

## Prevalence of Metabolic Syndrome among Patients with Bipolar Affective Disorder

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**Objective:** To evaluate the prevalence of metabolic syndrome (MetS) and metabolic abnormalities among patients with Bipolar Affective Disorder (BAD).

**Design:** A Case-Control Study.

**Setting:** Psychiatric Hospital, Ministry of Health, Kingdom of Bahrain.

**Method:** Sixty-six adult patients diagnosed with BAD were matched 1:1 to sixty-six controls by age and sex. Personal characteristics were documented and the following measurements were included: weight and height, waist and hip circumference, fasting blood glucose, lipids profile and blood pressure. Statistical analysis used: Case-control analysis of the two groups was performed.

**Result:** Twenty-three (34.8%) of the patients with BAD suffered from metabolic syndrome compared to twenty-one (31.8%) of the controls. Obesity, raised blood pressure and raised triglyceride were higher in cases compared to controls.

**Conclusion:** Metabolic abnormalities and metabolic syndrome are prevalent in approximately one-third of the patients with bipolar affective disorders in Bahrain.

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Bipolar disorder is a major psychiatric disorder characterized by a fluctuation of moods between elation and depression. Bipolar disorders would be visualized as a spectrum of disorders including bipolar I disorder, bipolar II disorder and cyclothymic disorder. Bipolar I disorder has at least one manic episode with or without depression. Bipolar II disorder has at least one hypomanic episode with one major depressive episode. Cyclothymic has at least a hypomanic episode with periods of milder depression<sup>1</sup>. The prevalence of the bipolar disorder is a proximately 1%<sup>1</sup>. The mean age onset is 25 years<sup>2</sup>. It is a disabling disorder with a chronic course. In 2013, there were 48.8 million people suffering from bipolar disorder worldwide accounting for 9.9 million DALY (disability-adjusted life years)<sup>3</sup>. The financial cost of this disorder in the United States was estimated at \$45 billion in 1991<sup>4</sup>.

MetS is characterized with abdominal obesity, elevated lipids, elevated blood pressure as well as hyperglycemia. All these factors may increase the risk of cardiovascular diseases as well as diabetes mellitus (DM)<sup>5,6</sup>.

MetS is currently defined by three main international bodies. However, in our study, we chose to adopt the International Diabetes Federation (IDF) criteria to define MetS. The other definitions are shown in table 1. Depending on the ethnic group, sex and diagnosis criteria adopted, the prevalence of MetS in the world ranges from 6% to 70.3%<sup>7</sup>.

It is well-known from many studies that bipolar disorder is associated with increased risk of MetS<sup>8</sup>. This association has led to the poor prognosis of bipolar disorder in the long-term. The prevalence of MetS among bipolar patients ranges from 16-25% in Europe and 30-49% in the US<sup>9-11</sup>. A study of the metabolic disorder among bipolar disorder patients in Tunisia revealed 26.1%<sup>12</sup>.

Several factors may contribute to the association of MetS with bipolar disorder including the use of antipsychotics, mood stabilizers as well as the lifestyle of bipolar patients. MetS increases the risk of cardiovascular diseases and hence reduce the life expectancy of bipolar patients by 25 to 30 years<sup>13</sup>. However, the exact mechanism of development of MetS among bipolar patients, even among those on no medications is still unknown. Bad health habits, such as smoking, alcohol consumption, overeating, lack of exercise was suggested<sup>14</sup>. Other biological mechanisms were also suggested, such as hypothalamic-pituitary-adrenocortical (HPA) axis disturbance, as well as immunologic system abnormalities (increased inflammatory cytokines)<sup>15,16</sup>. The prevalence of MetS among bipolar patients is rarely studied in GCC countries.

The aim of this study is to compare our finding in MetS patients with healthy controls.

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## METHOD

This is a case-control study. An equal number of cases and controls were included. The two samples were age and sex-matched. Sixty-six adult patients diagnosed with BAD were matched 1:1 by age and sex to sixty-six controls.

Cases were randomly selected from adult patients with the bipolar affective disorder (BAD) attending the outpatient. They were diagnosed according to the international classification of disease (ICD – 10). The consent of subjects was taken before inclusion in the study. Patients less than 18 years and more than 65 years were excluded. Patients with known cardiovascular diseases or complications were also excluded. Controls were healthy with no history of mental illness. They were randomly selected from the hospital staff.

The patient's characteristics, weight and height, waist-hip circumference measurement, fasting blood sugar, lipid profile, blood pressure were documented. The lab investigations were documented.

Written informed consent was obtained from all subjects. Participation was voluntary.

In our study, we used the International Diabetes Federation (IDF) criteria to define cases with metabolic syndrome<sup>17</sup>.

Data were analyzed using SPSS version 25. Descriptive statistics included personal characteristics as well as outcome measures. Pearson Chi<sup>2</sup>-squared test or Fisher's Exact Test and independent samples t-test were used to investigate differences between groups.

## RESULT

Sixty-six adult patients diagnosed with BAD were matched 1:1 by age and sex to sixty-six controls, see table 1.

**Table 1: Personal Characteristics of Cases and Controls**

Variable	Controls (n=66)	Cases (n=66)	Independent Samples t-test
Age	39.04 ± 10.26	38.71 ± 10.45	0.85
Weight Kg	74.06 ± 19.70	79.80 ± 18.36	0.09
Height CM	163.33 ± 9.10	162.4 ± 12.81	0.66
BMI	27.60 ± 6.39	29.90 ± 7.17	0.05*
Systolic BP	127.78 ± 18.23	135.10 ± 14.88	0.01*
Diastolic BP	78.72 ± 15.79	80.37 ± 9.02	0.46
HDL - High-density lipoprotein	1.34 ± 0.37	1.25 ± 0.31	0.12
LDL - low-density lipoprotein	2.762 ± 0.77	2.83 ± 0.92	0.61
TG	1.37 ± .96	1.66 ± .931	0.08
Cholesterol	5.47 ± 6.01	4.89 ± 1.17	0.45
Fasting Blood Sugar	5.38 ± 1.13	5.97 ± 2.12	0.05*
Waist circumference	92.04 ± 15.72	100.37 ± 14.45	0.00*
Hip circumference	101.03 ± 14.09	110.61 ± 13.50	0.00*
Waist Hip Ratio	0.91 ± .095	0.90 ± .071	0.79

The mean weight of cases with BAD was 79.8 kg compared to 74.0 kg of the controls. Although both controls and cases have BMI in the overweight range (27.6 versus 29.9), the BMI of cases with BAD was bordering the obesity range ( $\geq 30$ ).

The mean systolic blood pressure among cases was 135.1 (elevated); however, the mean systolic blood pressure among controls was 127.8 (normal), according to the IDF criteria. The mean diastolic blood pressure among both controls and cases with BAD was normal (78.7 versus 80.4). The mean waist circumference of cases (100.4) was greater than the controls (92.0). Most other parameters were higher among cases compared to controls.

The average weight of male controls (80.4 kg) was higher than female controls (67.67 kg). Triglyceride levels were higher among male controls (1.67) compared to female controls (1.09). Fasting blood sugar level was comparable among male and female controls.

Among cases, the males had a higher mean weight (81.0 kg) compared to females (78.6kg). Female cases had an average BMI in the obesity range (32) and male cases were in the overweight range (27.8). Mean systolic and diastolic pressures are higher among male cases compared to females. The lipid profile is similar among the two groups. The mean waist circumference was higher among female cases (103.6 cm) compared to males (97.1 cm).

Twenty-three (34.8%) cases and 21 (31.8%) controls had MetS; 29 (43.9%) cases and 24 (36.4%) controls were obese. Forty-four (66.7%) cases and 34 (51.5%) controls had elevated systolic blood pressure. Thirty (45.5%) cases and 14 (21.2%) controls had elevated triglycerides. Fifty-one (77.3%) cases and 48 (72.7%) controls had similar reduced HDL. Thirty-five (53.0%) BAD and 23 (34.8%) controls had elevated fasting blood sugar, see table 2.

**Table 2: Prevalence of Metabolic Syndrome in Cases and Controls**

Variables	Controls (n=66)		Cases (n=66)	
	Yes N (%)	No N (%)	Yes N (%)	No N (%)
Obesity	24 (36.4%)	42 (63.6%)	29 (43.9%)	37 (56.1%)
Raised triglycerides	14 (21.2%)	52 (78.8%)	30 (45.5%)	36 (54.5%)
Reduced HDL cholesterol	51 (77.3%)	15 (22.7%)	48 (72.7%)	18 (27.3%)
Raised BP	34 (51.5%)	32 (48.5%)	44 (66.7%)	22 (33.3%)
Fasting Blood Sugar	23 (34.8%)	43 (65.2%)	35 (53.0%)	31 (47.0%)
Metabolic Syndrome	21 (31.8%)	45 (68.2%)	23 (34.8%)	43 (65.2%)

The prevalence of obesity was high among female cases, 20 (30%), and low among male cases, 9 (13.6%). The prevalence of obesity among male controls, 11 (16.6%), was slightly lower than female controls, 13 (19.6%). The elevated triglycerides were high among male cases, 18 (12.1%), and low among female controls, 4 (6%). The reduced HDL was highest among female cases and controls, 28 (42.4%), and least among male cases, 20 (30%). The elevated blood pressure was high among female cases and male controls, 21 (31.8%), and least among female controls, 13 (19.6%). Fasting blood sugar was high among male and female cases, 17 (25.8%) and 18 (27.3%), respectively compared to male and female controls, 12 (18.2%) and 11 (16.6%), respectively. The prevalence of MetS among female cases was more than twice its prevalence among male cases, 16 (24.2%) compared to 7 (10.6%). Prevalence of MetS among male controls, 10 (15.2%), was almost equal to female controls, 11 (16.6%) see table 3.

**Table 3: Prevalence of Metabolic Syndrome in Male and Female Controls**

Variables	Males (n=33)		Females (n=33)	
	Yes N (%)	No N (%)	Yes N (%)	No N (%)
Obesity	11 (33.3%)	22 (66.7%)	13 (39.4%)	20 (60.6%)
Raised triglycerides	10 (30.3%)	23 (69.7%)	4 (12.1%)	29 (87.9%)
Reduced HDL cholesterol	23 (69.7%)	10 (30.3%)	28 (84.8%)	5 (15.2%)
Raised BP	21 (63.6%)	12 (36.4%)	13 (39.4%)	20 (60.6%)
Fasting Blood Sugar	12 (36.4%)	21 (63.6%)	11 (33.3%)	22 (66.7%)
Metabolic Syndrome	10 (30.3%)	23 (69.7%)	11 (33.3%)	22 (66.7%)

**Table 4: Prevalence of Metabolic Syndrome in Male and Female Cases**

Variables	Males (n=33)		Females (n=33)	
	Yes N (%)	No N (%)	Yes N (%)	No N (%)
Obesity	9 (27.3%)	24 (72.7%)	20 (60.6%)	13 (39.4%)
Raised triglycerides	18 (54.5%)	15 (45.5%)	12 (36.4%)	21 (63.6%)
Reduced HDL cholesterol	20 (60.6%)	13 (39.4%)	28 (84.8%)	5 (15.2%)
Raised BP	23 (69.7%)	10 (30.3%)	21 (63.6%)	12 (36.4%)
Fasting Blood Sugar	17 (51.5%)	16 (48.5%)	18 (54.5%)	15 (45.5%)
Metabolic Syndrome	7 (21.2%)	26 (78.8%)	16 (48.5%)	17 (51.5%)

## DISCUSSION

There is only one study from Saudi Arabia evaluating the prevalence of MetS among different psychiatric disorders, but not on BAD<sup>18</sup>. Our study is the first to evaluate MetS among patients with BAD in the GCC region.

The dietary habits of the GCC population had changed during the economic boom. Some studies have shown that the prevalence of overweight among the adult population ranges from two-thirds to three-quarters of the population<sup>19</sup>. Other studies found that the prevalence of obesity is higher among women than men in the region. Prevalence of MetS is higher among women than men in the region<sup>20</sup>.

MetS ranges from 36.1% to 45.9% among females and 29.6% to 36.2% among males<sup>20</sup>. These rates are also comparable to other Arab countries. Prevalence of hypertension and diabetes mellitus is high<sup>21,22</sup>.

Many factors contribute to the high prevalence of MetS in the region including decreased physical exercise, poor diet and a sedentary lifestyle<sup>23</sup>. Other contributing factors include increasing age, high income and poor education<sup>24</sup>. A study in Brazil found a high prevalence of MetS among bipolar patients (35.7%)<sup>25</sup>. However, this ratio is similar to the general population in Brazil. The rates of MetS among bipolar patients who receive antipsychotic medication are higher than others who do not receive their medications<sup>26</sup>. Prevalence of MetS among patients receiving a mood stabilizer alone is lower than those receiving atypical antipsychotic or combination therapy of antipsychotic with a mood stabilizer<sup>27</sup>. Bipolar disorder patients with MetS have a worse prognosis, frequent hospitalizations, poor insight, poor function, as well as more tardive dyskinesia<sup>27</sup>. The high prevalence of MetS among the general population in the region would also contribute to the development of the bipolar affective disorder.

Cardiovascular disease and MetS are more prevalent among women in the region. This could be due to the social norms, as well as the extremely hot climate which discourages many people from outdoor activity. Many women now work outside home and have no time to prepare healthy/home meals, hence, more and more families depend on fast food restaurants. Some studies have also shown a genetic predisposition to diabetes among the Arab population<sup>28</sup>.

Many bipolar patients spend most of their lives in depression, which is characterized by anhedonia and lack of energy. This could contribute to a sedentary lifestyle and predisposition to metabolic syndrome. A comprehensive approach to treat bipolar disorder patients could not only include psychological and pharmacological treatments, but also a change of lifestyle pattern including exercise and a healthy diet.

## CONCLUSION

**Metabolic syndrome is a major threat to the lives of psychiatric patients including bipolar patients. It leads to poor prognosis as well as a poor quality of life. A comprehensive approach to face this ever-growing problem is a high priority for a better management of the disorder.**

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**Competing Interest:** None.

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