ORIGINAL RESEARCH PAPER
Volume-6 | Issue-12 | December-2017 | ISSN No 2277 - 8179 | IF : 4.176 | IC Value : 93.98
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

PREDICTORS OF DEPRESSION IN PATIENTS WITH METABOLIC SYNDROME : A CROSS-SECTIONAL STUDY FROM NORTHERN INDIA

Medicine

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ABSTRACT

Background: Metabolic syndrome (MetS) has been associated with an increased risk of mood disorders as well as T2DM. Similarly, depression increases the risk of MetS.

Aims and Objective: This study was conducted to evaluate the occurrence of depressive symptoms in patients with MetS and their association with individual components of MetS.

Materials and Methods: The present study included 820 individuals from a tertiary care centre (Pt. B.D. Sharma PGIMS, Rohtak) in northern India. Their sociodemographic and relevant clinical profile were recorded. MetS was defined according to the International Diabetes Federation criteria and patients were evaluated for depression by using Hamilton Depression Rating Scale.

Results: The prevalence of depression among MetS patients was two folds higher (29.7% vs. 13.8%) than individuals without MetS. Women with MetS had higher depression (32.1% vs. 17.3%) than men. Overall, prevalence of MetS was 52.0% and was 3 times more common in females as compared to males (76.1% vs. 23.9%). Central obesity was the commonest component of MetS in females, males as well as in whole study group. The major predictors for depression in patients of MetS were central obesity, systolic hypertension, low HDL cholesterol levels, female sex and low education level (illiteracy).

Conclusion: This study demonstrated a high prevalence of depression in MetS patients. Screening of central obesity, systolic hypertension, low HDL cholesterol levels, female sex and illiteracy level can be helpful for early prediction of depression in these patients.

KEYWORDS

Metabolic Syndrome, Depression, International Diabetes Federation Criteria.

INTRODUCTION

Depressive disorders are highly prevalent in general population. Depression, which is associated with high rate of mortality and disability, is expected to become the second highest cause of disability by 2020. 1 The MetS refers to a cluster of metabolic risk factors like central obesity, glucose intolerance, hyperinsulinemia, low HDL cholesterol, high triglycerides and hypertension that increase the risk for morbidity and mortality from cardiovascular disease, T2DM and all-cause mortality. 2 MetS has also been strongly associated with a number of psychiatric illnesses including depression, anxiety and bipolar disorder across several studies from all over world. 3-6 A recent meta-analysis showed the bidirectional association between depression and MetS. 7 Moreover, depression increases the risk of MetS by 2 fold. 8, 9 Various studies found an association for depressive, but not anxiety symptoms with MetS. 10, 11 Several studies have shown that MetS and its various components, especially central obesity and dyslipidemia are predictors of depressive symptoms. [12,13]

Globally as well as in India, there are few studies that have addressed the prevalence of depression in patients with MetS. In a study by Kahl et al. 14 MetS was present in 27% of males and 25% of females, was significantly associated with lifetime major depression and anxiety disorder. Another study pointed out a robust association between depression and the prevalence of the metabolic syndrome in women with suspected coronary artery disease. 15 A Finnish study showed a two times higher prevalence rate of depressive symptoms in initially non-depressed men and women with metabolic syndrome at baseline after a 7-year follow-up. 16 A study by Aggarwal et al. 17 showed that 41.6% and 44.0% of patients with depressive disorder had metabolic syndrome according to IDF and NCEP-ATPIII criteria, respectively and while it was reported 25.0% by using NCEP-ATPIII criteria, in a recent study from Lucknow, Uttar Pradesh. 18 As there is scanty amount of data on mood disorders in patients with MetS in Indian population, the exact disease burden still remains unclear. Therefore, the present study was aimed to determine the prevalence rate of depression in patients with metabolic syndrome at Pt. B.D. Sharma, PGIMS, Rohtak, Haryana, India, a tertiary care center in Northern India using the International Diabetes Federation criteria.

MATERIALS AND METHODS

This was a cross-sectional study, which was conducted in outpatient unit of Pt. B.D. Sharma PGIMS, Rohtak, Haryana, a multispecialty tertiary care hospital in North India. The study protocol was approved by the Ethics Committee of the Institute. After taking informed and written consent, a total of 820 participants were included in the study.

Inclusion criteria

- Patients above 18 years of age
- Patients of either sex

Exclusion criteria

- Patients with chronic medical or surgical illness
- Patients having renal, neurological, or cardiovascular dysfunction who require immediate hospitalization for serious illness
- Patients who were on corticosteroids or any psychotropic drug.

Measures

A semi-structured proforma was used to obtain socio-demographic variables of patients and relevant past medical history and duration of illness, treatment taken for diabetes. Anthropometric measurements including weight, waist circumference, body mass index (BMI) were recorded. Blood pressure was measured using a sphygmomanometer. Fasting and postprandial plasma glucose level and lipid profile were done.

Metabolic Syndrome Definition

According to the new International Diabetes Federation (IDF) definition, 19 MetS is defined as when a person must have:

Central obesity (Waist Circumference with ethnicity specific value for South Asian population, Male ≥ 90 cm and Female ≥ 80 cm); plus any two of the following four factors:

(1) Raised triglycerides ≥ 150 mg/dL (1.7 mmol/L) or specific treatment for this lipid abnormality; (2) Reduced HDL cholesterol < 40 mg/dL (1.03 mmol/L) in males and < 50 mg/dL (1.29 mmol/L) in females or specific treatment for this lipid abnormality; (3) Raised blood pressure systolic BP ≥ 130 or diastolic BP ≥ 85 mm Hg or treatment of previously diagnosed hypertension; and (4) Raised fasting plasma glucose (FPG) ≥ 100 mg/dL (5.6 mmol/L) or previously diagnosed type 2 diabetes. If above 5.6 mmol/L or 100 mg/dL, OGTT

is strongly recommended but is not necessary to define presence of the syndrome.

Assessment of Depression

Hamilton Depression Rating Scale was administered to assess the presence of depression as well as severity. The scale consists of 17 items. In this scale, the score ranges from 0 to 54 where 0–7 indicate a normal person with regard to depression, 8–13 indicate mild depression, 14–18 indicate moderate depression and ≥19 indicate severe depression. 20

STATISTICALANALYSIS

The data collected during the study was entered in the Microsoft Excel format and was analyzed using SPSS version 17 version Microsoft software. A descriptive statistical analysis was done for continuous and categorical variables. Differences in characteristics between participants were tested with unpaired t-test for normally distributed variables and with the Chi-square test for categorical variables. Binary logistic regression model was used to examine the association between predictor variables and risk of depression. Results were expressed as odds ratio (OR) and 95% confidence intervals. The P values were two-tailed, and probability level of significant difference was set at <0.05.

RESULTS

For the study, a total of 820 individuals were examined out of which 426 females (52.0%) and 394 males (48.0%) were there. The overall mean age of the population was 53.52±10.31 years, whereas the ages of the males and females were 55.30±9.57 and 51.87±10.71, respectively. The sociodemographic and clinical characteristics of the patients with and without MetS are shown in Table 1.

Table 1
Sociodemographic and clinical profile of the patients with and without MetS

Variables	MetS (-) n=820 (100.0%)			MetS (+) n=426 (52.0%)		
	Male n=394 (48.0%)	Female n=426 (52.0%)	p value	Male n=102 (23.9%)	Female n=324 (76.1%)	p value
Age (%) 20-40 years 41-60 years ≥61 years	7.9 60.1 32.0	18.5 63.6 17.9	<0.001	7.8 51.0 41.2	18.8 62.3 18.9	<0.001
Marital status (%) Married Unmarried	93.1 6.9	89.4 10.6	0.061	100.0 0	99.7 0.3	0.565
Residential area (%) Urban Rural	68.3 31.7	72.3 27.7	0.207	71.6 28.4	75.0 25.0	0.490
Education level (%) Illiterate Up To 10TH Up To 12TH Graduation Post-Graduation	36.0 11.4 12.8 27.8 12.0	37.3 19.2 10.8 20.9 11.8	0.013	35.4 8.8 17.6 29.4 8.8	38.3 17.9 11.4 20.4 12.0	0.017
Type of family (%) Nuclear Joint	57.6 42.4	61.7 38.3	0.229	56.2 43.8	66.9 33.1	0.064
Life style (%) Physically active Sedentary	59.9 40.1	57.7 42.3	0.532	51.0 49.0	57.1 42.9	0.278
Smoking (%) Yes No	16.5 83.5	0 100.0	<0.001	36.2 63.8	0 100.0	<0.001
Alcohol (%) Yes No	14.9 85.1	0 100.0	<0.001	29.6 70.4	0 100.0	<0.001
Waist (cm)	94.71±12.33	94.95±9.64	0.048	99.79±7.94	95.71±8.89	<0.001
Height (cm)	166.91±8.63	156.42±7.41	0.041	167.75±7.23	156.52±7.47	<0.001
Weight (kg)	65.88±9.30	60.43±9.48	0.160	69.46±10.05	60.26±9.43	<0.001
BMI (kg/m2) (%)	23.64±2.91	24.73±3.67	<0.011	24.75±3.60	24.60±3.47	<0.044
Systolic BP (mmHg)	127.96±20.41	123.98±19.71	0.003	147.45±12.88	122.82±18.83	<0.001
Diastolic BP (mmHg)	81.12±10.53	82.54±12.67	0.115	85.22±10.35	81.72±11.17	<0.001
Fasting plasma sugar (mg/dl)	118.09±51.88	121.94±53.86	0.087	132.31±51.12	123.02±56.26	0.138
Postprandial plasma Sugar (mg/dl)	170.28±72.30	175.64±73.84	0.135	195.93±74.59	177.15±77.82	0.032
Serum triglyceride(mg/dl)	186.30±48.01	189.80±46.05	0.433	193.30±42.69	190±43.34	0.180
Serum HDL (mg/dl)	33.45±22.01	37.28±22.27	0.908	43.03±5.43	43.14±4.47	0.042

Prevalence of individual components of Mets is shown in Table 2. After applying the IDF criteria, the prevalence rate of MetS was found to be 52.0%, while prevalence rates of MetS in male and female was 23.9% and 76.1% respectively. Hence females were having higher prevalence of MetS as compared to males. Most of the MetS patients were in the 41–60 years age group (51.0% male and 62.3% female), which was statistically significant (table 1). Overall as well as in male and female groups, central obesity was the commonest component (80.8%, 65.4% and 96.9% respectively) followed by high serum triglycerides (73.1%, 57.1% and 88.0% respectively), while diastolic hypertension was the least prevalent component in overall and female group. The least prevalent component of MetS in male group was low HDL levels. Central obesity, high triglycerides and low HDL cholesterol were the only components that showed statistically significant difference between males and females (table 2).

Table 2
Prevalence of individual components of Mets

	Male (%) 394 (48.0%)	Female (%) 426 (52.0%)	Total (%) 820 (100.0)	p value
Central Obesity/ Waist Circumference (Male ≥90cm, Female ≥80cm)	258 (65.4)	413 (96.9)	671 (81.8)	0.001
Fasting blood sugar (≥100 mg/dl)	116 (29.4)	189 (44.3)	305 (37.1)	0.658
Serum triglyceride (≥150 mg/dl)	225 (57.1)	375 (88.0)	600 (73.1)	0.045
Serum HDL (Male <40 mg/dl, Female<50 mg/dl)	47 (11.9)	246 (57.7)	293 (35.7)	0.011
Systolic BP (≥130 mmHg)	120 (30.4)	134 (31.4)	254 (30.9)	0.147
Diastolic BP (≥85 mmHg)	78 (19.7)	125 (29.3)	203 (24.7)	0.590
MetS	102 (23.9)	324 (76.1)	426 (52.0)	

Prevalence rate of depression in patients with and without MetS is shown in Table 3.

Table 3
Prevalence rate of depression in patients with and without MetS

	Male (%)	Female (%)	Total (%)	p value
Depression in MetS (-) group	11.7	21.6	13.8	0.032
Depression in MetS (+) group	17.3	32.1	29.7	0.012

The independent risk factors for depression among the patients of MetS were calculated by applying binary logistic regression analysis (table 4). For depression, Odd Ratio was significantly higher for central obesity with the value of 4.32, followed by 2.53 for systolic hypertension, 1.08 for low HDL level and 0.55 for female sex, while it was lowest for low education level 0.35.

Table 4
Predictors of depression in MetS patients (results of logistic regression analysis)

Independent variables	OR	95% CI for OR Lower	Upper	p value
Central Obesity	4.32	2.09	8.89	**0.006**
Systolic Hypertension (mmHg)	2.53	1.58	4.05	**0.014**
Low HDL level (mg/dl)	1.08	1.02	1.15	**0.004**
Female Sex	0.55	0.33	0.91	**0.011**
Education Level (Illiteracy)	0.35	0.18	0.69	**0.032**

DISCUSSION

Studies from the West reported that the presence of depression (current and lifetime) increases the risk of MetS. 9 Also, the prevalence of MetS is more in patients of depression compared to healthy controls. 9 MetS has also been robustly connected with depression and other psychiatric disorder. 3-6 Due to these factors, some authors propose a bidirectional relationship between depression and MetS. 7 The findings of the present study suggested that prevalence of MetS was 3 times more common in females as compared to males (76.1% vs. 23.9%), while overall prevalence was 52.0%. A varying rate of prevalence of MetS 18.0% - 77.0% has been found in the various studies done in India, because of different criteria used for MetS. 21-23 The prevalence of MetS was significantly higher in women as compared to men, 22, 23 which was consistent with present study. The prevalence rate of depression was approximately 2 folds significantly higher in patients with MetS (29.7%) as compared to patients without MetS (13.8%). It was also significantly more in female patients with MetS as compared to males with MetS (32.1% vs.17.3%) (table 3). A study by Aggarwal et al. 17 which include 166 patients showed that 41.6% and 44.0% of patients with depressive disorder had metabolic syndrome according to IDF and NCEP-ATPIII criteria respectively. Another recent study from a tertiary care hospital at Lucknow, Uttar Pradesh, it was reported 25.0% by using NCEP-ATPIII criteria. 18 A study by Grover et al. showed the prevalence of MetS in subjects with first-episode depression was 34.5 and 50.0% in those with recurrent depressive disorder. In a study from north India, Mattoo et al. found the prevalence of MetS in psychiatric indoor patients was 37.8% as per IDF criteria. Western studies were reported the prevalence of MetS in patients with depression to vary from 30.4% to 48.8%. 24-26 In a recent study from Germany, Kahl et al. 14 showed the prevalence of MetS was present in 27% of males and 25% of females by using NCEP-ATPIII criteria and was significantly associated with lifetime major depression, anxiety disorder, body weight and physical activity. The varying rates of prevalence may be because of methodological differences such as self-reported depressive symptoms versus clinically diagnosed depression and various definitions of MetS that were used in studies such as Harmonized, NCEP-ATPIII, WHO and IDF. Tuomilehto J et al. 15 pointed out a strong association between depression and the prevalence of the metabolic syndrome in women which was similar to our result. Similar results were also observed in a cross-sectional study from United States which stated that women with major depressive symptoms were twice as likely to have MetS compared with those without it. 8 In contrast to our study, a Japanese study by Sekita et al. 27 demonstrated a higher prevalence of depressive symptoms in males with MetS compared to those without it. On the other hand, kahl et al. 4 found an increased prevalence of the MetS in both men and women with major depression. A cohort study in Finland reported that MetS was not associated with depression or anxiety in either men or women. 28 In present study, increased depressive symptoms in female patients with MetS may be because of high central obesity, low education level, poor diet and chronic stress about their own health status.

In this study, the central obesity was significantly associated with depression in MetS patients. Infact, obesity increased the odds of one having the depression in MetS, as obese patients were almost 4 times [4.32 (2.09-8.89)] more likely to develop the depression, as compared with normal weight individuals (table 4). These results were supported by previous studies from India 5, 17, 18 as well as globally. 8, 12, 24, 28, 29 These finding may be because of fact that South Asians population, including Indian, are having greater amount of visceral fat, high waist circumference, dyslipidemia and insulin resistance at younger age, compared to their Western counterpart and hence predispose them to very high risk of MetS, T2DM and cardiovascular diseases than any other residents in the world. [30]

This study showed the prevalence of depression was significantly higher in MetS patients with high systolic blood pressure. Patients of MetS with high systolic hypertension were almost 2 times [2.53 (1.58-4.05)] more likely to develop the depression, as compared with normotensive patients (table 4). Similar association had been reported in earlier studies. 17, 31-33 The present study also reported that the prevalence of depression was significantly higher in MetS patients with low HDL level. These results were also consistent with previous studies. 8, 24, 34, 35 This may be because high blood pressure 33 and low HDL cholesterol levels 36 are associated with higher risk of coronary heart diseases or cardiovascular diseases which ultimately augment chronic disease stress and hence increase depression. In the present study, the low education level (illiteracy) was significantly associated with depression in MetS patients. These findings were constant with a previous literature. 37 This could be due to their increase intake of saturated fatty foods, carbohydrate rich and low fiber diet as well as irregular exercising and sedentary life style in MetS patients with low education level.

Increased waist circumference was the found to be most common component of MetS in the present study, these results were similar to previous studies. 17, 31, 38 This was followed by high triglyceride level, while diastolic hypertension was the least common component of MetS. These results were not observed in other Indian studies by Surana et al. 22 and Yadav et al. 23 which reported hypertension as the commonest component of MetS. Furthermore, in the present study, increased waist circumference was the most common component among female and male group, while diastolic hypertension and low HDL level were the least common component in females and males, respectively. But Surana et al. 22 showed central obesity in female and hypertension in male were the most prevalent risk factors for MetS. While study by Yadav et al. 23 reported hypertension was a common component in female with MetS. In the present study, a statistically significant difference was also shown by central obesity, high triglycerides and low HDL cholesterol levels. Similar results had been observed in a previous study. 39 Thus, it is suggested that the prevalence of depressive symptoms were two times higher in patients of MetS and central obesity was the commonest component of MetS in the present study. Some studies have evidence that obesity may predict the development of depression 40 and other found depression as a leading cause for development of obesity. 41 Therefore, precise screening of commonest predictors of depression in MetS will provide guidance for prevention and treatment of its future complications.

CONCLUSION

The present study revealed a high prevalence of depression in patients of MetS and most common predictor of depression was central obesity, systolic hypertension, low HDL cholesterol levels, female sex and low education level. Central obesity had the highest odds ratio of predicting depression. These findings imply that screening of above risk factors can be useful in monitoring the development of depression in patients of MetS. Therefore, efforts should be intensified in educating patients regarding lifestyle modifications and management of these individuals by a multidisciplinary approach between the psychiatrist and physicians so that weight or other metabolic abnormalities can be reduced, which ultimately diminish the cardiovascular morbidity and mortality related to this syndrome.

LIMITATIONS

There were several limitations to this study. This was a cross-sectional study and hence, is not suitable to demonstrate a causal association between MetS and the development of depressive symptoms. Since sample size was small and thus results may not be generalized to general population. Therefore, multicentral and longitudinal studies in different geographical areas need to be considered to establish long-term conclusions. Despite these limitations, this study was able to reveal important aspects of depression in patients of MetS.

FINANCIAL SUPPORT AND SPONSORSHIP

No financial support was received to carry out the research.

CONFLICTS OF INTEREST

There are no conflicts of interest.

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