Prevalence of Metabolic Syndrome among Psychiatric Inpatients: A Hospital Based Study from Kashmir

TAJAMUL HUSSAIN[1], MUSHTAQ AHMAD MARGOOB[2], SHEIKH SHOIB[3], MAHAK SHAFAT[4], RAJESH KUMAR CHANDEL[5]

ABSTRACT

Introduction: Over the last fifty years there has been dramatic change in the human environment, behaviours and way-of-life. These changes have resulted in escalating rates of metabolic syndrome not only in general population but also among people with mental illness. Various factors, like the lack of exercise, use of psychotropic medications and inadequate medical care leads to the increased risk of metabolic changes among people with mental illness. Hence, there is a greater need to evaluate metabolic syndrome in this population.

Aim: To find the prevalence of metabolic syndrome among psychiatric inpatients in Tertiary Care Hospital in Kashmir region of North India.

Materials and Methods: It was a cross-sectional study conducted at the Institute of Mental Health and Neurosciences, Kashmir, India. A total of 213 in-patients with a primary psychiatric diagnosis as per The International Classification of Diseases, Tenth Revision (ICD 10) Classification of Mental and Behavioural Disorders criteria were evaluated for the presence of metabolic syndrome. A modified National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III) criterion for the diagnosis of metabolic syndrome was used. All the intergroup comparisons for parametric data were done by Student's t-test, whereas non-parametric data were analysed by Chi-square tests. A p-value <0.05 was considered statistically significant.

Results: The overall prevalence of metabolic syndrome was 34.74%. The prevalence was higher in females (43.3%) than males (28.5%) (p<0.05) and it increased with age, with the highest prevalence in the age group >50 years (p<0.05). Among the diagnostic subgroups, the prevalence was highest among patients with unipolar depression (45.0%), while it was lesser in patients with bipolar disorders (37.88%) and psychotic disorders (30.95%). Prevalence of metabolic syndrome was significantly higher (63.64%) among patients taking second generation antipsychotics (p<0.05).

Conclusion: Our study shows that metabolic syndrome is highly prevalent among psychiatric inpatients and needs to be addressed to prevent the risk for cardiovascular diseases.

INTRODUCTION

Metabolic syndrome refers to clustering of various cardiometabolic risk factors which includes truncal obesity, hyperglycemia, dyslipedimia and elevated blood pressure all that are likely associated to insulin resistance [1]. The syndrome has been given several names, including the 'insulin resistance syndrome', the 'plurimetabolic syndrome', and the 'deadly quartet' [2]. The three main aetiological factors for metabolic syndrome are: obesity and disorders of adipose tissue; insulin resistance; and a collection of independent factors like molecules of hepatic, vascular, and immunologic origin that are associated with specific components of the metabolic syndrome. Other risk factors are aging, pro inflammatory state, and hormonal changes [3].

Metabolic syndrome is highly prevalent in general population. When data from various studies across the world was analysed, which included population samples, aged 20 years and above, the prevalence rate varied from 8% (India) to 24% (United States) in men and from 7% (France) to 46% (India) in women [4]. The prevalence of metabolic syndrome is even higher in psychiatric populations. Studies across various countries with patients who have schizophrenia or schizoaffective disorder found indexes that varied between 28.4% and 62.4% [5-12]. Ample information is available which point towards the relationship between mood disorders and components of metabolic syndrome, such as obesity, hyperglycaemia, and diabetes mellitus [13].

Various factors like psychological stress, lack of exercise, poor diet, excessive smoking and inadequate medical care have been implicated in higher prevalence among psychiatric population [14]. However, the use of psychotropic medication stands out as one of the main cause for the higher prevalence of metabolic syndrome in psychiatric patients. Weight gain is a frequent side effect of many antipsychotics (like clozapine, olanzapine etc.,), mood stabilizers (valproic acid, lithium) and antidepressants (mirtazapine) [15,16]. Furthermore, many antipsychotics (like olanzapine) also have adverse effects on the glycidic and lipid metabolisms [17,18]. Hence, this study was conducted to assess the prevalence of metabolic syndrome in psychiatric inpatients, and correlate it with the psychiatric diagnoses of the patients and with the psychotropic medications used.

MATERIALS AND METHODS

We conducted a cross-sectional study at a Tertiary Care Psychiatric Hospital. The study was approved by the Institutional Ethical Committee of the hospital. Every consecutive adult patient admitted in the Inpatient Department of the hospital during a period of one year from 1st January 2015 till 31st December 2015, was included in the study. Written informed consent was obtained from each patient; those who were incapable of consenting, the consent of their closest family member or custodian was taken. Those who did not consent or were less than 18 years of age or had a history of pregnancy in the last six months were excluded from the study. Out

of the total of 548 patients admitted during the study period, 171 cases were excluded because the patients or their custodian did not give consent, 89 patients were admitted for one day only and hence their fasting blood samples could not be taken, 42 patients were less than 18 years age and 33 patients were either pregnant or had a history of pregnancy during past six months. Thus a total of 213 patients were eventually included in the study, as shown in the flowchart below [Table/Fig-1].

[Table/Fig-1]: Flowchart depicting the number of participants included in study group.
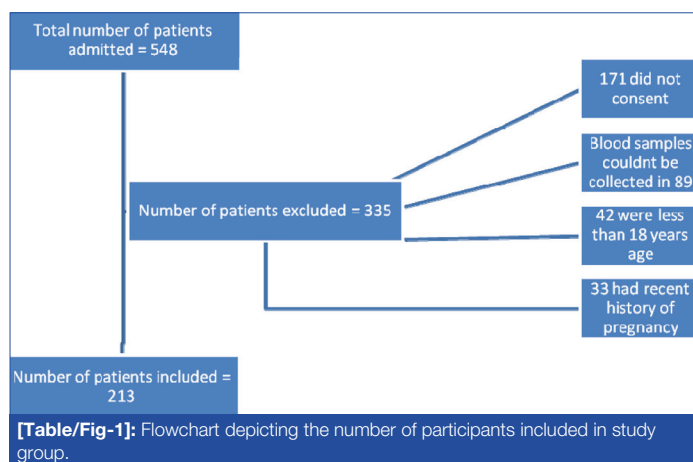
The psychiatric diagnosis was confirmed by a consultant psychiatrist according to the ICD 10 Classification of Mental and Behavioural Disorders [19]. For the ease of analysis, the diagnoses were clubbed together in four broad groups (ICD-10 codes): psychoses (F20-F29), bipolar disorders (F30-31), unipolar depression (F32-F34), and remaining diagnostic groups (others).

The modified NCEP ATP III criterion for Asian population for Metabolic Syndrome diagnosis was used [20] according to which three or more of the following conditions were necessary for diagnosis:

1. Waist circumference > 90 cm for males and > 80 cm for females;
2. Triglycerides ≥ 150 mg/dl;
3. HDL levels < 40 mg/dl for males and < 50 mg/dl for females;
4. Blood pressure ≥ 130/ 85 mmHg;
5. Fasting glucose ≥ 100 mg/dl.

Waist Circumference (WC) was measured midway between the inferior border of ribs and the superior border of iliac crest, in a horizontal plane. These measurements were repeated thrice and their average was taken in all cases.

Systolic and diastolic blood pressures (SBP and DBP) were recorded twice at an interval of three minutes in the sitting position after a 15 minutes rest, and the mean was taken. For the measurement of High Density Lipoprotein (HDL), Tiglycerides (TG) and fasting plasma glucose levels, blood samples (3 ml) were drawn after 8-12 hours overnight fasting. Plasma glucose level was measured using the glucose oxidase-peroxidase enzymatic method [21] and lipid profile was measured by enzymatic assay on a Hitachi 704 system auto-analyser [22]. Out of the 213 patients, 87 were drug naïve while as 126 patients were on medication. For the ease of evaluation, medications used were clubbed together as FGA's-First Generation Antipsychotics (includes haloperidol, trifluoperazine), SGA's-Second Generation Antipsychotics (olanzapine, quetiapine, risperidone), antidepressants (escitalopram, fluoxetine), mood stabilizers (divalproex sodium, lithium) and multiple drugs (those on two or more drugs other than benzodiazepines).

STATISTICAL ANALYSIS

The results were subjected to appropriate statistical methods. Student's t-test was used for comparison of all the inter group parametric data, while the non parametric data was analysed using the Chi-square test. A two-tailed p-value was used for calculating statistical significance. A p-value of <0.05 was taken as statistically significant.

RESULTS

Of all the inpatients in the Psychiatric Hospital during the study period, 213 met the inclusion criteria. Of these, 42.26% were females and 57.74% were males. The mean age of the entire population was 38.26±11.4 years.

Majority (59.6%) were from rural background and from lower middle socioeconomic status (35.7%). The most commonly found diagnostic category was psychotic disorder (39.45%) followed by bipolar disorder (31%). About 41% of the study population was off psychotropic medication at the time of admission [Table/Fig-2] [23]. The prevalence of metabolic syndrome in the sample studied was 34.74% (n = 74; 95% CI: 22.7-36.9). The prevalence increased with age and it was highest in age group > 50 years. The prevalence among females was 43.3% (n = 39; 95% CI: 31.4-56.7), while the prevalence among males was 28.45% (n =35; 95% CI: 13.5-29.7); the difference between the genders was significant (p <0.05) [Table/Fig-3].

Variables	Sub Groups	Total Number (%)
Sex	Males	123 (57.74)
	Females	90 (42.26)
Residence	Rural	127 (59.62)
	Urban	86 (40.38)
Socio economic status (based on Kuppuswamy's Socioeconomic Scale) [23]	Upper	0 (0.00)
	Upper middle	48 (22.53)
	Lower middle	76 (35.68)
	Upper lower	69 (32.39)
	Lower	20 (9.39)
Diagnostic subgroups	Psychotic Disorders	84 (39.45)
	Bipolar Disorders	66 (30.99)
	Depressive Disorders	40 (18.78)
	Other Mental Disorders	23 (10.80)
Treatment subgroups	On Treatment	126 (59.15)
	Off Treatment	87 (40.85)

[Table/Fig 2]: Socio demographic and clinical profile of study population [23].

Age Group (in years)	Metabolic Syndrome Prevalence in each Group		Total
	Males	Females	
18-30	10.53% (4/38)	17.86% (5/28)	13.63% (9/66)
31-40	27.27% (6/22)	42.85% (6/14)	33.33% (12/36)
41-50	30.55% (11/36)	44.44% (12/27)	36.50% (23/63)
>50	51.85% (14/27)	76.19% (16/21)	62.50% (30/48)
Total	28.45% (35/123)	43.33% (39/90)	34.74% (74/213)

[Table/Fig-3]: Prevalence of metabolic syndrome as per gender and age group.

Among the diagnostic subgroups, the prevalence of MS was highest (45%) among those with depressive disorders [Table/Fig-4]. Among the treatment subgroups, the prevalence was highest among those taking SGA's (63.64%) [Table/Fig-5].

Among the individual metabolic abnormalities, low HDL levels (males<40 mg/dl, females<50 mg/dl) was the most common abnormality among all patients (52.11%) while as high diastolic blood pressure (≥85 mmHg) was least common abnormality (17.84%). Metabolic syndrome was most commonly associated with elevated waist circumference (88.89%) and least associated with high (≥85 mmHg) diastolic pressure (34.21%). Metabolic syndrome and its relationship with clinical variables are shown in [Table/Fig-6].

Diagnostic Groups	Metabolic Syndrome		Total	p-value
	Absent	Present		
Psychotic Disorders	58(69.05%)	26 (30.95%)	84(100.0%)	
Bipolar Disorders	41(62.12%)	25 (37.88%)	66(100.0%)	p = 0.4134*
Depressive Disorders	22 (55.0%)	18 (45.0%)	40 (100.0%)	
Other Mental Disorders	18 (78.26%)	5 (21.74)	23(100.0%)	

[Table/Fig-4]: Prevalence of metabolic syndrome as per diagnostic groups.
*Chi-square test is used.

Treatment received	Total No. of Patients	Metabolic Syndrome		p-value
		Absent	Present	
FGA's	12	9 (75%)	3 (25%)	
SGA's	22	8 (36.36%)	14 (63.64%)	
Mood Stabilizers	21	16 (76.19%)	5 (23.81%)	p<0.05*
Antidepressants	17	15 (88.24%)	2 (11.76%)	
Multiple drugs	54	27 (50%)	27 (50%)	

[Table/Fig-5]: Prevalence of metabolic syndrome as per psychotropic drugs received.
FGA's = First Generation Antipsychotics SGA's = Second Generation Antipsychotics
*Chi-square test showing difference among groups.

Individual Metabolic Abnormalities	Number of Patients (% of Total)	Metabolic Syndrome		p-value*
		Absent	Present	
Increased Waist Circumference (males>90 cm, females>80 cm)	54 (25.35%)	6 (11.11%)	48 (88.89%)	<0.05
Low HDL levels (males<40 mg/dl, females<50 mg/dl)	111 (52.11%)	55 (49.55%)	56 (50.45%)	0.9244
High Triglycerides (>150 mg/dl)	90 (42.25%)	34 (37.78%)	56 (62.22%)	<0.05
High Systolic Blood pressure (≥130 mm Hg)	68 (31.92%)	40 (58.82%)	28 (41.18%)	0.1773
High Diastolic Blood pressure (≥85 mmHg)	38 (17.84%)	25 (65.79%)	13 (34.21%)	0.9203
High Fasting plasma glucose (≥100 mg/dl)	69 (32.39%)	36 (52.17%)	33 (47.83%)	<0.05
Increased BMI (≥25)	69 (32.39%)	44 (63.77%)	25 (36.23%)	0.761

[Table/Fig-6]: Prevalence of metabolic syndrome as per individual metabolic abnormalities.
HDL = High Density Lipoprotein BMI= Body Mass Index* Using chi-square test

Study	Prevalence of MS
Depressive Disorders	
Mattoo SK and Mohan Singh S [24]	52.2%
Teixeira PJR and Rocha FL [26]	48.1%
Kinder LS et al., [27]	50%
Bipolar Disorders	
Teixeira PJR and Rocha FL [26]	38.3%
Chang HH et al., [28]	33.9%
Psychotic Disorders	
Malhotra N et al., [29]	26%
Pallava A et al., [30]	27.5%
Sugawara N et al., [31]	36%
Medeiros-Ferreira L et al., [32]	36.8%

[Table/Fig 7]: Summary of various studies on prevalence of MS in patients with psychiatric disorders [24-32].
MS= metabolic syndrome

DISCUSSION

The overall prevalence of metabolic syndrome in our study was 34.74%. Our results are comparable to the other studies which had similar study design as ours. In a North Indian study by Mattoo SK and Mohan Singh S, among the 90 patients included in the study, the prevalence of MS was 37.8% [24]. In a recent study in Hong Kong by Bressington DT et al., the overall prevalence of MS found was 35% [25].

Among the diagnostic subgroups, the prevalence of metabolic syndrome was highest among those with depressive disorders (45%) followed by those with bipolar disorders (37.8%). These results are comparable to numerous studies done across the world as shown in [Table/Fig-6]. Similarly, the prevalence of metabolic syndrome among patients with psychotic disorders was 30.95%. Prevalence rates of metabolic syndrome have varied from 26% to 52.2% in various cross-sectional studies [Table/Fig-7] [24-32].

In our study, the prevalence of metabolic syndrome was highest (63.64%) in patients on SGA's, followed by those on multiple (≥2) drugs (50%). The prevalence was lesser in patients on mood stabilizers, first generation antipsychotics and antidepressants. These findings are in accordance with numerous studies in literature. Yumru M et al., studied the atypical antipsychotics (also called second generation antipsychotics SGA's) related metabolic syndrome in bipolar patients. Atypical Antipsychotic taking patients had significantly higher MS rates than the others ($\chi^2=10.47$ df=2 p= 0.005). Also, atypical antipsychotic taking patients had significantly higher metabolic syndrome rates than mood stabilizers taking patients ($\chi^2=8.86$ df=1 p=0.003) [33]. In a recent study on 210 patients with schizophrenia, Gupta A et al., found that olanzapine was the most potent antipsychotic to induce metabolic syndrome followed by clozapine [34]. Corell CU et al., in his study evaluated the risk of metabolic syndrome in patients on antipsychotic polypharmacy. He concluded that compared with antipsychotic monotherapy, polytherapy was associated with elevated rates of metabolic syndrome (50.0% vs. 34.3%, p=0.015) [35]. In another study by Misawa E et al., results suggested that antipsychotic polypharmacy may be independently associated with an increased risk of having pre-metabolic syndrome, even after adjusting for patients' lifestyle characteristics as compared with monotherapy [36]. In our study, the prevalence of metabolic syndrome was highest (88.89%) in patients with waist circumference above cut off levels followed by those with elevated triglyceride levels (62.22%). Thus, waist circumference emerged as the best predictor of metabolic syndrome among various metabolic parameters. Our results are in accordance with numerous studies which have shown similar results. In the study by Mattoo SK and Mohan Singh S, about 70% of the patients with waist circumference above cut off level as per IDF criteria had metabolic syndrome [24]. In our study, the mean value of each metabolic parameter like waist circumference, triglycerides and fasting blood sugar was significantly higher in patients with metabolic syndrome than those without metabolic syndrome. While as serum HDL levels, blood pressure and BMI were significantly lower in patients with metabolic syndrome as compared to patients without metabolic syndrome. Similar results have been obtained in various studies comparing individual metabolic parameters in those with and without mental illness [37-40].

LIMITATION

It was a hospital based study which may not be representative of other individuals with less complex illness presentations in the community. We could not compare our results with age and sex matched healthy controls.

CONCLUSION

Our study showed that the prevalence of metabolic syndrome among psychiatric inpatients in Kashmir was significantly high. Patients with unipolar depression or those on second generation antipsychotics had higher prevalence. Female gender and increasing age were associated with greater risk. Thus, we conclude that the people with major mental disorders are at greater risk of metabolic syndrome that impacts their morbidity and mortality. Hence, these patients should be routinely monitored for cardiometabolic risk factors during their treatment.

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PARTICULARS OF CONTRIBUTORS:
1. Senior Resident, Department of Psychiatry, Government Medical College, Srinagar, Jammu and Kashmir, India.
2. Professor and Ex-Head, Department of Psychiatry, Government Medical College, Srinagar, Jammu and Kashmir, India.
3. Senior Resident, Department of Psychiatry, Government Medical College, Srinagar, Jammu and Kashmir, India.
4. Resident, Department of Pathology, Sher-i-Kashmir Institute of Medical Sciences, Soura, Srinagar, Jammu and Kashmir, India.
5. Consultant Psychiatrist, Department of Health and Medical Education, Jammu and Kashmir, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Tajamul Hussain,
H.No.15, Bismillah Colony Parray Pora, Srinagar-190005, Jammu and Kashmir, India.
E-mail: dhartajamul@gmail.com

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