



## A Cross-Sectional Study to Evaluate the Prevalence of Metabolic Syndrome in Pre-Menopausal and Post-Menopausal Women

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### Abstract

**Background:** Metabolic syndrome is combination of several disorders, which predispose to atherosclerotic cardiovascular disease, insulin resistance, diabetes mellitus, with vascular and neurological complications such as a cerebrovascular accident.

**Aims:** To assess the prevalence of metabolic syndrome and its components in pre-menopausal and post-menopausal women coming to Asian Institute Of Medical Sciences OPD In Faridabad, Delhi- NCR.

**Materials and Methods:** It is a Hospital Based Single Center Cross-sectional study conducted by Department of Obstetrics and Gynecology, Asian Institute of Medical Sciences, Faridabad, Delhi- NCR in the out patient department over a duration of 1 year with a total of 200 women in age group of 40-78 yrs (100 post- menopausal women and 100 pre-menopausal women) recruited by random selection method.

**Results:** In our study, the prevalence of metabolic syndrome in the overall study group was 31% (62/200) as per modified NCEP ATP III criteria. The occurrence of metabolic syndrome was found to be 17% in pre-menopausal group and 45% in post-menopausal group, and the difference in both the groups was found to be statistically significant ( $P < 0.001$ ; OR: 3.99- 95% CI: 2.08-7.68).

**Conclusions:** The prevalence of metabolic syndrome was more in post-menopausal women compared with pre-menopausal women as per modified NCEP ATP III criteria. The most prevalent component of metabolic syndrome being central obesity with decreased physical activity in post-menopausal women as compared to pre-menopausal women. However no association was found with duration of menopause, socioeconomic status or parity of women.

**Keywords:** Metabolic Syndrome; Menopause; Post-menopausal Women; Pre-Menopausal Women

### Abbreviations

MS: Metabolic Syndrome; NCEP-ATP: National Cholesterol Educational Programme- Adult Treatment Panel III; IDF: International Diabetes Federation; H\_MS: Harmonization Criteria for Metabolic Syndrome; BMI: Body Mass Index; NASH: Non-Alcoholic Steatohepatitis

### Introduction

Metabolic syndrome, a cluster of factors like dysglycemia, dyslipidemia, central obesity and hypertension, is known to pronounce the risk for future development of Type 2 diabetes mellitus and cardiovascular diseases [1]. Studies show that metabolic syndrome and cardiovascular diseases are more common in women above 55 years of age with significant increase in individual risk factors in the postmenopausal phase [2,3]. Changing hormonal milieu with declining estrogen and alteration of its ratio with testosterone has been implicated as a causal factor for the emergence of metabolic syndrome at menopausal transition [4,5].

Besides the age as an individual risk for increase in the incidence of metabolic syndrome, in India and other South Asian Countries other attributing factors are sedentary lifestyle, socioeconomic transitions, and rural to urban migration [6].

The incidence of metabolic syndrome among pre-menopausal and post-menopausal women has ranged from 13.8% in pre-menopausal to  $\geq 60\%$  in postmenopausal women varying greatly in different populations [7].

The etiology of the metabolic syndrome is unknown, but it is thought to be a combination of several factors. Menopausal transition leads to decreased estrogen, which is thought to be cardioprotective and antiatherogenic. However decline in the estrogen/androgen ratio dilutes the vasorelaxant effects of estrogen on the vessel wall and promotes the production of vasoconstrictive factors such as endothelin, which leads to metabolic abnormalities culminating into metabolic syndrome [8].

**Aims and Objectives**

As there is a paucity of data regarding the prevalence of metabolic syndrome in Indian post and pre-menopausal women with limited studies from Northern area; hence, we have done this study to find the prevalence of metabolic syndrome and its various components in Delhi- NCR pre and post-menopausal women.

**Material and Methods**

This study is a Hospital Based Single Center Cross-sectional study conducted by Department of Obstetrics and Gynecology, Asian Institute of Medical Sciences, Faridabad, Delhi-NCR in the out patient department over a duration of 1 year with 200 women in age group of 40-78 years (100 post-menopausal women and 100 pre-menopausal women) recruited by random selection method.

Women were considered to have metabolic syndrome if they had any three or more of the following as per modified NCEP ATP III criteria:

- Central obesity: waist circumference  $\geq 88$  cm
- Hypertriglyceridemia: serum triglycerides level  $\geq 150$  mg/dl
- Low HDL (High density Lipoprotein) level: HDL level  $< 50$  mg/dl
- High blood pressure (BP): Systolic BP (SBP)  $\geq 130$  mmHg and/or Diastolic BP (DBP)  $\geq 85$  mmHg
- High fasting glucose: serum glucose level  $\geq 100$  mg/dl

**Exclusion criteria**

- Patients having a history of Type 2 diabetes mellitus, cirrhosis of liver, chronic renal disease, pancreatic disease, and any other severe illness.
- History of hormone replacement therapy, secondary hypertension or congenital obesity syndrome, smokers and alcoholic and those with chronic medical illnesses such as hypothyroidism, Cushing’s disease and Type 1 diabetes mellitus.

Menopause is defined as at least 12 consecutive months of amenorrhea with no other medical and surgical cause. A written consent was obtained from all participating subjects and socio-demographic details regarding age, sex, education, occupation, socioeconomic status, physical activity, menopausal history, reproductive practice obtained. Anthropometric measurements like height, weight, BMI. Physical examination to record pulse, blood pressure (BP), hip and waist circumference and biochemical lab parameter of random blood sugar (RBS), total cholesterol, low density lipoprotein (LDL), high density lipoprotein (HDL) also done.

**Statistical analysis**

All the data was compiled in a Microsoft Excel Sheet (version 2013) for various variables of interest which was presented in the form of graphs and tables appropriately. The statistical analysis was carried out using appropriate statistical software Statistical Package for Social Sciences (SPSS version 23.0) and Graph Pad (Version 8.0.2). Normal distribution of the data was checked by applying Kolmogorov-Simrnov test and Shapiro wilk test. For normally distributed continuous variable, data was represented as mean and cstandard deviation (SD) (Mean  $\pm$  SD). Qualitative categorical variables were presented as frequency and percentage (N%). Pearson’s chi-square test was applied to find out the association between independent categorical data. For normally distributed variables of primary and secondary outcomes; independent- t-test was applied for statistical analysis. A p-value  $< 0.05$  was considered as statistically significant.

**Results**

Metabolic syndrome	Post-menopausal		Pre-menopausal	
	Count	Column N %	Count	Column N %
Absent	55	55.00%	83	83.00%
Present	45	45.00%	17	17.00%
Chi square test; $p < 0.001$ ; Odds ratio: 3.99 (2.08-7.68)				

**Table 1:** Incidence of metabolic syndrome in pre-menopausal and post-menopausal women.

Count		Post-menopausal		Pre-menopausal		p-value	Odds Ratio (95%CI)
		Column N %	Count	Column N %	Count		
Central Obesity (WC $>88$ cm)	No	11	11.0%	17	17.0%	0.221	1.66 (0.73-3.74)
	Yes	89	89.0%	83	83.0%		
Hypertriglyceride a (>150 inmg/dl)	No	53	53.0%	71	71.0%	0.009	2.17 (1.21-3.89)
	Yes	47	47.0%	29	29.0%		
Low HDL (<50 in mg/dl)	No	53	53.0%	59	59.0%	0.393	1.28 (0.73-2.23)
	Yes	47	47.0%	41	41.0%		
High BP (>130/85 mmhg)	No	47	47.0%	78	78.0%	<0.001	4.00 (2.16-7.39)
	Yes	53	53.0%	22	22.0%		
High FBS (>100 in mg/dl)	No	47	47.0%	51	51.0%	0.572	1.17 (0.67-2.04)
	Yes	53	53.0%	49	49.0%		
Metabolic syndrome	Present	45	45.0%	17	17.0%		

**Table 2:** Incidence of component of metabolic syndrome in each group.

Clinical and Laboratory Parameters					
	Post menopause		Pre menopause		p-value
	Mean	Std. Deviation	Mean	Std. Deviation	
Age (in year)	62.72	5.00	42.81	2.39	<0.001
Age of menarche (inyears)	12.10	1.03	12.11	1.49	0.653
Weight (in kg)	69.25	9.90	68.02	10.89	0.404
Height (in cm)	151.41	10.78	153.95	3.33	0.025
BMI (kg/m <sup>2</sup> )	29.77	3.90	28.70	4.49	0.074
Waist Circumference (in cm)	96.26	12.54	90.62	11.55	0.001
Hip Circumference (in cm)	103.28	13.19	95.70	11.53	<0.001
Waist to Hip Ratio	0.93	0.04	0.94	0.031	0.002
Sys. BP (in mmHg)	123.90	13.33	116.49	10.83	<0.001
Dias. BP (in mmHg)	82.20	8.60	77.10	8.68	<0.001
Fasting BS (in mg/dl)	108.30	27.91	115.94	49.40	0.180
Total Cholesterol (inmg/dl)	189.01	48.13	177.19	43.65	0.070
HDL (in mg/dl)	51.01	9.94	53.17	17.32	0.281
LDL (in mg/dl)	121.62	33.96	116.33	28.57	0.235
Triglyceride (in mg/dl)	158.83	85.80	135.93	67.77	0.037

**Table 3:** Clinical and Laboratory characteristics between both the groups.

	Groups				
		Post menopause		Pre menopause	
		Count	Column N %	Count	Column N %
Physical activity	Vigorous	7	7.0%	20	20.0%
	Moderate	74	74.0%	54	54.0%
	Light	19	19.0%	18	18.0%
	Normal	0	0.0%	8	8.0%
Fischer’s exact test; p = 0.003					

**Table 4:** Intensity of Physical activity.

**Discussion**

The overall prevalence of metabolic syndrome in our study group of 200 women in age group of 40-78 years was 31% (62/200) as per modified NCEP ATP III criteria. The occurrence of metabolic syndrome was found to be 17% in pre-menopausal group and 45% in post-menopausal group, and the difference in both the groups was found to be statistically significant (P < 0.001; OR: 3.99- 95% CI: 2.08-7.68).

The results of our study were partly in accordance with the studies by Aggarwal, *et al.* [10]; Mehndiratta, *et al.* [8] and Toppo, *et al.* [9].

In the present study most prevalent component in both pre-menopausal and post-menopausal women study group was central obesity (44.5%), followed by low HDL (44%), hypertriglyceridemia (38%), high BP (37.5%), high fasting blood sugar (31%) with 53% cases associated with high BP amongst the post-menopausal women. A comparative table showing the prevalence of components of metabolic syndrome in our study with other studies is given below.

In our study, lack of physical activity was found significantly associated with occurrence of metabolic syndrome in pre-menopausal and post-menopausal women. Metabolic syndrome is closely linked to overweight, obesity or inactivity [10].

S/no.	Components	Present study	Agarwal., et al.	Mehendiratta.,et al.
1	Central obesity (waist circumference)	Overall; 44.5% pre-menopausal-83%; post-menopausal-89%	Overall; 55% pre- menopausal-40%; post-menopausal-70%	Overall; 42% pre- menopausal-20%; post-menopausal-64%
2	Hypertriglyceridemia	Overall; 38%; pre-menopausal-29%; post-menopausal-47%	Overall; 60%; pre- menopausal-36%; post-menopausal-84%	Overall; 40%; pre-menopausal-26%; post-menopausal-54%
3	Low HDL	Overall; 44%; pre-menopausal-41%; post-menopausal-47%	Overall; 60%; pre- menopausal-32%; post-menopausal-88%	Overall; 37%; pre-menopausal-16%; post-menopausal-58%
4	High BP	Overall; 37.5%; pre-menopausal-22%; post-menopausal-53%	Overall; 58%; pre- menopausal-30%; post-menopausal-86%	Overall; 58%; pre-menopausal-38%; post-menopausal-78%
5	High fasting blood sugar	Overall; 31%; pre-menopausal-49%; post-menopausal-53%	Overall; 60%; pre- menopausal-44%; post-menopausal-38%	Overall; 34%; pre-menopausal-22%; post-menopausal-46%

Table 5

**Conclusions**

Metabolic syndrome being a complex pre-disease state with accumulation of several metabolic abnormalities predisposing for future occurrence of insulin resistance, DM Type-2, atherosclerotic cardiovascular disease with cardiovascular accidents, needs early prophylaxis and control. Although etiology is still not clear but beside age, menopausal transition and post-menopausal status increase the vulnerability to develop metabolic syndrome. Decreasing oestrogen level with menopause has been attributed to increasing insulin resistance, hence increased prevalence of metabolic syndrome.

From our study primarily central obesity with other major contributing factors such as deranged lipid profile, high BP, abnormal blood sugar levels and decreased physical activity have been shown to increase incidence of metabolic syndrome in post-menopausal women. Hence targeting obesity and decreased physical activity by adopting healthy lifestyle changes and avoiding harmful food will reduce prevalence of metabolic syndrome in the studied age-group.

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