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Original Article

Study of Cardiometabolic Risk Factors in Postmenopausal Women

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Abstract

Background: *Postmenopausal women are found to have increased prevalence of cardiovascular diseases (CVD) due to aging and loss of protective effects of estrogen. It is essential to screen these women to facilitate early detection. Awareness, education & timely intervention can help in minimizing the morbidity and mortality in this group. In this study we tried to actually measure the burden of such risk factors in our region because such data is scarce compared to developed nations.*

Methods: *This cross-sectional, observational study was conducted in Lata Mangeshkar Hospital, Nagpur. (M.S.) for a period of 2 years. 100 postmenopausal women were studied for cardiometabolic risk factors after fulfilling inclusion & exclusion criteria, by detailed clinical examination & laboratory tests. Statistical analysis was done by an expert using SPSS software v15.Chi square test was applied to derive statistical difference.*

Results: *The mean age of study population was 57±5.4 yrs. A large proportion (51%) of subjects were illiterate. Majority of women (59%) belonged to low socioeconomic strata of the society. Mean age of menopause in our subjects was 47.2±1.2 yrs. 57% women belonged to light physical activity group.*
49% women were in overweight BMI category, 13% were obese & only 32% had normal BMI. Total 56% women had dysglycemia & diabetic status was newly detected in 14% of them. In 57% subject's hypertension was detected for first time. Dyslipidemia was seen in 35% women. In total 35% subjects fulfilled criteria of metabolic syndrome.6% asymptomatic women were detected to be hypothyroid.
In 6% women coronary artery disease (CAD) was diagnosed by history, ECG& 2D-Echocardiography.

Conclusion: *There is clustering of cardiometabolic risk factors in postmenopausal women which predisposes them to hazards of cardiovascular diseases.(CVD) This study emphasises the importance of early & regular screening of these women to reduce the burden of CVD related morbidity & mortality. The awareness programmes, education of women with changes of lifestyle & timely intervention can help in achieving the goal.*

Keywords: *Postmenopausal women, Cardiometabolic risk factors, Cardiovascular Diseases, metabolic syndrome.*

Introduction

Cardiovascular diseases are the topmost cause of mortality & morbidity worldwide.[1] It is seen that there is an increasing trend for such diseases in developing countries like India.[2,3] In India the increased prevalence of CVD is seen in low socioeconomic urban & rural population due to adoption of unhealthy lifestyle with high fat intake, low fibre diet, low intake of fruits & vegetables, tobacco abuse, smoking & physical inactivity.[4,30]

There are distinct gender differences in various CVD related factors such as incidence, mortality, risk factors, outcomes & clinical presentation. The cardiovascular diseases are higher in males than females in all ages except in older age group viz>75 yrs. After the age of 60, rate of CAD increases exponentially in women.[5]There is greater prevalence of hypertension in women aged >60 yrs. It is observed that premenopausal women have favourable metabolic profile for CVD.[5,6] It is attributable to the protective effects of estrogen on BP, lipid profile, endothelial dysfunction, visceral obesity & glucose tolerance.[12]

After menopause there is loss of this protective effect of estrogen leading to increase in prevalence of CVD viz, hypertension, atherosclerosis, coronary artery disease & stroke.[15] Menopause is characterized by atherogenic lipid profile.[8,9] There is fat distribution from gynacoid to android pattern thus increasing visceral adiposity.[10,11] Thus menopause acts as a risk factor for the metabolic syndrome.[15,24] As aging & menopause are concurrent phenomena, it is difficult to distinguish the consequences of estrogen deprivation from those due to aging. Both of them could be contributing to increased prevalence.

Further research has shown that women experience poorer outcomes when CVD event occurs.[8] The factors attributable to it include casual approach towards women's health in the women themselves & in the society, delay in seeking help, atypical presentation, lack of awareness & inappropriate /inadequate treatment. Women have microvascular coronary artery disease commonly referred as 'Syndrome X' common in postmenopausal age. [9]Due to atypical symptoms diagnosis of CAD may be missed even by physicians. Risk factors are underestimated & burden of these issues is very high as per studies.

A cautious approach towards women's health aimed at early detection in postmenopausal state& timely intervention in form of controlling risk factors & therapeutic measures may decrease the morbidity & mortality associated with CVD. Almost all the risk factors are modifiable hence need attention.

Majority of the data in this regard is scanty from our region & CVD in postmenopausal women in India is in nascency. Hence we studied the cardiometabolic risk factors in such postmenopausal women to assess the burden, to determine the need for evaluating them, and formulate & implement health care policies directed towards prevention, early detection, treatment & control of CVD burden.

Objectives

1) To study the frequency of cardiovascular risk factors in postmenopausal women
2) To postulate the need for screening these risk factors in them.

Method

This hospital based, cross-sectional, observational study was conducted in Lata Mangeshkar Hospital Nagpur, (Maharashtra) for a period of 2 yrs. from 2014-2016.

Sample Size: 100 consecutive women from our hospital OPD & IPD

Inclusion Criteria

1) Postmenopausal women irrespective of duration,
2) Age of 45 to 65 yrs.
3) Menopause achieved naturally.
4) No past history of cardiovascular diseases.

Exclusion Criteria

1) Known cases of cardiovascular diseases on treatment.
2) History of taking hormonal treatment or steroids.
3) Surgically achieved menopause.

After taking the detail consent of patients & the necessary approval from the institutional ethical committee, the study was carried out in 100 postmenopausal women.

After enrolment in the study, details of demographic data of the subjects such as age at

menopause, duration of menopause, level of education & socio-economic status were collected. Kuppuswamy's scale was used to categorise subjects in 7 socioeconomic groups.

GPAQ-Indian adaptation questionnaire was used to assess the level of activity in study population as vigorous, moderate intensity & sedentary level of activity.

Routine physical examination including fundus examination by ophthalmologist &anthropometric measurements were done.

The cardiometabolic risk factors which we studied were age, duration of menopause, socioeconomic & educational status, physical inactivity, substance abuse of tobacco/alcohol/ghutka, family history of CVD, obesity, Hypertension, Diabetes Mellitus, Dyslipidemia, and Hypothyroidism.

Then they were subjected to following blood investigations:

1. Complete haemogram
2. Fasting & 2hrs.postmeal blood glucose
3. Haemoglobin A1C (Glycosylated haemoglobin)
4. Kidney function test
5. Urine exam. & Albuminuria
6. Fasting lipid profile
7. Thyroid profile

Routine 12 lead ECG was done in all cases & 2D-Echowas done in symptomatic subjects & in those with ECG changes.

Statistical analysis was done using SPSS software v15.Chi square test was applied to derive the statistical difference in categorical variables. $P<0.05$ was considered significant.

Observations & Results

In this cross-sectional & observational study conducted in our hospital, the following observations were made:-

Table 1: Age distribution of the study population

Age (years)	Observation (n=100)
Mean ± SD	57.0±5.4
Minimum and Maximum	48 and 65

The mean age of the study population was 57 ± 5.4 years. Out of total

100 subjects, 55 (55%) aged between 56-65years, with 37(37%) subjects aged ≥ 60yrs & 45(45%) subjects aged between 45-55yrs (**table 1**).

Table 2: Education status of the study population

Education	Frequency (%)
Illiterate	51 (51.0)
Primary	4 (4.0)
Secondary	42 (42.0)
Higher Secondary	3 (3.0)

The study population consisted of a large number of illiterate subjects

i.e. 51 (51%) of the total, with only 42 (42%) of the rest having received secondary school education (**table 2**).

Table 3: Socioeconomic status of study population

Socioeconomic Status	Frequency (%)
Lower	18 (18.0)
Upper Lower	41(41.0)
Lower Middle	36 (36.0)
Upper Middle	5 (5.0)

As per the modified Kuppuswamy scale for socioeconomic status 18 subjects (18%) from the study population belonged to lower class, 41 subjects (41%) belonged to upper lower class, 36(36%) belonged to lower middle class & only 5(5%) belonged to upper middle class (**table 3**).

Table 4: Age at Menopause

Age at Menopause(years)	Observation
Mean ± SD	47.2±1.2
Minimum/Maximum	45/50

Table 5: Duration since menopause

Duration since menopause (years)	Observation
Mean ± SD	9.8 ± 5.1
Minimum/maximum	2/20
GROUPS	**Frequency(%)**
≤ 5 years	25 (25.0)
6 to 10 years	31 (31.0)
≥ 11years	44 (44.0)

Mean age at menopause in the study population was 47.2 ± 1.2 years with the duration of menopause being ≥ 11 years in 44(44%) subjects, between 6 - 10years in 31(31%) subjects & ≤ 5 years in 25 (25%) subjects **(**tables 4 & 5**).**

Menopausal symptoms commonly seen in them were fatigability, lack of energy (48%), hot

flushes (48%), cold hands & feet (38%), joint pains (31%), irritability/nervousness/anxiety (36%), sleeplessness (27%) and cardiac symptoms like palpitations, chest pain or uneasiness (15%).

Table 6: Personal habits observed in the study population

Habits	Frequency (%)
Betel nut Chewing	4 (4.0)
Tobacco chewing	15 (15.0)

History of present tobacco chewing was observed in 15(15.0%) subjects & betel nut chewing in 4(4.0%) subjects. No history of alcohol intake.

Table 7: Positive Family history of cardiometabolic risk factors & cardiovascular diseases

Cardiometabolic risk factors or CVD in family	Frequency (%)
Hypertension	15 (15.0)
Diabetes Mellitus	15 (15.0)
Ischemic Heart Disease	8 (8.0)
Stroke	4 (4.0)

Of the total 100 subjects, 28(28%) gave positive family history of cardiovascular diseases, with family history of hypertension & diabetes mellitus observed in 15 subjects (15%); ischemic heart disease in 8(8%) & stroke in 4(4%) subjects. 5(5%) subjects gave family history of both diabetes & hypertension; 4(4%) gave family history of all three i.e. hypertension, diabetes & ischemic heart disease (**table 7**).

Table 8: Level of physical activity in the study population

Physical Activity	Frequency (%)
Light	57 (57.0)
Moderate	43 (43.0)

As per the Indian adaptation of WHO recommended global physical activity questionarre, majority of the study population i.e. 57 subjects (57%) gave history of light physical activity; the rest i.e. 43(43%) gave history of moderate physical activity (**table 8**).

Table 9: Anthropometric parameters in the study population

Anthropometric Parameter	Mean±SD	Minimum	Maximum
Height (cm)	156.6±5.1	141	170
Weight (kg)	58.8±9.3	35	84
BMI (Kg/m^2)	24.0±3.6	16.43	41.17
Waist circumference (cm)	81.9±9.3	68	110
Hip circumference (cm)	86.3±13.0	70	118
Waist: Hip Ratio	0.94±0.02	0.84	0.97

Anthropometric parameter	Frequency (%)
Waist circumference≥ 80 cm	49 (49.0)
Waist: hip ratio	
0.81 to 0.85	1 (1.0)
≥ 0.86	99 (99.0)

Anthropometric measurements revealed a mean height of 156.6 ± 5.1cm, mean weight of 58.8 ± 9.3 kg & mean BMI of 24.0 ± 3.6 (kg/m2). Mean values for waist circumference & waist: hip ratio were 81.9 ± 9.3cm &0.94 ± 0.02,respectively Substantial number of subjects i.e. 49 subjects (49%) were found to have waist circumference ≥ 80cm (**table 9**).

Table 10: BMI characteristics of the study population

BMI	Frequency (%)
Underweight (<18.5)	6 (6.0)
Normal (18.5 to 22.9)	32 (32.0)
Overweight (23.0 to 27.49)	49 (49.0)
Obese (27.5 and above)	13 (13.0)

As per classification of BMI based on the recommendations made by WHO for Asian populations, majority of the study population i.e. 49 subjects (49%) were found to be overweight, 13(13%) were found to be obese whereas 6(6%) were underweight. The rest had normal BMI (**table 10**).

Table 11: Current level of blood pressure in study population

Blood Pressure (mm Hg)	Mean±SD	Minimum	Maximum
Systolic	140.9±20.7	110	180
Diastolic	88.4±13.9	70	120

Blood pressure values revealed mean systolic blood pressure of 140.9 ± 20.7mm Hg & mean diastolic pressure of 88.4 ± 13.9mm Hg (**table 11**).

Table 12: Distribution of Hypertension in study population

Hypertension	Frequency (%)
Systolic BP <120 (normotensive)	19 (19.0)
Systolic BP 120 to 139 (pre-hypertension)	24 (24.0)
Systolic BP ≥ 140 (hypertension)	57 (57.0)
Systolic ≥ 140 mmHg and Diastolic ≥ 90 mmHg	44 (44.0)
Systolic ≥ 140 mmHg (Isolated Systolic HTN)	13 (13.0)

Of the total 100 subjects, 57(57%) were diagnosed with hypertension newly, of which 13(13%) had isolated systolic hypertension as per the JNC 7 guidelines. Also, 24 subjects (24%) were found to be pre-hypertensive (**table 12**).

Table 13: Current level of glycemic parameters in the study population

Blood Glucose	Observation
Fasting	
Mean±SD	124.4±33.4
Minimum/Maximum	81/223
FBS <100 (Normal)	44 (44.0)
FBS 100 to 125 (Prediabetes)	14(14.0)
Post-prandial	
Mean±SD	166.8±52.1
Minimum/Maximum	100/357
HbA1c (n=56)	
Mean±SD	7.9±1.7
Minimum/Maximum	5.3/12.0
HbA1C< 6.5	27(27.0)
HbA1C ≥ 5.7 < 6.5 (pre- diabetic)	5(5.0)
HbA1c >6.5-8.9 (diabetic)	29(29.0)
HbA1c > 9.0 (diabetics)	13(13.0)

Assessment of glycemic status of the study population revealed mean fasting blood glucose levels of 124.4±33.4 mg/dl & mean post-prandial blood glucose levels of 166.8±52.1 mg/dl (**table 13**).

Mean HbA1c value in the study population was 7.9±1.7.

Table 14: Distribution of diabetes in the study population

	Frequency (%)
Diabetes mellitus	42(42.0)
Diabetes diagnosed by	
FBS ≥ 126 (Diabetes)	13 (13.0)
FBS ≥ 126 & PMBS ≥ 200	29 (29.0)

Total 42 subjects (42%) were diagnosed with frank diabetes mellitus newly, of which 13(13%) were diagnosed on the basis of raised fasting blood glucose levels; also all 42 subjects with newly detected diabetes had HbA1c values diagnostic of diabetes. **(table 14).**

Further, 14 subjects(14%) were diagnosed with pre-diabetes on the basis of impaired fasting blood glucose levels, 5 subjects (5%) of which also had HbA1c levels in the pre-diabetic range.

Table 15: Lipid profile and abnormalities in study population

Lipid Parameters	Observation
Total Cholesterol (mg/dL)	
Mean±SD	179.3±36.6
Minimum/Maximum	127/391
Total Cholesterol > 200	18 (18.0)
Triglycerides (mg/dL)	
Mean±SD	138.5±40.2
Minimum/Maximum	69/240
Serum triglycerides > 150	31 (31.0)
LDL (mg/dL)	
Mean±SD	104.4±36.6
Minimum/Maximum	60/309
LDL > 130	19 (19.0)
HDL (mg/dL)	
Mean±SD	48.4±5.7
Minimum/Maximum	28/56
HDL < 50	31(31.0)

Lipid studies in the study population revealed mean total cholesterol levels of 179.3±36.6 mg/dL, mean triglyceride levels of 138.5±40. 2mg/dL, mean LDL cholesterol levels of 104.4±36.6 mg/dL & mean HDL cholesterol levels of 48.4±5.7mg/dL.

Dyslipidemia was found in total 35 (35%) subjects with 18 (18%)subjects observed to have total cholesterol levels > 200mg/dl, 31(31%) found to have triglycerides

> 150mg/dl, 19 (19%) subjects found to have LDL cholesterol > 130mg/dl & 31(31%) subjects found to have HDL cholesterol < 50mg/dl (**table 15**).

Table 16: Metabolic syndrome in study population

Metabolic syndrome	Observation
Present	35 (35.0)
Absent	65 (65.0)

Of total 100 subjects, 35(35%) subjects fulfilled the criteria of metabolic syndrome (**table 16**).

Table 17: Kidney function parameters in study population

Renal Parameters	Observation
BUN (mg/dL)	
Mean±SD	30.2±10.3
Minimum/Maximum	14/65
BUN > 40	13 (13.0)
Serum creatinine (mg/dL)	
Mean±SD	0.91±0.23
Minimum/Maximum	0.4/1.5

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Table 18: Hypothyroidism in study population

Hypothyroidism	Observation
Present	9 (9.0)
Absent	91 (91.0)

9(9%) out of total 100 subjects were newly diagnosed with hypothyroidism (**table 18**).

Table 19: Cardiac involvement in study population

Cardiac Disease	Observation
ECG	
Normal	83 (83.0)
Anterolateral wall MI	3 (3.0)
Inferior wall MI	3 (3.0)
LVH	11 (11.0)
2D ECHO (n=59)	
Resting wall motion abnormality	6 (10.2)
LVEF >40	53 (89.8)
LVEF≤40 (15=1,35=2, 40=3)	6 (10.2)

Evidence of cardiac involvement was seen in 6(6%) subjects in the form of coronaryartery disease on both ECG & 2D-ECHOtesting.

Table 20: distribution of cardiometabolic risk factors as per duration since menopause

Parameter	Menopause duration (years)			P value
	≤ 5 years (n= 25)	6 – 10 years (n =31)	≥ 11 years (n= 44)	
HTN	11 (44%)	18 (58%)	28 (63.63%)	0.282
T2DM	11 (44%)	12 (38.7%)	19 (43.2%)	0.903
High TC	4 (16%)	5 (16.1%)	9 (20.5%)	0.852
High LDL	4 (16%)	5 (16.1%)	10 (22.7%)	0.701
High TG	7 (28%)	8 (25.8%)	16 (36.4%)	0.580
Low HDL	8(32%)	9(29%)	14(31.8%)	0.960

Distribution of cardiometabolic risk factors as per duration since menopause did not reveal any significant association between duration since menopause & cardiometabolic risk factors **(table 20)**

Discussion

We looked at common CVD risk factors in postmenopausal women in this study. Mean age of subjects was 57±5.4 years. Cagnacci et al (2012) in a similar study reported mean age of 57.0±6.0 yrs.[32] Large number of our subjects (51%) were illiterate. Similar study done by Tandon et al in 2010, reported 21% literacy. Formal education may be a contributing factor towards understanding self-care in transition phase of menopause. 59% women in this study belonged to low socioeconomic strata. Lawlor et al (2004) studied socioeconomic status in association with CVD in postmenopausal women & reported similar linear relationship.[7] The reason could be due to poor nutritional status and level of insulin resistance. Age at menopause in this study was 47.2±1.2 yrs. Anjaly et al (2014) also found the similar mean age of 48.26 yrs in women at menopause.[25]

Mean duration since menopause in our study was 9.8±5.1 yrs. Maturana et al(2015) reported mean duration since menopause to be 5.8 yrs, which is less compared to our study.[26] About 15% women were chewing tobacco in our study, which is reported to increase CVD risk. Singh YP et al, also highlighted role of tobacco chewing in metabolic syndrome.[30] A positive history of CVD risk factors is associated with greater risk in immediate relatives especially important in postmenopausal women.[21]In our study 28% subjects had positive history of CVD.As far as level of activity is considered, most of our study subjects (57%) were doing light work & 43% were doing moderate work. Higher level of activities protective against CVD risk. Stori et al,(2010) found that higher level of activity were associated with low coronary artery calcium a surrogate marker of CAD, in postmenopausal women.[27] Mean BMI of our subjects was 24±3.6. Our 49% and 13% women were overweight & obese respectively. The waist circumference of ≥ 80 cm was noted in 49% women. Maturana et al, (2015) reported mean BMI & waist circumference of 27±2.5kg/m² and 86.1±10 cm respectively in

Brazilian postmenopausal women which is similar in our study.[26] It is suggestive of increased visceral obesity which is a preventable risk factor.

In this study 57% women were newly detected to be hypertensive. Hypertension has linear relationship with CVD & postmenopausal state poses potential risk for it. Tandon et al, (2014) reported similar findings in their study where 56% postmenopausal women were newly diagnosed with hypertension.[21] Menopause increases the risk of dysglycemia compared to premenopausal state. In present study 42% women were newly detected to be diabetic as per HBA1C criteria. Mean level of HBA1C, FBG & PMBG were 7.9±1.7%, 124.4±33.4 mg/dl and 166.8±52.1 mg/dl respectively. This finding shows higher % of DM in our population than reported by Tandon et al, who found 21% women as diabetic for first time.DM is reported to be major risk for fatal CAD & CVD in women.[21]Our subjects also had acanthosis nigricans in 45% and skin tags in 13% which are markers of insulin resistance. Dyslipidemia was frequent in our study population. Raised total cholesterol, triglyceride, LDL and low HDL cholesterol were evident in18%, 31%, 19% & 31% subjects respectively. Tandon et al, (2014) reported similar abnormalities in 30%,31%,27% and21% subjects.[21] It indicates higher prevalence of dyslipidemia in postmenopausal women which is increases risk of CVD in them. The constellation these risk factors including HTN, DM, obesity & dyslipidemia lead to metabolic syndrome which was seen in 35% of our subjects. Hidalgo et al al,(2006) reported metabolic syndrome in 41.5% postmenopausal women from Ecudor.[28] In 9% women hypothyroidism was detected which is a known risk factor for CVD.[33] Due to marked similarity in symptoms of menopause & hypothyroidism the diagnosis may be missed. Increased incidence of hypothyroidism in such women warrants screening for thyroid dysfunction to prevent undiagnosed condition contributing to increased CVD risk.LVH was found in ECG & 2Decho in 11% women and myocardial infarction was present in 6% subjects. Heart failure suggested by low ejection fraction <40% was also noted in 6% women. A study by Schillaci et al,(1998) investing early changes after menopause found that menopause is associated with blunted day-night BP reduction, impaired left ventricular systolic performance & concentric left ventricular geometric pattern. These findings were independent of presence or absence of high BP.[31] Bulliyya G (2001) in their study noted that the risk of coronary artery disease & heart failure is substantially higher in postmenopuasal women.[29]

Conclusion

The present study revealed that there is an increased frequency of cardiometabolic risk factors in postmenopausal women. This finding is supported by many previous studies done worldwide in women of different race & ethnicity. The shift of fat distribution from gynaecoid to android pattern, atherogenic lipid profile, endothelial dysfunction, increased activity of sympathetic nervous system & renin-angoitensin system associated with menopause predisposes the postmenopausal women to cardiometabolic risk factors and thus CVD related morbidity & mortality. The relative physical inactivity in this group may contribute to CVD risk, emphasising the need for lifestyle modification. Hence it is crucial to screen the postmenopausal women regularly for the cardiometabolic risk factors so that timely intervention can minimize CVD related morbidity & mortality. Further, it is necessary to bring about the awareness regarding menopause & related health problems in these women which may change their attitude & realize importance of early screening & seeking timely medical help whenever necessary.

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