Original Article

Relationship between Metabolic Syndrome and Mental Health Status among Geriatric Females: A Cross-sectional Study

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ABSTRACT

Introduction: Postmenopausal status is a known risk factors for developing metabolic syndrome (MetS). Studies focusing on establishing the relationship between Mets and mental health state are limited. **Aims and Objective:** To identify the frequency of MetS along with its components in geriatric females and assess its relationship with three negative emotional states (depression/anxiety/stress). **Materials and Methods:** Women aged ≥60 years from October 2020 to March 2022 were included in study. We used the Consensus Definition IDF and AHA/NHLBI (2009) criteria to classify subjects as having metabolic syndrome. Mental health status were assessed using Depression Anxiety and Stress Scale (DASS 21) questionnaire. **Results:** The frequency of metabolic syndrome in this sample was 36.58% (30 out of 82 patients). The Depression, anxiety, stress scale and total scores in women with MetS were 14 ± 5.3, 8.5 ± 3.92, 12.13 ± 5.58 and 34.66 ± 9.60 as compared to 6.6 ± 3.7, 5.3 ± 2.49, 7.1 ± 3.12 and 19.2 ± 6.51 in those without MetS; difference being statistically significant. **Conclusion:** MetS results in poor mental health state in geriatric women but large-scale studies are needed to clarify this association.

KEYWORDS: *Geriatric females, mental health, metabolic syndrome*

INTRODUCTION

With increase in percentage of the elderly population (≥60 years) over these years, it is estimated that by 2031, these vulnerable groups will make around 13.1% of the total Indian population. As per 2031 Census projections, approximately 100 million women will be aged 60 years and above.[1] Extended life expectancy is linked to a higher likelihood of age-related illnesses and rising prevalence of chronic conditions.[2] Mental health issues and metabolic syndrome (MetS) are two such conditions with rising prevalence in the geriatric population. MetS includes a set of metabolic derangements involving glucose intolerance, obesity, dyslipidemias, insulin resistance, and hypertension.[3] In a recent meta-analysis of 111 Indian studies involving 133,926 participants, it was observed that the prevalence of MetS raised from 13% in the 18–29 years' age group to 41% in the age group of ≥60 years.[4] When compared to age-matched premenopausal women, men are more likely to acquire MetS; however, this relationship flips after menopause, with women having a higher frequency than men.[5,6] Menopausal women are prone to develop MetS owing to the declining estrogen levels along with increased likelihood of insulin resistance occurring after menopause.

Mental health disorder on the other hand is another important health concern in the geriatric population. Based on the 2011 Indian census, it is reported that 1 of every 20 individuals aged ≥60 years has some form of mental or physical disability.[7]

Literature search shows that there exists a bidirectional relationship between MetS and depression.[8-10] These

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health issues need to be dealt with aggressively in terms of prevention, early detection, and management for a better quality of life in the geriatric population. Considering that there is an uncertainty in the relationship between mental health disorders and MetS, we planned to undertake this study. The aim of this study was to identify the frequency of MetS along with components in geriatric females and assess its relationship with three negative emotional states (depression/anxiety/stress).

Materials and Methods

This was a cross-sectional study conducted from October 2020 to March 2022 at a tertiary center in Uttarakhand, India. The study received approval from the institutional ethics committee. The study participants included women >60 years old and those consenting to participate in the study. Informed consent was taken from all participants. Baseline demographic details such as age, parity, and duration of menopause along with anthropometric measurements such as weight, height, body mass index, and waist circumference (WC) were noted. Systolic and diastolic blood pressure measurements were taken twice, and a mean value was noted. Blood samples for fasting blood sugars and lipid profiles were taken after an overnight fasting state. Lipid accumulation product (LAP) and Visceral Adiposity Index (VAI) are simple mathematical tools combining both anthropometric and lipid parameters and have been used as predictors of MetS.[11,12]

Diagnostic criteria of metabolic syndrome

The 2009 Consensus Definition International Diabetes Federation and American Heart Association/National Heart, Lung, and Blood Institute criteria were used to classify participants as having MetS[13] [Table 1].

Mental health status assessment

This was assessed using Depression, Anxiety, and Stress Scale (DASS-21).[14] This is a validated screening tool that screens three negative emotional states (depression, anxiety, and stress). It includes 21 questions, and each state has seven questions. Each item has scores ranging from 0 (did not apply at all) to 3 (applied most of the time). Scores from each state of mind are summed, and the final score is multiplied by 2 for characterizing each state as normal, mild, moderate, severe, and extremely severe as per the DASS Manual. For depression, the score of ≤9 – normal, 10–13 – mild, 14–20 – moderate, 21–27 – severe, and higher is taken as extremely severe. Similarly, for anxiety and stress domains, a score of ≤7 and ≤14, respectively, is considered normal and higher scores are subgrouped as mild, moderate, severe, and extremely severe. Considering this, we considered scores ≥10, ≥8, and ≥15 as depression, anxiety, and stress, respectively.

Statistical analysis

The data were entered into Microsoft Excel spreadsheet, and the final analysis was done using Statistical Package for the Social Sciences (SPSS) software, IBM manufacturer, Chicago, USA, version 21.0. Quantitative data were presented as means ± SD. The association of variables which were qualitative in nature were analysed using Chi-Square test. Pearson correlation coefficient was used for the correlation of DASS 21 scale in patients with and without MetS. $P < 0.05$ was considered statistically significant.

Results

There were 82 women aged ≥60 years in the study. The baseline clinical, anthropometric, and metabolic characteristics of these women are shown in Table 2.

Table 1: Diagnostic criteria of metabolic syndrome

Criteria	Defined as
Abdominal obesity	WC ≥80 cm in Asian women
High levels of blood glucose	Fasting level ≥100 mg/dL or a diagnosis of type 2 diabetes
Hypertension	SBP ≥130 mmHg and/or diastolic ≥85 mmHg
High TG levels	≥150 mg/dL or in treatment
Reduction in HDL cholesterol	<50 mg/dL or in treatment

Presence of three of the above five features was taken as MetS. MetS: Metabolic syndrome, HDL: High-density lipoprotein, TG: Triglyceride, WC: Waist circumference, SBP: Systolic blood pressure

Table 2: Baseline clinical, anthropometric, and metabolic characteristics of study participants (*n*=82)

Variables	Mean±SD
Age (years)	66.08±4.91
Time since menopause (years)	18.42±8.06
Parity	3.93±1.71
SBP (mmHg)	131.10±15.32
DBP (mmHg)	79.67±9.02
WC (cm)	83.35±5.36
BMI (kg/m^2)	25.90±3.50
FBG (mg/dL)	123.67±37.35
TG (mg/dL)	147.92±56.79
TC (mg/dL)	149.70±55.27
HDL cholesterol (mg/dL)	40.81±14.74
LDL cholesterol (mg/dL)	105.20±38.27
VAI	3.33±2.06
LAP	42.69±20.55

VAI: Visceral adiposity index, LAP: Lipid accumulation product, BMI: Body mass index, TG: Triglyceride, TC: Total cholesterol, FBG: Fasting blood glucose, WC: Waist circumference, SBP: Systolic blood pressure, DBP: Diastolic blood pressure, HDL: High-density lipoprotein, LDL: Low-density lipoprotein, SD: Standard deviation

Of the 82 women in these cross-sectional dataset, 30 (36.58%) had MetS [Table 3 and Figure 1].

The proportion of patients with depression (83.3% vs. 17.3%), anxiety (63.3% vs. 30.8%), and stress (16.7% vs. 0%) was significantly higher in patients with MetS as compared to those without MetS [Table 4].

As shown in Table 5, there was a significant positive correlation between fasting blood glucose (FBG) and triglyceride (TG) with total DASS-21 scores as well as its subscales. Similarly, LAP had a significant positive correlation with total DASS-21 scores as well as its subscales. VAI had a positive correlation with depression and total scores.

Table 3: Frequency of metabolic syndrome in study participants (*n*=82)

MetS	Frequency, *n* (%)
Yes	30 (36.58)
No	52 (63.41)

MetS: Metabolic syndrome

Discussion

With increase in life expectancy, there is a steady increase in the proportion of the geriatric population

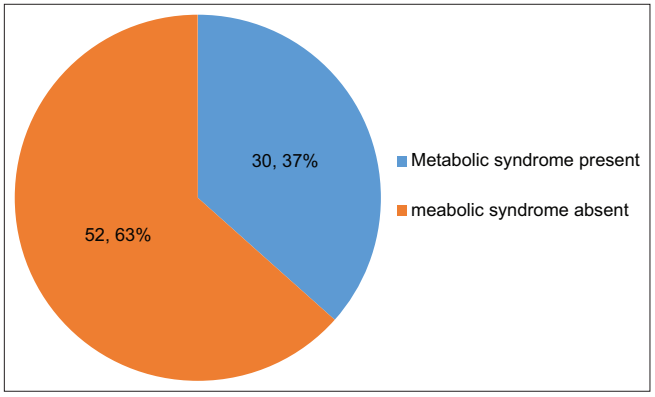

Figure 1: Frequency of metabolic syndrome in the study cohort

Table 4: Comparison of Depression, Anxiety, and Stress Scale 21 in women with or without metabolic syndrome

DASS-21	Patients with MetS (*n*=30), *n* (%)	Patients without MetS (*n*=52), *n* (%)	Total	*P*
Depression				
No (0–9)	5 (16.7)	43 (82.7)	48 (58.5)	<0.0001†
Yes (≥10)	25 (83.3)	9 (17.3)	34 (41.5)	
Total score, mean±SD	14±5.3	6.6±3.7		
Anxiety				
No (0–7)	11 (36.7)	36 (69.2)	47 (57.3)	0.004*
Yes (≥8)	19 (63.3)	16 (30.8)	35 (42.7)	
Total score, mean±SD	8.5±3.92	5.38±2.49		
Stress				
No (0–14)	25 (83.3)	52 (100)	77 (93.9)	0.005†
Yes (≥15)	5 (16.7)	0	5 (6.1)	
Total score, mean±SD	12.13±5.58	7.17±3.12		
Total DASS-21, mean±SD	34.66±9.60	19.23±6.51		

*Fisher's exact test, †Chi-square test. SD: Standard deviation, DASS: Depression, Anxiety, and Stress Scale, MetS: Metabolic syndrome

Table 5: Correlation between mental health scores and risk factors for metabolic syndrome

Risk factors for MetS	Depression		Anxiety		Stress		Total DASS 21 score	
	Correlation coefficient	*P*	Correlation coefficient	*P*	Correlation coefficient	*P*	Correlation coefficient	*P*
SBP	0.158	0.157	0.152	0.173	0.177	0.111	0.210	0.058
DBP	0.127	0.256	0.101	0.368	0.173	0.121	0.176	0.114
BMI	0.048	0.667	0.075	0.504	−0.018	0.874	0.041	0.713
WC	0.124	0.266	0.129	0.247	0.125	0.262	0.162	0.146
FBG	0.321**	0.003	0.308**	0.005	0.284**	0.010	0.393**	0.000
TG	0.443**	0.000	0.264*	0.016	0.360**	0.001	0.476**	0.000
TC	0.105	0.350	0.039	0.727	0.190	0.087	0.152	0.173
HDL	−0.078	0.487	0.025	0.821	0.074	0.506	0.001	0.996
LAP	0.380**	0.000	0.240*	0.030	0.337**	0.002	0.426**	0.000
VAI	0.296**	0.007	0.033	0.770	0.154	0.168	0.234*	0.035

*Correlation is significant at the 0.05 level (two-tailed), **Correlation is significant at the 0.01 level (two-tailed). Pearson correlation. MetS: Metabolic syndrome, DASS: Depression, Anxiety, and Stress Scale, VAI: Visceral adiposity index, LAP: Lipid accumulation product, BMI: Body mass index, TG: Triglyceride, TC: Total cholesterol, FBG: Fasting blood glucose, WC: Waist circumference, SBP: Systolic blood pressure, DBP: Diastolic blood pressure, HDL: High-density lipoprotein, LDL: Low-density lipoprotein

over the years in India. This rise has also resulted in parallel increase in age-related chronic illness. Hence, it becomes important to screen these women for any such condition for a healthy quality of life. This study showed that in women aged more than 60 years, the frequency of MetS was 36.58%. Although studies focusing on the prevalence of MetS among geriatric Indian women are limited, there are a few that show varying rates of prevalence. Similar to ours, in another Indian study with 312 participants involving both male and female, the authors reported that 36.9% of females had MetS.[15] In a recent study from Southern India, it was seen that 63.1% of urban participants aged 65–74 years had MetS.[16] A cross-sectional study from Nainital reported the prevalence as 34.68% in geriatric females.[17] The wide variation in the frequency of MetS in these studies could be attributed to the use of varying diagnostic criteria to detect MetS, different lifestyles, and environmental and geographical locations.

The present study showed that women with MetS had higher frequency of depression (83.3% vs. 17.3%), anxiety (63.3% vs. 30.8%), and stress (16.7% vs. 0%) as compared to those without MetS, difference being statistically significant. We also observed a significant positive correlation between FBG and TG with total DASS-21 scores as well as its subscales. In a recent systematic review by Repousi *et al*. involving 12 studies, it was observed that depression was associated with MetS in the majority of the studies (10/12 = 83.3%).[18] In terms of the association between the components of MetS and depression, there was mixed results. In this review, depression had a significant association with WC in four studies, with fasting blood sugar in two and with TGs in one study, respectively. In another cross-sectional study from Iran, involving 1560 elderly of both sexes, aged ≥60 years, the authors observed that there was a significant association with TG, high-density lipoprotein, WC, and FBG with depression, but after gender and age adjustment, this association did not exist.[19] In another cross-sectional study involving 1015 participants of both sexes with a mean age of 49.6 ± 18.7 years, it was noted that MetS was substantially linked to increased depressed symptoms in females.[20] In an Indian study involving 93 elderly patients of both sexes suffering from depression, the frequency of MetS was observed to be as high as 57% indicating the need to screen this vulnerable group for metabolic abnormalities.[21]

While our findings align with existing research in many areas, it is important to consider the limitations. The cross-sectional nature of the study limits causal inference. In addition, variability in measurement methods and the influence of confounding factors could affect the observed relationships. Future research should consider longitudinal studies to better understand causality and explore the underlying mechanisms linking psychological distress with metabolic risk factors.

Conclusion

Our study reinforces the significant associations between psychological distress and key metabolic risk factors such as FBG, TG, LAP, and VAI. These findings contribute to the growing body of evidence highlighting the interplay between mental health and metabolic health. Addressing psychological distress may be a crucial component in managing and preventing MetS, underscoring the need for integrated approaches that consider both psychological and metabolic health.

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Conflicts of interest

There are no conflicts of interest.

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