

A Cross-Sectional Study on Prevalence of Metabolic Syndrome and Its Predominant Components among Pre and Post-Menopausal Women in South Delhi

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ABSTRACT

Background: Postmenopaus refers to the stage in a woman's life following menopause. Objective of study is to investigate the prevalence of metabolic syndrome (Mets) among pre and postmenopausal women in South Delhi as well as to identify association of MetS with various sociodemographic factors and menopausal status of women.

Materials and methods: The convenience sample for the study consisted of 320 females from South Delhi, aged 40-65, with recent medical reports, 160 of whom were premenopausal and 160 of whom were postmenopausal. The study employed a cross-sectional survey design. The NCEP ATP III criteria, which diagnose metabolic syndrome (MetS) when at least three of the five components are present, were used to evaluate MetS. Anthropometric parameters were measured using standard protocols.

Result: 45.9% of the women in the research, whose mean age was 50.42 ± 7.905 years, had metabolic syndrome. The prevalence was higher in postmenopausal women (64%) compared to premenopausal women (21.9%), and common characteristics included elevated waist circumference, elevated triglyceride levels, and hypertension. Significant correlations between education, age, employment, exercise habits, and physical inactivity were found in the research ($p < 0.005$). Women who have undergone menopause were more susceptible to some aspects of the MetS.

Conclusion: In South Delhi, postmenopausal women had a greater risk of metabolic syndrome, which is strongly correlated with age, occupation, education, physical inactivity, and exercise habits. It is imperative to priorities lifestyle modifications and heightened physical exercise in order to tackle this.

Keywords- Menopause, post-menopausal women, premenopausal women, metabolic syndrome

INTRODUCTION

Metabolic syndrome (MetS) is a collection of risk factors for Type 2 diabetes mellitus and cardiovascular disease (CVD). It has deglycation (abnormal blood sugar levels), dyslipidemia (an unhealthy lipid profile), central obesity, and hypertension as components. These factors all lead to an increased vulnerability to diabetes and cardiovascular disease^[1]. premenopausal is the phase when females have irregular or sometimes regular periods phase before menopause. Postmenopausal women have a higher incidence of MetS than premenopausal women due to changes in the estrogen hormone level. Researches have shown higher prevalence of MeTs in postmenopausal women compared to premenopausal^[1,2]. The prevalence of MetS varies from population to population and ethnic variation. Asian Indians are more prone to MetS than Caucasians^[1]

Studies in the past have shown that women are more likely to develop MetS and CVD after the age of 55 years (postmenopausal phase). Changes during the menopausal transition increase the risk of CVD (45-55 years). Weight gain and menopause is the main predictor of MetS^[3]. Central obesity, high blood pressure, hyperglycemia, poor glucose tolerance, hypertriglyceridemia, and low HDL-C levels are risk factors for MetS. 20-25% of the world population who have MetS are three times more prone to die from stroke and heart attack compared to people who do not have MetS^[2,4,5].

The study used the NCEP ATP III Criteria to assess the occurrence of metabolic syndrome (MetS) in women from South Delhi, both pre- and postmenopausal. It also tried to establish any links between MetS and various socio-demographic

characteristics, as well as the participants' menopausal status. Previous study using similar approaches has helped to understand the prevalence of MetS in both premenopausal and postmenopausal women^[6,7,8,9].

METHODOLOGY

Participants

It was a Cross-sectional study which was conducted from November 2021 to August 2022 in the Outpatient department of DPSR University Delhi. Prior approval was taken from Research Committee of School of Physiotherapy DPSRU. A convenience sample of 320 females was taken, of which 160 were premenopausal and 160 were postmenopausal women. Women of age 40-65 years, with availability of medical reports in the last 1 month and who volunteered to participate in the study were included. Exclusion criteria were Perimenopausal women, not willing to participate, and co-existence of any other serious illness (including HRT, taking antidiabetic and antihypertensive drugs). Women with polycystic ovarian syndrome, and fatty liver, were excluded from the study.

Procedure

A team of skilled interviewers gathered the data. Demographic information was obtained by using a self-structured questionnaire.

The following parameters were used to assess metabolic syndrome: waist circumference greater than 88cm, fasting blood glucose levels greater than 110mg/dL, HDL cholesterol less than 50mg/dL, systolic blood pressure greater than 130 mmHg, diastolic blood pressure greater than 85mmHg, and triglyceride levels greater than 150mg/dL. The presence of three of the five components, according to these criteria, confirms the presence of metabolic syndrome (MetS).

Using defined methods, anthropometric measurements such as height, weight, blood pressure (both systolic and diastolic), and waist circumference were gathered. A

weighing machine was used to record weight, and a stadiometer was used to measure height. Waist circumference was measured by putting a measuring tape between the tip of the lower rib and the iliac crest. Waist circumference (in cm) was divided by hip circumference (in cm) to compute the waist-to-hip ratio (WHR). Following a 5-minute rest interval, blood pressure was taken on the left arm, just above the cubital fossa.

DATA ANALYSIS

Data was entered in Microsoft excel. SPSS software version 24 was used for data analysis. Descriptive analysis was done which were represented through tables and graphs. Continuous data were provided as mean standard error of the mean (SEM), whereas categorical variables were presented as proportions. Statistical significance was determined in the comparison analysis at a level of $p < 0.05$.

RESULTS

This study included 320 women (160 postmenopausal and 160 premenopausal women) from south Delhi. Mean age of females was 50.42 ± 7.905 years. BMI ranged from 21-47 kg/m² with 28.32 ± 3.68 kg/m² as the mean value. Waist circumference ranged between 65-116 cm with 88.45 ± 6.84 as the mean value. Out of 320 females 147 females had presence of metabolic syndrome. According to the study's findings, the majority of the subjects possessed at least two MetS characteristics. Overall prevalence was 45.9%, in pre-menopausal it was 21.9%

and in post-menopausal it was 64%. Compared to other metabolic components elevated waist circumference, triglyceride levels, and hypertension are the most frequent characteristics in this study.

Table 1 shows significant association of metabolic syndrome with education, age, employment, exercise habits and physical inactivity ($p < 0.005$). Table 2 shows association of metabolic syndrome with menopausal status. The odds of postmenopausal women developing high fasting blood glucose (>110 mg/dL) was 4.69 times higher than premenopausal women. ($X^2 = 18.94$) (p value = 0.00). The odds of postmenopausal women developing greater waist circumference (>88 cm) was 2.77 time greater than premenopausal women (p value 0.00). The odds of postmenopausal women developing high SBP (>130 mmhg) was 3.33 times higher than premenopausal women (p value = 0.00) and the odds of postmenopausal women also developing high DBP (>85 mmhg) was 3.44 times higher than premenopausal women (p value = 0.00). This study shows the odds of postmenopausal women developing high triglyceride level (>150 mg/dL) was 3.55 time higher than premenopausal women (p value = 0.00). The odds of postmenopausal women developing low HDL-C (<50 mg/dL) was 0.40 times lower than premenopausal women (p value = 0.00)

Variable	Variable 2	χ^2	P value	Significance
METABOLIC SYNDROME	Education	17.779	0.000	Sig
	Age	7.317	0.026	Sig
	Employment	7.448	0.014	Sig
	Marital status	3.386	0.184	Non-Sig
	Family type	4.978	0.017	Non-Sig
	No of children	1.181	0.758	Non- Sig
	Exercise habits	15.010	0.000	Sig
	Physical inactivity	0.074	0.052	Sig
	Income	0.027	0.087	Non-Sig

Table-1: Association of various factors with prevalence of MetS using chi square test.

Components	Post-menopausal N (%)	Pre-menopausal N (%)	Total	X ²	Odds ratio (95%CI lower-upper)	P value
FBG (More than 110mg/Dl)	25(7.8%)	3(0.93%)	28(8.8%)	18.94	4.69(2.86-8.80)	Significant
Waist circumference (More than 88cm)	100(31.25%)	60(18.75%)	160(50%)	20.00	2.77(1.76-4.36)	Significant
SBP (More than 130mmHg)	68(21.25%)	29(9.06%)	97(30.3%)	22.50	3.33(2.00-5.56)	Significant

DBP (More than 85mmHg)	74(23.12%)	32(10%)	106(33.12 %)	24.88	3.44(2-5.65)	Significant
TG (More than 150mg/dl)	118(36.87%)	48(15%)	166(51.87 %)	61.33	3.55(3.02-6.68)	Significant
HDL (Less than 50mg/dl)	37(11.56%)	68(21.25%)	105(32.81 %)	13.52	0.40(0.25-0.66)	Significant

Table-2: Association of metabolic syndrome with menopausal status.

DISCUSSION

The present study stands out since there aren't many Indian studies that have looked at the relationship between MS and menopause. The current study also examined the relationship between the metabolic syndrome and various sociodemographic elements. This study included 320 women (160 post-menopausal 160 and premenopausal women) from south Delhi. The prevalence of metabolic syndrome was reported to be 45.9% overall, with postmenopausal women having a greater prevalence (64%), compared to premenopausal women's 21.9%. The result of present study is in line with results of study by Naina Mehndiratta, et al 2020 in a study done in Amritsar, North-western India on 200 females Their results showed a prevalence of 16% and 42% in pre and postmenopausal women respectively [4]. Another research done by Sandeep Sharma et al 2016, in North India showed that the prevalence of MetS was 62.6% which is higher than present study [10]. The study among urban adult women in South Delhi, India showed that the overall prevalence of metabolic syndrome was 29.6% using NCEP/ATP-III criteria [11] which is lower than the present study.

With an overall frequency of 45.9%, the study examined the association between menopause and metabolic syndrome in 320 women from south Delhi, India. The prevalence was higher in postmenopausal

women (64%) than in premenopausal women (21.9%). Comparable research conducted in Amritsar and North India revealed differing prevalence percentages; one study[4] found that the prevalence in premenopausal women was 16%, while the prevalence in postmenopausal women was 42%. Another study[10] found that the prevalence was greater, at 62.6%. The results of this study show how the frequency of metabolic syndrome varies throughout India and are in line with certain previous research while deviating from others[11].

The results of the study show significant association of metabolic syndrome with age, education, employment, exercise habits and physical inactivity. This study demonstrates that MetS rises with ageing, as has also been demonstrated by other researchers. As per literature the prevalence of MetS rises with ageing with highest prevalence in second to third decade of life [12]. There was a significant association between the Mets and Education level with higher prevalence in women who were less educated compared to those who were highly educated and these findings are similar with other studies [12,13]. Author postulate that this could be because educated individuals are more aware of their own health, follow a healthy lifestyle and are less likely to get Mets. However further researches are needed to better understand the association of education



level and metabolic syndrome. This study demonstrates that the risk of Mets rises with inactivity and falls with regular exercise practices, which was previously demonstrated by an earlier author [14,15]. Inactivity may exacerbate insulin resistance and abdominal obesity, both of which can lead to metabolic syndrome. The metabolic syndrome can be treated and prevented through exercise. The study found a link between women's employment status and the prevalence of Mets. Kang et al stated that postmenopausal women's employment appears to be strongly associated with a decreased prevalence of MetS, but not premenopausal women. It is thought that elements like socioeconomic level and lifestyle characteristics may have an impact on this [16]. This study did not find any relation of marital status, number of children, family type and income with MetS.

The NCEP ATP III CRITERIA was used in study. Notably, all MetS components were considerably greater in postmenopausal women, including elevated systolic and diastolic blood pressure, lipids, fasting blood sugar, and increased waist circumference. Previous research on the association between menopause and blood pressure has found that systolic blood pressure rises in postmenopausal women while diastolic blood pressure remains stable [17]. However, our study found that both systolic and diastolic blood pressures were significantly higher in postmenopausal women with metabolic syndrome. This finding shows that diastolic blood pressure may be a substantial risk factor for cardiovascular disease in this population. Several variables, including an increased testosterone to estrogen ratio, raised endothelin levels, oxidative stress, obesity, and sympathetic nervous system activation, have been identified as potential

contributors to postmenopausal hypertension [18]. The study discovered considerably higher triglycerides in postmenopausal women with metabolic syndrome, correlating with other studies that reported inconsistent results on how menopause impacts triglycerides. Some studies show no change, while others show an increase after menopause. Notably, one study suggests that the combination of high triglycerides and a large waist circumference may be a strong predictor of cardiovascular risk in postmenopausal women [19].

In addition, we discovered reduced HDL cholesterol levels in postmenopausal women with metabolic syndrome. Various studies show that HDL cholesterol levels rise and fall after menopause. However, as shown in Kreisberg's study, declines in HDL cholesterol are regarded as a substantial risk factor for coronary heart disease in postmenopausal women [20]. Furthermore, postmenopausal women with metabolic syndrome had higher fasting blood sugar levels, which were likely driven by age-related changes in glucose tolerance, insulin sensitivity, and decreased physical activity. Waist circumference was raised in both pre- and postmenopausal women, with greater values in the latter group, according to NCEP criteria. Several studies, like Lobo's, have found a link between increased weight, obesity, and the chance of developing metabolic syndrome in postmenopausal women, underlining the influence of central obesity on metabolism and overall health. [21].

CONCLUSION

Based on the assessment criteria, postmenopausal women were more likely to develop MetS than premenopausal women. Significant association of metabolic syndrome with age, education, employment, exercise habits and physical

inactivity was seen. Compared to other metabolic components elevated waist circumference, triglyceride levels, and hypertension are the most frequent characteristics in this study. These elements could make postmenopausal women with metabolic syndrome more susceptible to cardiovascular disease. In conclusion, MetS poses a serious hazard to the health of women and an ageing population. Longitudinal research is needed to understand the process underlying postmenopausal MetS.

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