Original Research Article

A study of metabolic syndrome in chronic institutionalized patients with schizophrenia

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Abstract

Background: Metabolic syndrome (Mets), which consist of several metabolic abnormalities, is an important clinical issue in patients with schizophrenia and a key risk factor for cardiovascular diseases and type-2 diabetes mellitus, both of which impact heavily upon life quality as well as expectancy.
Objectives: The aim of this study was to determine the prevalence of Mets in chronic institutionalized patients with schizophrenia and to find out association between Mets, sociodemographic and clinical variables.
Materials and methods: The study was carried out at Psychiatry wards of the Psychiatric Hospital, SMS Medical College, Jaipur. Sixty male schizophrenic inpatients (with at least 6 months of hospital stay at their last admission), diagnosed according to ICD-10 criteria were evaluated for Mets as per the criteria of the International Diabetes Federation (IDF). Patients with Mets were compared to those without Mets on the basis of demographic and clinical characteristics. Binary logistic regression analysis was conducted to find out the association between Mets, demographic and clinical variables.
Results: Schizophrenia patients with Mets were older, have a longer duration of illness, using 2nd generation antipsychotics and more likely to be smokers as compared to patients without Mets. Mets was significantly correlated with age, waist circumference, BMI and presence of negative symptoms.
Conclusion: The study showed that prevalence of Mets in chronic institutionalized patients with schizophrenia as per IDF was 31.66 percent. This mandates systematic screening as well as elimination of risk factors such as poor lifestyle, obesity and metabolic disturbances in these indoor patients. Further study on a larger number of samples is needed to be done.

Key words

Schizophrenia, Metabolic Syndrome, Waist circumference, BMI.

Introduction

Schizophrenia is a most devastating psychiatric disorder which has worldwide distribution and associated with several health concerns and risks. The metabolic syndrome (Mets); also known as syndrome x, Reaven's syndrome is an increasingly prevalent and important clinical issue in patients with schizophrenia [1-3]. It is characterized by co-occurrence of obesity, hypertension, hyperglycemia, dyslipidemia, and is a key risk factor for cardiovascular diseases and type-2 diabetes mellitus, both of which impact heavily upon life quality and expectancy [4].The mechanism involved in its pathogenesis are not fully understood; however insulin resistance and central obesity are considered to be important underlying causes of Mets [5-6].

Mets is one of the primary reasons for increased morbidity and mortality in schizophrenia patients. The frequency of Mets in medicated patients is two to four times higher than in appropriate reference population [7]. The life expectancy is 20 to 25 years lower and that life expectancy worsen over time[8].Most of the excess mortality in individuals suffering from schizophrenia is attributed to physical illness, with cardiovascular diseases being the major contributor [9]. Several factors like poor diet, lack of exercise, use of antipsychotics, sex hormone abnormalities, changes in pituitary-adrenal axis functioning, difficulty dealing with stress and genetic predisposition may contribute to increase risk for Mets [1, 10]. The current study was therefore aimed to determine prevalence of Mets in chronic institutionalized patients with schizophrenia and to find out association between Mets, sociodemographic and clinical variables.

Material and methods

The study was carried out at Psychiatry wards of the Psychiatric Hospital, SMS Medical College, Jaipur, India after approval by the Research Committee of College. Sixty male schizophrenia inpatients (with at least 6 months of hospital stay at their last admission), diagnosed with ICD-10 criteria were screened for prevalence of Mets, as per the criteria of International Diabetes Federation (IDF). In IDF criteria presence of abdominal adiposity is an essential criteria along with at least two other criteria in order to determine the presence of Mets as stated below.

Waist Circumference (WC)	**>90 for Males**
Fasting plasma Glucose (mg/dl)	≥ 100 mg/dl
High Triglycerides (mg/dl)	≥ 150 mg/dl
Raised BP (mmHg)	≥ 130/≥85 mmHg
Low HDLc (mg/dl)	< 40 mg/dl

The study patients were between the age of 18 to 60 years. Patients with organic brain damage, mental retardation, substance abuse/drug dependence or withdrawal, impairment of renal/hepatic functions, and diagnosed with any part of metabolic abnormalities (hypertension, diabetes mellitus and hyperlipidemia) were all excluded from the study. Sociodemographic characteristics, data regarding onset of illness, disease duration and medication treatment were collected in demographic data sheet. Written informed consent was taken from the all patients or their primary caregivers when the patient was incompetent to give consent. All participants underwent physical examinations including anthropometric assessments and biochemical assessments. Waist circumference was measured in centimeter (cm) with a non elastic tape applied at a point between the inferior costal margin and superior iliac crest at the end of normal expiration while standing. Weight in kilogram (kg) and height in cm was measured by calibrated scales. Body mass index was calculated as weight in kg divided by the square of height in meters. BP was measured using digital sphygmometer on right and left arm in seated position following rest of 5 minutes and

average values for systolic and diastolic BP were noted. Fasting venous blood samples were collected for biochemical investigations and measured by enzymatic colorimetric methods using an automated clinical chemistry analyzer (Selectra E; Merck, Netherlands). Psychopathology was assessed by Positive and Negative Syndrome Scale (PANSS) on the day of blood collection. Patients were divided into 2 groups: **Schizophrenia with Mets and without Mets** according to IDF criterion.

Statistical Analysis

Data were analyzed using a statistical package program (SPSS 17 Inc; Chicago II, USA) for social science. For numerical data mean and standard deviation (SD) were calculated. Pearson chi-square test was used to compare sociodemographic variables and student-t-test for comparison of the mean between the groups. Binary logistic regression analysis was conducted for association between Mets, clinical and demographic variables. Statistical significance was established at $p<0.05$.

Results

The prevalence of metabolic syndrome in chronic institutionalized patients with schizophrenia was 31.66% (19/60). Sociodemographic characteristics of the study groups revealed no significant differences except smoking and use of antipsychotic medications (**Table - 1**). In both the groups, most subjects were married, Hindu, unemployed, educated up to sr.sec standard, having monthly income upto Rs. 6000/- and from an urban extended nuclear family. The clinical variables of the study groups were as per **Table - 2**.

Schizophrenia patients with metabolic syndrome were older (38.47±12.35) and have a longer duration of illness (10.95±7.42) than those without Mets (32.07±8.12; 7.15±5.11). Among metabolic syndrome parameters, waist circumference, BMI, fasting blood sugar, and blood pressure were significantly higher in schizophrenia patients with metabolic syndrome. In lipid parameters serum triglyceride levels were significantly higher and HDL levels were lower but did not reach to a significant level. Mean BMI of schizophrenia patients with metabolic syndrome (26.92±3.62) was statistically higher as compared to without metabolic syndrome (23.43±4.15). A majority of patients with Mets were overweight (31.57% vs 14.63%) and obese (47.36% vs19.5%) compared to those in the non metabolic group. As regards the severity of illness, patients with Mets obtained higher PANSS total score on Positive and Negative Syndrome Scale (PANSS).

The result of regression analysis was as per **Table - 3**. Waist circumference and BMI among all the criteria for metabolic syndrome were most strongly identifying the presence of metabolic syndrome (odd ratio 2.13, 2.11 respectively; $p<0.05$).In clinical variables age (odd Ratio 2.29; $p<0.05$) and presence of negative symptoms (2.27; 0.023) was significantly associated with Mets. This is similar to study of Elgamal M, et al. (2012) and Sicras- Mainar A, et al. (2015) [11-12].

Discussion

In the present study, prevalence of Mets according to IDF was 31.66% which is significantly higher than that seen in general population and drug naïve schizophrenic patients [13-16]. Several factors like obesity, sedentary lifestyle, lack of exercise and high intake of fat and carbohydrate diet, that are frequently seen in people with mental disorders are associated with Mets [17]. In addition schizophrenia may predispose individuals to physiological changes, like abnormalities in glucose regulation along with a pattern of insulin resistance that have been observed even prior to the onset of disease or the use of antipsychotics; further increases the risk of Mets.

Table - 1: Comparison of sociodemographic characteristics between the patient groups.

Variables	With Mets (Group-I) (n=19)	Without Mets (Group-II) (n=41)	X^2(df)	p- value
Marital status	**n (%)**	**n (%)**		
Married	11 (57.89)	27 (65.85)	0.354 (1)	0.577
Single/Widower	8 (42.10)	14 (34.15)		
Occupation	**n (%)**	**n (%)**		
Unemployed	6 (31.58)	15 (36.59)	1.608 (4)	0.874
Skilled worker	0 (0.00)	2 (4.88)		
Semi-skilled	7 (36.84)	15 (36.59)		
Farmer	5 (26.32)	8 (19.51)		
Professional	1 (5.26)	1 (2.44)		
Education	**n (%)**	**n (%)**		
Uneducated	3 (15.79)	4 (9.76)	4.299 (3)	0.232
Up to middle	4 (21.05)	19 (46.34)		
Middle to Sr. sec.	12 (63.16)	17 (41.46)		
Grad to postgraduate	0 (0.00)	1 (2.44)		
Monthly income	**n (%)**	**n (%)**		
Low to medium	17 (89.47)	34 (8.93)	0.436 (1)	0.750
Medium to high	2 (10.53)	7 (17.07)		
Religion	**n (%)**	**n (%)**		
Hindu	17 (89.47)	35 (85.37)	0.109 (1)	0.716
Muslim	2 (10.53)	6 (14.63)		
Family type	**n (%)**	**n (%)**		
Nuclear	5 (26.32)	11 (26.83)	1.026 (2)	0.628
Nuclear extended	11 (57.89)	19 (46.34)		
Joint/Others	3 (15.79)	11 (26.83)		
Locality	**n (%)**	**n (%)**		
Urban	14 (73.68)	37 (90.24)	2.792 (1)	0.126
Rural	5 (26.32)	4 (9.75)		
Smoking	**n (%)**	**n (%)**		
Yes	16 (84.21)	26 (63.41)	3.911(1)	0.047*
No	3 (15.79)	15 (36.85)		
Medication	**n (%)**	**n (%)**		
1st generation	0 (0.00)	10 (25.00)	8.334 (2)	0.017*
2nd generation	19 (100)	19 (58.35)		
Mixed	0 (0.00)	7 (16.66)		

(*P<0.05, **p<0.01, ***p<0.001)

Table - 2: Comparison of clinical variables between patient groups.

Variables	With Mets (Group-I) (n=19)	Without Mets (Group-II) (n=41)	t value	p-value
Age	38.47±12.35	32.07±8.12	-2.061	0.050*
Onset of Disease	24.53±7.01	22.93±6.60	-0837	0.409
Duration of illness	10.95±7.42	7.15±5.11	-2.020	0.054
Waist circumference	100.33±6.70	87.13±7.83	-6.712	0.000***
BMI (kg/m^2)	26.92±3.62	23.43±4.15	-3.303	0.002**
Fasting Blood Sugar	104.84±20.41	88.61±22.29	-2.782	0.008**
Triglycerides	186.79±52.80	152.54±46.42	-2.121	0.040*
High Density Lipoprotein	40.92±8.75	42.02±10.89	0.422	0.675
Systolic BP	124.77±12.07	114.80±13.86	2.837	0.007**
Diastolic BP	82.54±10.67	75.84±12.70	2.049	0.050*

(*P<0.05, **p<0.01, ***p<0.001)

Table - 3: Binary logistic regression analysis for association between presence of Mets and specified variables.

Variables	Coef(B)	Standard error	Odd ratio	p-value
Waist circumference	.1386	.06525	2.13	0.034*
BMI	.5995	.2848	2.11	0.035*
Total Negative score	-.1926	.8484	2.27	0.023*
Age	.1215	.05311	2.29	0.022*

(*P<0.05, **p<0.01, ***p<0.001)

Among the 60 studied patients 23 patients (38.33%) suffered from diabetes mellitus, 26 patients (43.33%) with dyslipidemia and 8 patients (13.33%) had hypertension. A prior study by Heiskanen T, et al. (2003) found 2 to 4 times higher frequency of Mets in group of people with schizophrenia, treated with typical and atypical antipsychotics than in appropriate reference population [7]. Uses of atypical antipsychotics are also associated with impaired glucose regulation and increased risk of hyperglycemia, which consequently increase the risk of Mets [18].

In our study the mean age of patients having Mets was significantly higher as compared to patients having no Mets syndrome. In regression analysis age is significantly associated with Mets. Similar findings were reported previously by Kang S, et al. (2011) [19]. Mean value of all metabolic components were significantly higher except HDLc which was lower in patient with Mets but differences were not significant.

Among component of Mets, WC and BMI showed a significant association with Mets. WC is a marker of visceral fat and abdominal adiposity [20]. Visceral adipose tissue has number of metabolic, endocrine and immunological functions that are intricately linked to the pathogenesis of Mets [21]. Ryan MC, et al. (2004) found that individual with schizophrenia have more than three times as much intra-abdominal fat as controls matched for age, gender, and lifestyle [22].

Earlier studies (Siddichha S, et al. (2007) and Uma Devi P, et al. (2009)) have reported 31.8%

prevalence of obesity, 10.1% incidence of obesity and 18.2% prevalence of Mets after 6 weeks of treatment with antipsychotics and increased FBS, total cholesterol and TG levels in patients with schizophrenia [23-24]. Obesity is one of the most important risk factor for type-2 diabetes mellitus. Higher prevalence of type-2 DM in these patients might be a function of illness itself and genetic predisposition. Unaffected 1st degree relatives of schizophrenia also have high rates of type-2 DM (19-30%), indicates a genetic association between these two disorders [25].

In clinical variables negative symptoms were significantly associated with Mets. Association is expected as negative symptoms are reflective of marked decrease in physical activity, which in turn is important risk factor for Mets. Negative symptoms are key components of disease which affects patients' ability to cope with daily activities as well as have a negative impact on their quality of life which predispose an individual to develop Mets [12].

Conclusion

Our findings showed a high risk of Mets in chronic institutionalized patients with schizophrenia. Presence of negative symptoms is an important predictor of development of metabolic syndrome. Furthermore, for early identification of Mets clinicians should keep close watch on patients' waist circumference and BMI. Though, further studies on a larger sample are required to substantiate the findings.

Limitations

Finding higher prevalence of Mets in patients with schizophrenia; the present study should be viewed with its limitations. First, as this was a case control study, the causal pathway of Mets could not be inferred. Secondly, we did not have a reference population without psychopathology.

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