unfortunately, bipolar disorder patients with coexisting metabolic syndrome tend to have a poorer prognosis, including a higher likelihood of repeated hospitalizations and an elevated risk of developing tardive dyskinesia [17]. Bipolar illness may arise as a result of the region's high rate of metabolic syndrome in the general population.

It is possible to explain how bipolar disorder and metabolic syndrome are related, which may be explained, in part, by the prolonged periods of depression experienced by bipolar disorder patients. Symptoms such as anhedonia and low energy levels that often accompany depression can hinder physical activity, contributing to an inactive lifestyle and an increased risk of metabolic syndrome. Healthy nutrition and regular exercise are two lifestyle changes that are advised for individuals with bipolar disorder in addition to psychological and pharmaceutical therapies.

The study's scope was limited to a specific population, patients with bipolar disorder who were admitted to NGHA (National Guard Health Affairs) in Riyadh. This may not represent the broader population of individuals with bipolar disorder in Saudi Arabia or other regions. Future research with larger and more diverse samples and the ability to collect comprehensive patient data directly is needed to further investigate the relationship between bipolar disorder and metabolic syndrome in the region.

Conclusion

Metabolic syndrome, when co-occurring with bipolar disorder, has a major impact on the affected person's quality of life and overall prognosis. This dual diagnosis poses a considerable health challenge for those with bipolar disorder. Effective management of this complex condition necessitates a comprehensive and meticulous approach to treatment and care. The insights gained from this study underscore the importance of routine screening for metabolic syndrome in individuals with bipolar disorder, allowing for early intervention and tailored treatment strategies. Furthermore, these findings highlight the need for interdisciplinary collaboration between mental health and metabolic health professionals to address the

dual challenges faced by this patient population. Future research endeavours should explore targeted interventions and preventive measures to mitigate the adverse outcomes associated with the coexistence of bipolar disorder and metabolic syndrome, ultimately improving the holistic well-being of individuals affected by these conditions.

Acknowledgements

None.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Authors' Contributions

All authors contributed to data analysis, drafting, and revising of the paper and agreed to be responsible for all the aspects of this work.

Conflict of Interest

No potential conflict of interest was reported by the authors.

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How to cite this article: Asma Alanazi*, Saud Alsadhan, Sultan Aldosari, Abdullah Alharbi, Mohammed Albawardi, Saud Alrabah, Haifa Alhawas, Maram Albalawi, Metabolic syndrome prevalence and association in bipolar disorder patients abstract. *Journal of Medicinal and Pharmaceutical Chemistry Research*, 2024, 6(6), 682-689. **Link:** https://jmpcr.samipubco.com/article_188188.html