

# Study of Metabolic Syndrome in Pre and Post Menopausal Women

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**ABSTRACT – Objective:** The goal of this study was to determine the occurrence of metabolic disorder (MS) and its various components among pre-and postmenopausal women and their associated relationship between menopausal status and MS.

**Materials and methods:** The present study was conducted at the Biochemistry department in association with Obstetrics and Gynecology Department, Santosh Medical College and Hospital, Ghaziabad. The necessary approval was obtained from the institutional ethical committee to conduct the study and informed written consent was also obtained from the study subjects. The cross-sectional case-control study included premenopausal females aged between 20-40 years as the control group (n=41) postmenopausal females aged between 50-60 years as the case group (n=41).

**Results:** In the study group (post-menopause women), the mean value of BMI is  $26.35 \pm 2.302$  (kg/m<sup>2</sup>). In comparison with the control group (pre-menopause women), the mean value of BMI is  $24.05 \pm 1.851$  (kg/m<sup>2</sup>). There was a statically significant increase in the levels of BMI in the study group in comparison with the control group. There was a statically significant increase in the levels of SBP and DBP in the study group compared with the control group. In the study group, the mean value of FBS is  $127.12 \pm 48.186$  (mg/dl). In comparison with the control group (pre-menopause women), the mean value of FBS is  $96.12 \pm 25.567$  (mg/dl). There was a statically significant increase in the levels of FBS in the study group compared with the control group.

**Conclusion:** It has been concluded that MS was significantly more prevalent among postmenopausal women than premenopausal women. This indicates that they are at risk of developing hypertension, cardiovascular disease, and type 2 diabetes mellitus. Therefore, health care workers should closely monitor for the two conditions as metabolic syndrome is an underlying condition for other non-communicable diseases and also be advised to adopt healthy lifestyles to minimize the incidence of these conditions.

**Keywords:** Medical Studies, Menopausal, Metabolic Syndrome

## I. Introduction

Menopause is the natural change due to a decrease in hormone production by the ovaries and occurs at a mean age of 45-50 years [1-3]. The term pre-menopause designates the years

leading up to the last period. Pre-menopause usually starts sometime before the monthly cycles become noticeably irregular in timing [4]. The term "postmenopausal" describes women who have not experienced any menstrual flow for a minimum of 12 months, assuming that they have a uterus and

are not pregnant or lactating due to decreased estrogen and progesterone. Menopause is connected with the redeployment of body weight and weight gain in a majority of women and is considered a predictor of metabolic syndrome independent of women's age [5]. The increased life expectancy has led to an increased postmenopausal phase with a heightened risk of metabolic syndrome (MetS) [6].

The metabolic syndrome included factors such as dyslipidemia, and cardiovascular disease (CVD) mortality stratified by blood glucose intolerance (syndrome X, insulin resistance syndrome) and hypertension or obesity [7]. The prevalence of the metabolic syndrome is influenced by genetic background, age, sex, diet, and levels of physical activity [8]. Menopause has been associated with an increased risk of CVD [9]. Increased weight and development of obesity lead to a higher prevalence of metabolic syndrome in postmenopausal women and result in a twofold increase in risk for cardiovascular disease after menopause [10-12]. It is widely accepted that cardiovascular disease is associated with hypertension and increased blood levels of LDL, TC, and TG, and a low level of HDL [13]. Women with high amounts of visceral fat have an excess of cardiovascular mortality and associated metabolic abnormalities [14].

Hormonal changes after menopause such as low plasma estrogen levels and elevated LH and FSH levels have a significant effect on plasma lipid and lipoprotein metabolism [15, 16]. After menopause, the ovaries cease to produce significant amounts of estrogen. Estrogen and progesterone, which have a protective effect on hypertension, lipid profile, and lipoprotein metabolism in premenopausal women, are lacking in post-menopausal females [17]. It is not yet clear whether the change in sex steroid concentrations is related to changes that lead to metabolic syndrome [18]. Early detection of abnormal levels of different markers of metabolic syndrome may prevent the risk of cardiovascular disease and may be useful in timely diagnosis and prevention. The study aimed to compare various parameters of metabolic syndrome in postmenopausal females with respect to premenopausal females.

## II. Material and Methods

The present cross-sectional case-control study is conducted at the Biochemistry department in association with Obstetrics and Gynecology Department, Santosh Medical College and Hospital, Ghaziabad from September 2018 to April 2019. The necessary approval was obtained from the institutional ethical committee to conduct the study in the Department of Biochemistry Santosh Medical College and Hospital, Ghaziabad. The sample size was determined to be 82 using the prevalence rate of 55% [19]. The study comprised of two groups.

**Group 1** (Control group n=41) consisted of premenopausal females aged between 20-40 years attending Out-Patient Department of Obstetrics and Gynecology at the Santosh hospital were enrolled for the present study.

**Group 2** (case group n=41) consisted of postmenopausal females aged between 50-60 years attending the Out-Patient Department of Obstetrics and Gynecology in the Santosh hospital who were enrolled for the present study.

After explaining the study to all participants, written consent was taken and a detailed history was elicited about age, race, socio-economic status, occupation, smoking, drug intake, reproductive, personal profile and socio-economic status was recorded in the prescribed format. Inclusion criteria included Females who have given consent, Healthy Premenopausal females of the reproductive group (30-50 years of age), Healthy Postmenopausal females (50 -60 years), no significant medical history, and no history of drug use. The females who visited the outpatient department of Obstetrics and Gynecology and had hot flashes, mood swings, vaginal dryness, sleep disturbances, night sweat, forgetfulness, urinary symptoms, palpitations, anxiety, joint and muscle pain, depression and irritability, hypertension, and history of smoking and alcoholism were excluded from the study. The Anthropometric parameters such as Age, Height, Weight, and Basal parameters such as systolic blood pressure (SBP), Diastolic blood pressure (DBP), and BMI were collected from the patients. After overnight fasting of 12-14 hours about 5ml of the whole blood sample was drawn by venipuncture from

each female and placed in the plain tube and centrifuged at 3000rpm for 3 minutes. Aliquots of serum stored at -4 C for biochemical analysis for fasting blood glucose, triglycerides (TG), total cholesterol, low-density lipoprotein cholesterol, and high-density lipoprotein (HDL) cholesterol.

Statistical analysis was done by using SPSS version 20.0. Descriptive statistics were calculated as frequency, percentage, mean, and standard deviation. Descriptive data were represented using various tables, graphs, diagrams, etc. After the normality tests (Kolmogorov- Simonov, and Shapiro -Wilk) showed normal distribution of continuous variables, students t-test was done to test the difference in means between the study group and the control group. ANOVA test was done to test the difference in means between more than 2 groups. For categorical nominal variables, the chi-square test was done to the association between the variables. For all the statistical tests of significance, a p-value of <0.05 was considered to reject the null hypothesis.

### III. Result

The study enrolled 41 Postmenopausal women in group1 and 41 Pre-menopausal women

Group2. Table 1 depicts the different study variables in Postmenopausal women (group 1) & Pre-menopausal women (group 2). (Table 1)

In the study group (post-menopause women), the mean value of BMI is  $26.35 \pm 2.302$  (kg/m<sup>2</sup>). In comparison, the control group (pre-menopause women) had a mean value of BMI is  $24.05 \pm 1.851$  (kg/m<sup>2</sup>). There was a statically significant increase in the levels of BMI in the study group in comparison with the control group. (Figure 1) In the study group (post-menopause women), the mean value of Systolic Blood Pressure is  $124.49 \pm 17.182$  (mmHg), Diastolic Blood Pressure is  $117.37 \pm 36.320$  (mmHg). In comparison, the control group (pre-menopause women) had a mean value of Systolic Blood Pressure  $114.80 \pm 7.444$  (mmHg) and Diastolic Blood Pressure  $84.80 \pm 8.274$  (mmHg). There was a statically significant increase in the levels of SBP and DBP in the study group compared with the control group. (Figure 2)

In the study group (post-menopause women), the mean value of FBS is  $127.12 \pm 48.186$  (mg/dl). In comparison, the control group (pre-menopause women) had a mean value of FBS  $96.12 \pm 25.567$  (mg/dl). There was a statically significant increase in the levels of FBS in the study group compared with the control group (Figure 2). A non-significant difference was observed in weight ( $p < 0.462$ ), TC ( $P < 0.541$ ), TG ( $P < 0.861$ ), HDL ( $P < 0.347$ ), and LDL ( $P < 0.309$ ).

### IV. Discussion

Metabolic syndrome in post-menopausal women is associated with the risk of cardiovascular disease and diabetes. Levels of fasting sugar are significantly higher in postmenopausal women (24.38 %) as compared to premenopausal women. Metabolic syndrome is also associated with hypertension which in turn has been identified as a risk factor for cardiovascular disease (CVD). However, cross-sectional or longitudinal studies completed so far were often too small and could not indicate whether this BP increase is dependent on menopause or was caused by age or changes in body mass index (BMI).

In the present study, we found that most women during menopause have higher levels of systolic and diastolic blood pressure in comparison with premenopausal women, and diabetes mellitus (DM) proves to be closely associated with diastolic blood pressure. The subgroup without Diabetes mellitus showed more increase in diastolic blood pressure in the perimenopausal stage with higher BMI as compared to the postmenopausal group with higher diastolic pressure. The risks conferred by diastolic blood pressure and diastolic blood pressure, irrespective of the methods of BP measurement, are age-dependent. However, some studies suggested that menopause was related to systolic, rather than diastolic hypertension, with the hypothesis that menopause decreased the compliance of large arteries through a decrease in estrogen. Our study shows higher diastolic pressure as compared to systolic blood pressure in postmenopausal women. Almost 24% of women were hypertensive and prediabetic, however, around 76% of diabetic women showed

higher diastolic blood pressure in comparison to systolic blood pressure. There may be a possibility that the duration of hypertension progresses to diabetes. An increase in BMI may also be associated with hypertension and diabetes. Reversibility of the risk by diastolic Blood pressure-lowering treatment in randomized trials confirms that diastolic hypertension is a risk factor that must be treated as shown in our study [20]. The larger sample size is required to plan a comprehensive study of metabolic and genetic markers.

## V. Conclusion

In our study, it was concluded that metabolic syndrome was associated high in postmenopausal women than in premenopausal women and such a high predominance of MS in the postmenopausal population is a disturbing sign. Elevated fasting blood glucose, high blood pressures, and central obesity were the most frequent features in postmenopausal women than in comparison to the others. Implementing proactive measures through changes in lifestyle i.e. induction of physical activity routine, reducing the intake of high calorific value, or early identification, and treatment of raised fasting blood glucose, hypertension, and hyperlipidemia are essential for counteraction of cardiovascular diseases for women arriving at menopause. Well-being experts ought to consider the postmenopausal ladies as a significant target population for counteraction of M S, which is a fundamental state of numerous non-communicable diseases.

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**Table 1:** Study variable in Postmenopausal women (Group 1) & Pre-menopausal women (Group 2)

<b>Variable</b>	<b>Postmenopausal women group1(n=41) Mean ±SD</b>	<b>Pre-menopausal women group2(n=41) Mean ±SD</b>	<b>p-value</b>
Age in years	55.78±3.244	37.20±3.863	0.00
Height(cm)	154.34±5.466	159.46±8.626	0.02
Weight (kg)	61.88±3.035	61.20±5.085	0.462
BMI(Kg/m <sup>2</sup> )	26.35±2.302	24.05±1.851	0.00
SBP(mmHg)	124.49±17.182	114.80±7.444	0.001
DBP(mmHg)	117.37±36.320	84.80±8.274	0.00
FBS	127.12±48.186	96.12±25.567	0.001
TC	187.24±33.610	182.56±35.501	0.541
TG	154.46±40.25	150.83±39.605	0.861
HDL	46.51±11.567	48.63±8.520	0.347
LDL	114.28±32.764	107.137±30.438	0.309

Data expressed as mean ± SD. p<0.05 is considered significant.

**BMI:** Body Mass Index,

**SBP:** Systolic Blood Pressure,

**DBP:** Diastolic Blood Pressure,

**FBS:** fasting blood sugar and lipid profile (**TC**=Total cholesterol, **TG**=Triglycerides, **HDL**=High density lipoprotein, **LDL**=Low density lipoprotein).

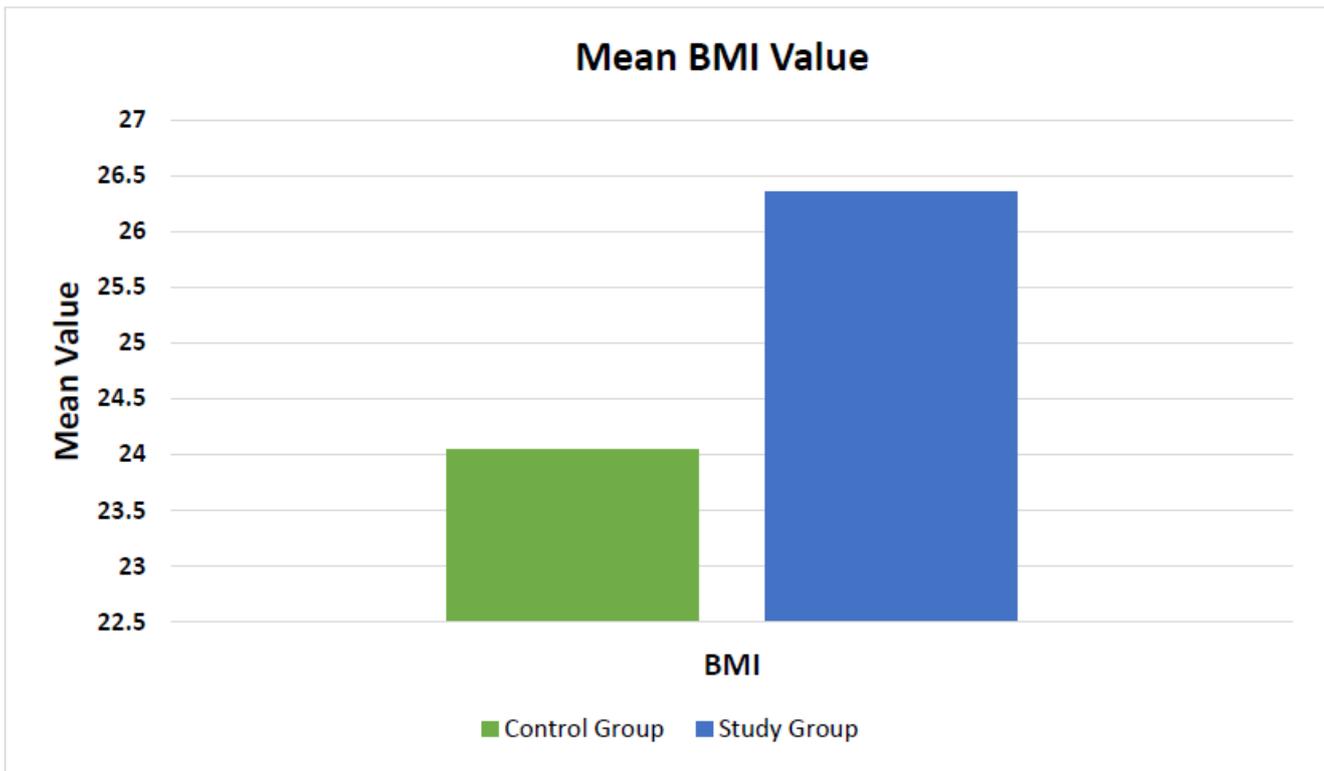


Figure 1: Mean BMI in pre and post-menopausal women

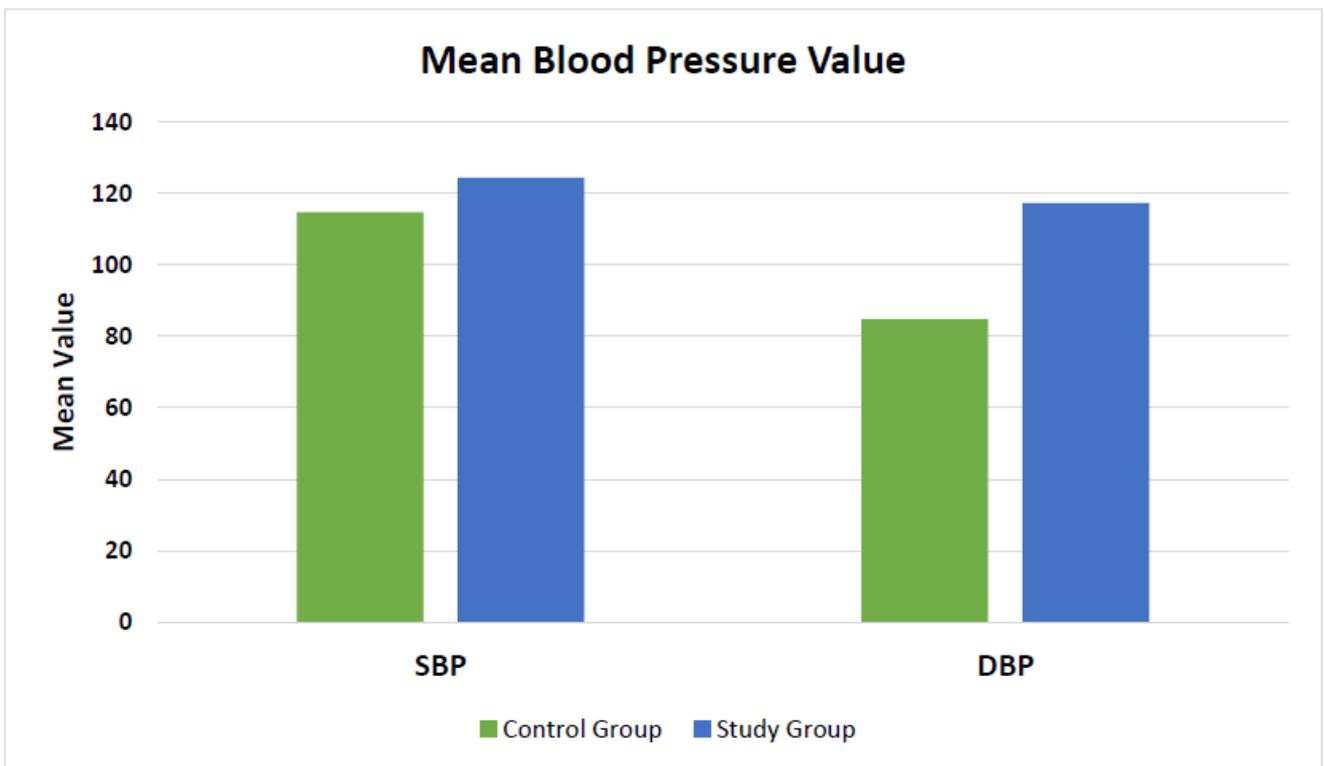


Figure 2: Mean Blood pressure (SBP and DBP) in pre and post-menopausal women