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## **Prevalence of metabolic syndrome in pre as well as postmenopausal women in a tertiary care center: A hospital based observational study**

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**Abstract**---Background: Metabolic syndrome is a constellation of metabolic abnormalities and a complex pre-disease state that predicts future development of type 2 diabetes mellitus and cardiovascular diseases. Epidemiologically it is observed that incidence of metabolic syndrome increases with age and more so in women once they attain menopause. Objectives: To study the prevalence of metabolic syndrome in pre as well as post-menopausal women and to study the various components of metabolic syndrome. Materials and Methods: We performed an observational study in a tertiary care teaching institute. Women attending general health checkup were selected for the study A total of 484 women were selected. 267 were in the postmenopausal group and 217 in premenopausal group. After a detailed collection of demographic data, medical, surgical, obstetrical and gynecological history, general physical and systemic examination was done. Height, weight, waist

circumference were measured. BMI was calculated. Venous blood sample sent for fasting blood glucose, HDL, Triglycerides. Metabolic syndrome was diagnosed when three out of five parameters were found abnormal. Results: Metabolic syndrome was seen in 158 women (32.6%). Among these women, 118 (44.19%) were postmenopausal women and 40 (18.4%) were premenopausal. Postmenopausal women are at twice the risk of developing metabolic syndrome. Conclusion: The prevalence of metabolic syndrome is quite high among the postmenopausal women in our region. Hence women in this group should be monitored regularly and also to be advised to follow healthy life style. This may certainly help in decreasing major cardiovascular and cerebrovascular accidents.

**Keywords**---Metabolic syndrome, Menopause, Obesity.

## **Introduction**

Metabolic syndrome is a constellation of metabolic abnormalities and a complex pre-disease state that predicts future development of type 2 diabetes mellitus and cardiovascular diseases. [1] It is defined as syndrome marked by the presence of usually three or more of a group of factors such as high blood pressure, abdominal obesity, high triglyceride levels, low HDL levels and high fasting blood sugar level. [2]

Menopause is defined as permanent cessation of menses for at least one year. It is due to estrogen deficiency. [3] It is a period in women's life when her reproductive capacity ceases. The median age of menopause in Europe ranges from 50.1 to 52.8 years, and 50.5 to 51.4 years in North America. [4] The mean age at which Indian women attain menopause is 46.2 +/- 4.9 years. [5] Later age at natural menopause has been associated with longer overall survival, greater life expectancy and reduced all-cause mortality. [6] It is also associated with reduced risk of cardiovascular disease and less loss of bone density. [6]

Menopausal transition and postmenopausal period are considered as a vulnerable period for developing metabolic syndrome. This increased risk is due to decreasing levels of estrogen with increased risk of insulin resistance. [6] It is observed that almost 20% to 30% of middle-aged population are affected by Metabolic Syndrome. [7] Many cross-sectional studies have shown an increased risk of Metabolic Syndrome in postmenopausal women which varies from 32.6% to 41.5%. Some studies show an increasing prevalence of metabolic syndrome in developing countries and Asia. [7,8,9,10] The etiology of this syndrome is not clearly understood. [9] The proposed theory being the metabolic changes and increased abdominal obesity as a result of decrease in estrogen production. [9] Metabolic syndrome needs to be timely diagnosed and managed appropriately so as to prevent major cardiovascular complications.

This observational study aims at estimating the prevalence of metabolic syndrome in pre-menopausal and post-menopausal population in our region, and to study the components.

## **Materials and Methods**

This study was conducted in a tertiary care teaching hospital. A total of 484 women were recruited after assessing their eligibility according to the selection criteria. Permission for the study was obtained from the College Institutional Ethics Committee prior to commencement.

### **Inclusion criteria:**

- 1) Women aged more than 35 years
- 2) Consenting to take part in the study

### **Exclusion criteria:**

- 1) Women with secondary hypertension
- 2) Women on Hormone Replacement Therapy (HRT)
- 3) Women with history of smoking or alcohol consumption

Out of 484 women, 267 were in the postmenopausal age group and 217 in premenopausal age group. This study was prospective observational study. The selected women were attending the hospital for general health checkup. All the selected women underwent thorough history taking, general, systemic, and gynecological examination by an experienced Gynecologist.

Blood pressure readings were taken in the right arm, with the patient in sitting position. Waist circumference was measured at the level of upper border of iliac crest, with the patient in standing position. Height and weight were also measured, and BMI calculated. Venous blood sample was collected after 12 hours of fasting and sent to laboratory for estimation of fasting glucose, High Density Lipoprotein (HDL), Low Density Lipoprotein (LDL) and Triglycerides (TGs) levels were estimated.

Body Mass Index (BMI) each patient was calculated and the patients in both the groups were categorized as per the World Health Organization (WHO) BMI Classification. [11] Modified National Cholesterol Education Programme Adult Treatment Panel 111(NCEP ATP panel III) 2005 criteria were used for the diagnosis of Metabolic Syndrome. [2] According to these criteria, Metabolic Syndrome is said to be present if more than three of these parameters are found in a person:

1. Central obesity i.e. waist circumference >88 cm
2. Hypertension >130/85 mm of Hg, or on treatment for Hypertension.
3. Low HDL <50 mg/dl
4. Increased Triglycerides >150m/dl.
5. Impaired fasting glucose >110mg/dl, or on treatment for type 2 DM

### **Statistical analysis**

The results obtained were tabulated and subjected to statistical analysis by an experienced statistician. Independent sample t test and Chi square test was used for analysis. P value of <0.001 is taken as significant.

## **Results**

The values of various parameters of the Modified NCEP ATP Panel III, 2005, observed in our study were tabulated and compared between the two study groups. Table 1

### ***Findings in premenopausal women***

The mean age in premenopausal age group was 42.48yrs (median 43 years). The prevalence of metabolic syndrome women in the premenopausal women was 18.4 % (40%). Central obesity was observed in 24.1 (117%). Hypertriglyceridemia was seen in 7.6 (37%). Abnormal HDL value was seen in 14.87 (72%), hypertension in 3.92 (19%) and Diabetes Mellitus in 2.4 (12%). Only 2 values abnormal found in 13.4 (29%).

Two women in this group were underweight, 85 women had normal weight, 80 women were pre-obese, and 50 women were obese. Of the obese women, 45 were Class I obese (BMI 30.0- 34.9), four were Class II obese and one was Class III obese. Three patients with normal BMI, 13 overweight patients, 20 Class I obese patients, three Class II obese patients and one Class III obese patient had Metabolic Syndrome. Table 2

### ***Findings in postmenopausal women***

The mean age in postmenopausal women was 56.7 years (mean 56 years). Out of 267 postmenopausal women, 118 women were diagnosed to have metabolic syndrome, the prevalence being 44.19%. 198 (40.9%) women were found to have waist circumference > 88 cm. Hypertriglyceridemia was found in 79 (16.3%). Hypertension was found in 81 (16.7%) and Diabetes Mellitus in 50 (10.3%) women. Abnormal HDL was observed in 190 (71.1%). Two values abnormal were found in 29 women (10.9%).

Two women in this group were underweight, 28 women had normal weight, 126 women were pre-obese, and 111 women were obese. Of the obese women, 86 were Class I obese (BMI 30.0- 34.9), 22 were Class II obese and three were Class III obese. Six patients with normal BMI, 60 overweight patients, 29 Class I obese patients, 21 Class II obese patients and two Class III obese patients had Metabolic Syndrome. Table 3

In our study of 484 women (267 postmenopausal and 217 premenopausal women), the overall prevalence of metabolic syndrome was 32.64% (158 women). The prevalence of Metabolic Syndrome was significantly higher in the postmenopausal women than in premenopausal women (Table 2) with a P value of <0.001. Another interesting observation in our study was the higher prevalence of Metabolic Syndrome in women with fewer than 3 children (13.7%) and those with three or more children (9.8%).

### **Correlation of BMI with Metabolic Syndrome**

None of the underweight women in either group had Metabolic Syndrome. Table 3, 4. The prevalence of Metabolic Syndrome in women with normal BMI was 3.5% and 21.4% in pre- and post-menopausal groups respectively. The prevalence of Metabolic Syndrome in women with pre-obesity was 16.2% and 47.6% in pre- and post-menopausal groups respectively. The prevalence of Metabolic Syndrome in women with Class I obesity was 44.4% and 33.7% in pre- and post-menopausal groups respectively. The prevalence of Metabolic Syndrome in women with Class II obesity was 75% and 95.4% in pre- and post-menopausal groups respectively. The prevalence of Metabolic Syndrome in women with Class III obesity was 100% and 66.6% in pre- and post-menopausal groups respectively.

Table 1  
Results of various parameters in the study groups

PARAMETERS	PRE-MENOPAUSAL	POST-MENOPAUSAL
Waist Circumference >88cm	117 (53.9%)	198 (74%)
Triglycerides >150 mg/dl	37 (17%)	79 (29.5%)
HDL <50 mg/dl	72 (33.2%)	190 (71%)
Hypertension	19 (8.7%)	81 (30.3%)
Diabetes Mellitus	12 (5.5%)	50 (18.7%)

Table 2  
Prevalence of metabolic syndrome in pre- and post-menopausal women

	NO METABOLIC SYNDROME	2 VALUES ABNORMAL	METABOLIC SYNDROME
PREMENOPAUSAL	148 (68.2%)	29 (13.4%)	40 (18.4%)
POSTMENOPAUSAL	119 (44.56%)	29 (10.8%)	118 (44.19%)

Table 3  
BMI in pre-menopausal women

CLASSIFICATION	BMI (kg/m <sup>2</sup> )	NO. OF WOMEN	METABOLIC SYNDROME
UNDERWEIGHT	<18.5	2 (1%)	0 (0%)
NORMAL	18.5-24.9	85 (39.2%)	3 (3.5%)
PRE-OBESITY	25-29.9	80 (36.8%)	13 (16.2%)
OBESITY CLASS 1	30-34.9	45 (20.7%)	20 (44.4%)
OBESITY CLASS 2	35-39.9	4 (1.8%)	3 (75%)
OBESITY CLASS 3	>40	1 (0.5%)	1 (100%)

Table 4  
BMI in post-menopausal women

CLASSIFICATION	BMI (kg/m <sup>2</sup> )	NO. OF WOMEN	METABOLIC SYNDROME
UNDERWEIGHT	<18.5	2 (0.7%)	0 (0%)
NORMAL	18.5-24.9	28 (10.5%)	6 (21.4%)
PRE-OBESITY	25-29.9	126 (47.2%)	60 (47.6%)
OBESITY CLASS 1	30-34.9	86 (32.2%)	29 (33.7%)
OBESITY CLASS 2	35-39.9	22 (8.3%)	21 (95.4%)
OBESITY CLASS 3	>40	3 (1.1%)	2 (66.6%)

## Discussion

Metabolic syndrome, or Syndrome X, is basically a lifestyle disease. Increase in the aging population along with faulty lifestyle and food habits can increase the prevalence of Metabolic Syndrome in the future. The hormonal changes associated with menopause may itself predispose the women of this age group to Metabolic Syndrome. Decrease in the serum estrogen levels may lead to increased insulin resistance and alteration in the lipid profile. [7,12] Several previous studies, done across various regions, show varied prevalence of Metabolic Syndrome in pre- and post- menopausal women. Higher prevalence was noted in South Asian women as compared to other regions of Asia or the Caucasians. [12] In our study, we have attempted to estimate the prevalence of Metabolic Syndrome in pre- and post- menopausal women in our region and compare it with the prevalence in other regions of the world.

KowNanse Arthur et al, in 2013, studied the prevalence of Metabolic Syndrome in 250 Ghanaian women using the World Health Organization (WHO), NCEP ATP III, International Diabetes Federation and Harmonization criteria. They reported a prevalence of 25.6% using the NCEP ATP III Panel criteria. The prevalence was found to increase with age, irrespective of the criterion used. [10] They found central obesity, higher blood pressure and raised fasting blood sugar as the predominant components in their population.

Jesmin et al, in 2013, performed a similar study in rural Bangladesh. Of the 1802 women who were included in their study, 25.6% of respondents had Metabolic Syndrome. 39.3% of post-menopausal women and 16.8% of pre-menopausal women had Metabolic Syndrome. High blood pressure, high fasting blood glucose and hypertriglyceridemia was significantly higher in postmenopausal women. However, LDL levels were significantly lower in postmenopausal women when compared to premenopausal women. [12]

Sharma et al, in 2016, observed a very high incidence of Metabolic Syndrome in North India. Among the 350 women in their study, 219 women (62.6%) had Metabolic Syndrome. [7] Abnormal waist circumference was prevalent in 83% of the women. Systemic hypertension was seen in 71%, abnormal HDL in 55%, hypertriglyceridemia in 40%, and hyperglycemia in 36% of the women. They also found insignificant correlation of Metabolic Syndrome with age at menopause,

educational status, parity, and family history. The higher prevalence of Metabolic Syndrome was attributed to the higher prevalence of obesity.

The overall prevalence of Metabolic Syndrome in our study population was 32.64%. This is marginally higher as compared to similar studies done in other parts of the world. [7,10,12] Abnormal waist circumference was the most prevalent component of Metabolic Syndrome in our population followed by low HDL levels. A worrying finding in our study was the significant prevalence of Metabolic Syndrome in post-menopausal women with normal BMI (21.4%) and pre-obesity (47.6%). This suggests that post-menopausal women with normal and pre-obese level BMI too should be investigated thoroughly for Metabolic Syndrome.

Patni and Mahajan have proposed lifestyle modification measures like moderate physical activity, healthy diet with low calorie and salt intake, cessation of smoking and alcohol, and involving in intellectual activities in the prevention of metabolic syndrome. These measures can be used in adjunct to pharmacological treatment wherever necessary. [13] Hence, a serious effort needs to be made in educating the vulnerable population like postmenopausal ladies about metabolic syndrome and its ill effects.

### **Conclusion**

The prevalence of Metabolic Syndrome is relatively high in our region as compared to other geographies. Abnormal waist circumference and derangements in lipid profile seem to be the factors responsible for most cases of Metabolic Syndrome in this region. Post-menopausal women with normal or pre-obese level BMI too are at risk for Metabolic Syndrome. Considering the changing demographic pattern, changes in lifestyle as well as due to increased life span with resultant increase in elderly population, the prevalence of Metabolic Syndrome is going to increase. Hence, a serious effort needs to be made in educating the vulnerable population like post-menopausal ladies about Metabolic Syndrome and its ill effects.

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