

Comparison of Cardiovascular Status among Rural and Urban Perimenopausal and Postmenopausal Women in West Bengal, India

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Abstract: Menopause increases cardiovascular disease risk in women, and rural women are thought to be partially immune and better off than their urban counterparts. In support of this belief, our study was conducted to assess the cardiovascular disease risk by noting Blood Pressure, ECG changes and BMI measurements in 158 rural and urban peri- and postmenopausal women from different districts of West Bengal, India. About 50% of urban women were found to be overweight and almost another one-fifth of them obese, with an average BMI of 26.32 ± 0.45 , an alarming evidence of increasing obesity with urbanization. Data shows that while 64% of urban population were hypertensive, 59% of the rural population were also suffering from Hypertension. But an equally dismal finding of only 7% of the rural population and 49% of the urban women being treated for Hypertension, were also noted. We report a significantly high prevalence of ischemic changes of 52% in Rural and 34% in Urban population, the higher prevalence in rural population may be attributed to the lack of awareness and treatment of associated hypertension. Evidences of long-standing hypertension presenting with ischemic changes in ECG could be noted in the finding that, all 13 females in rural area (100%) and 21 out of 26 females (81%) in urban areas noted with ischemic changes, were suffering from Hypertension. While association between Hypertension and Overweight were found highly significant, overweight population did not show any significant levels of increased ischemic changes. Thus our study shows that being Overweight significantly increases risk of Hypertension which further predisposes to Ischemic heart disease when left untreated, equally true across all women in rural and urban areas, with rural females having more untreated hypertension and at significantly higher risk of heart disease.

Keywords: BMI, Cardiovascular diseases, Hypertension, Ischemia, Perimenopause

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I. Introduction

“Old age is the most unexpected of all the things that happen to human beings”

– Leon Trotsky [Diary in exile, 1935]

With the advent of newer technologies and advancements of Modern Medicine, Menopausal medicine has experienced a marked renaissance in the last few years. The average female life expectancy has doubled from 48 years in 1900 to 82 years today (1), but the age at menopause has changed little from 48 to 51 years (2). Thus the average woman now spends almost 1/3rd of her lifetime in a post-menopausal, estrogen-deprived state. And to maintain good health throughout these menopausal years is the secret of a ‘graceful ageing’ for a female.

Though the ageing women are more fearful of Cancers, but by age 55, cardiovascular disease (CVD) becomes the leading cause of death, 50% will develop heart disease and 4% Breast cancer (1). Obesity is increasing to epidemic proportions, in western world as well as in India, and sedentary life-style along with obesity have been identified to be the chief contributors to CVD in postmenopausal women. In fact, the percentage of all deaths secondary to cardiovascular disease is higher among women (43%) than even among men (37%) (3).

A high fiber intake and a low fat diet, along with increased levels of physical activity seen in the rural population is believed to make the rural women less prone to CVD. In this Study, a sample of the rural and urban population are compared, based on their cardiovascular profile, and observed whether rural peri- and postmenopausal women are really better off than their urban counterparts.

II. Methodology

A cross-sectional, observational and analytical study was carried out on perimenopausal and postmenopausal women from different districts in West Bengal, like – Howrah, Hooghly, Burdwan, Durgapur, 24Pgs(N) and Kolkata. Menopausal status was noted and those women fulfilling the inclusion criteria were enrolled in the study after informed consent. A total of 158 women, selected randomly, were enrolled in this study – 75 women were from Rural areas and 83 women from Urban areas. The Inclusion and Exclusion criteria followed were:

Inclusion criteria: All women of the age 40 years and above: those having regular periods (perimenopausal), and those with no periods for last one year (postmenopausal)

Exclusion criteria: Those excluded from this study were:

- 1) Women with surgical menopause – whose uterus and/or ovaries were removed surgically
- 2) Women on Hormone replacement Therapy (HRT)

Collection of background data was followed by measurement of Height and Weight, and Body Mass Index (BMI) was calculated from the Formula: $BMI = \text{Weight (in Kg)} / \text{Height in m}^2$. Women were categorized according to the BMI classification of Underweight [BMI \leq 18.49], Normal weight [BMI = 18.5 – 24.9], Overweight [BMI = 25 – 29.9] and Obese [BMI \geq 30] (4).

Then Blood Pressure (BP) measurements were taken twice with a 10 minute interval, and at rest. A Systolic BP $>$ 140mm Hg and Diastolic BP $>$ 90 mm Hg were taken as Systolic and Diastolic Hypertension respectively in adults less than 60 years of age, and Blood pressure of more than 150/90 in adults more than 60 years (5). Self-reported intake of antihypertensive medication were taken to be on treatment of hypertension.

Finally ECG recordings were taken on all 12 leads and with long lead II, as per standard protocol. Of the total population under study, while a few women dropped out before ECG recordings, another few ECG tracings were eventually cancelled due to technical errors in its tracings. Thus a total of 101 ECG tracings were finally evaluated in this study. A horizontal ST depression of \geq 2mm along with T-wave inversion in the concerned leads were evaluated for ischemic changes, and diagnosed for ischemia depending upon their location. Features of left ventricular hypertrophy based on voltage criteria [R in V_5 or $V_6 \geq$ 25mm, and/or, S in V_1 + R in V_5 or $V_6 \geq$ 35mm] were included in assessment of ischemia if associated with a strain pattern, i.e. T-wave inversion in the left ventricular leads (Leads V_5 and V_6) (6).

The data of this study was compiled in Microsoft Excel 2010 and analyzed with appropriate statistical tests. Chi-square test was applied with a two-tailed hypothesis to assess the level of significance in the findings. A p-value of $p < 0.05$ taken as a significant finding, and $p < 0.01$ as highly significant.

III. Results

In Table 1, Height and Weight measurements were used to categorize women into different sub-groups based on their calculated BMI. All parameters were seen to be increased in the Urban group, with highly significant p-values. Even the average BMI of the Urban population of 26.32 ± 0.45 lies in the Overweight category.

Table No. 1: Weight and BMI in Rural and Urban population

| | | RURAL (n=75) | URBAN (n=83) | P-value |
|----|---|-------------------|-------------------|--------------------|
| 1) | Average Height (Mean \pm S.E.) | 147.52 \pm 0.78 | 152.07 \pm 0.53 | < 0.0001 |
| 2) | Average Weight (Mean \pm S.E.) | 46.95 \pm 1.11 | 60.84 \pm 1.03 | < 0.0001 |
| 3) | Average BMI (Mean \pm S.E.) | 21.52 \pm 0.44 | 26.32 \pm 0.45 | < 0.0001 |
| 4) | Classification of BMI - No. of persons (%): | | | |
| | * Underweight (%) [BMI \leq 18.49] | 18 (24%) | 3 (4%) | < 0.0001 |
| | * Normal weight (%) [BMI = 18.5 – 24.9] | 41 (55%) | 24 (29%) | < 0.0001 |
| | * Overweight (%) [BMI = 25 – 29.9] | 15 (20%) | 42 (50%) | 0.00063 |
| | * Obese (%) [BMI \geq 30] | 1 (1%) | 14 (17%) | 0.00088 |

Fig. 1 shows the distribution of the two population based on the BMI classification. Urban population recorded a highly significant increase in overweight and obese females, than rural people. Almost 50% of the Urban population are overweight and another 17% are obese – an alarming finding.

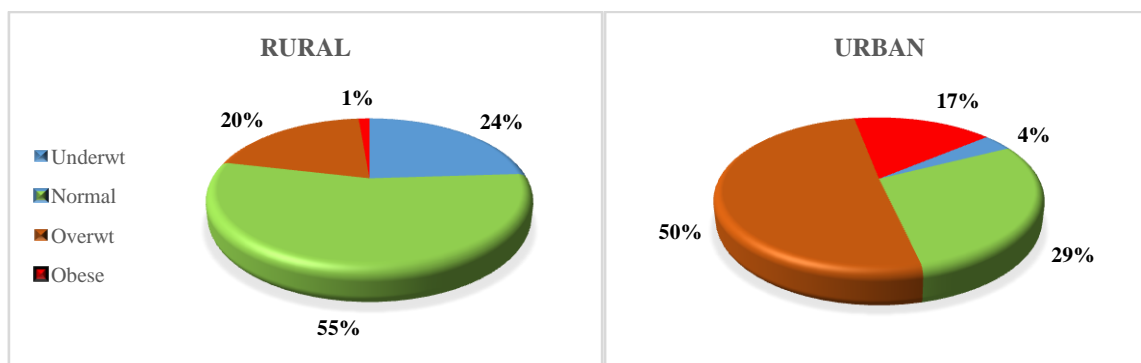


Figure 1: Shows the distribution of the categories of BMI among the two sub-populations

Table No. 2 shows that while 64% of urban population were hypertensive, 59% of the rural population were also suffering from Hypertension. But equally dismal finding of only 7% of the rural population and 49% of the urban women being treated for Hypertension, was also noted.

Table No. 2: Normal and Hypertensive (HTN) women in Rural and Urban population

| | | Rural (n=75) | Urban (n=83) | P-value |
|----|----------------------------|--------------|--------------|---|
| 1) | Normal BP (%) | 31 (41%) | 30 (36%) | < 0.01 (between Normal & HTN in both groups) |
| 2) | HTN individuals (%) | 44 (59%) | 53 (64%) | |
| | HTN women on Treatment (%) | 3/44 (7%) | 26/53 (49%) | < 0.0001 |

The ischemic changes noted in the women were grouped under those having normal BP and those with hypertension. Table No. 3 shows these groups distributed in Rural and Urban population. A highly significant increase of ischemic changes were noted in the hypertensive women in both areas: with all 13 females in rural area (100%) and 21 out of 26 females (81%) in urban with ischemic changes suffering from Hypertension.

Table No. 3: Ischemic changes in ECG in Rural and Urban population

| | | Rural (n=25) | Urban (n=76) | P-value |
|----|---------------------------------|--------------|--------------|---|
| 1) | Normal BP (%) | 0 | 5 (7%) | < 0.0001 (between Normal and HTN in both groups) |
| 2) | In Hypertensive individuals (%) | 13 (52%) | 21 (28%) | |
| | Total | 13 (52%) | 26 (34%) | |

Any association of overweight with Blood pressure and ECG changes were analyzed in Table No. 4. While association between Hypertension and Overweight were found highly significant, Ischemic change in overweight population did not reach any level of significance when compared to normal weight females.

Table No. 4: Normal and Hypertensive (HTN) women in Rural and Urban population

| | | Normal BP | HTN | P-value | Normal ECG | Ischemic changes | P-value |
|----|-----------------------------|-----------|-----|---------|------------|------------------|---------|
| 1) | Normal weight (BMI=18-24.9) | 33 | 32 | 0.0033 | 26 | 13 | 0.3873 |
| 2) | Overweight (BMI≥25) | 19 | 53 | | 36 | 26 | |
| | Total | 52 | 85 | | 62 | 39 | |

IV. Discussion

Menopause, from the Greek word 'Menos' (month) and 'Pausis' (cessation), is defined as the last menstrual period, diagnosed retrospectively after a minimum of 1 year's amenorrhoea (1). But the declining oocyte pool in the female ovaries signal the oncoming menopausal event long before, and this period of perimenopause experiences the beginning of symptoms of estrogen deficiency. Ovarian mass and fertility declines sharply after age 35, and even more precipitously during perimenopause, occurring steadily until menopause (2).

Data available support increased android body fat with ageing in postmenopausal women (7), thus further increasing the risks of CVD. We have noted an increase in the Overweight and Obese population in the urban areas with the average BMI being 26.32 ± 0.45 , which lies in the Overweight category. This supports the findings of National Family Health Survey [NFHS-4] which state that, India's obesity has doubled in 10 years: obesity affecting urban population more than its rural counterpart (8).

Almost 50% of the Urban population are overweight and another 17% are obese. On contrast, the overweight and obese population in the rural areas are 20% and 1% respectively, may be attributed to the increased physical activity and possible diminished nutritional status in the rural women. This is in accordance of ICMR – INDIAB Study (Phase 1) conducted in three States [Tamil Nadu, Maharashtra and Jharkhand] and one Union Territory [Chandigarh] of India (9).

Anchala R, et al. (10) in a systemic review and meta-analysis from different part of India noted significant differences in hypertension prevalence between rural and urban parts [27.6% (23.2–32.0) and 33.8% (29.7–37.8); $P=0.05$] respectively, which was much less than our study, as both male and female population were considered. But J.P. Tripathy reported “alarmingly high prevalence of hypertension and pre-hypertension in North India-results from a large cross-sectional STEPS survey” where overall prevalence of Hypertension was 40.1% (11), again from both male and female persons. We found hypertension to be prevalent in alarmingly high proportions in India, with 64% of urban females and 59% rural females suffering from Hypertension, as noted in our study. Due to paucity of data on the prevalence of Hypertension in peri- and postmenopausal women in India, we recommend urgent needs to measure the existing hypertension status in this vulnerable age group with large-sized samples and from different parts of India.

Our study show only 7% of the rural population and 49% of the urban women being treated for Hypertension, in West Bengal. Data from National Capital Region of Delhi (urban Delhi and adjoining rural Haryana) show 49.6% urban and 33.2% rural population on treatment (12), but similar studies on females from Northern India is lacking.

There is a dearth of data on the prevalence of ischemia in the female population in India. Scanty studies on Indian women with angiographic findings of Bhatt P in “Unique Aspects of Coronary Artery Disease in Indian Women” (13), and Pathak LA in “Coronary Artery disease in Women” (14) with reports on angiographic profile from Mumbai, both point to the increased prevalence of CVD in women in the peri- and postmenopausal age. We report a significantly high prevalence of Ischemic changes of 52% in Rural and 34% in Urban population. The higher prevalence in Rural population as opposed to urban population may be attributed to the lack of awareness and treatment of associated hypertension. The finding that Hypertension is indeed the main causative factor can be noticed from the fact that: all 13 females in rural area (100%) and 21 out of 26 females (81%) in urban with ischemic changes were suffering from Hypertension.

Overweight as a risk factor of high Blood pressure have been studied by Singh M and Kotwal A (15) on semi-rural South Indian population. We studied similar association and found Overweight females having high levels of Hypertension, compared to those with normal body weight. Ischemic changes in overweight population did not reach any level of significance when compared to normal weight females. Thus proving the role of uncontrolled Hypertension, rather than overweight, to be the major determining factor in causing ischemic changes in heart in females of menopausal age.

V. Conclusion

Overweight including Obesity is rising to epidemic proportions with about 50% of urban women being overweight and 17% Obese. Hypertension too, being elevated in overweight female population, shows alarmingly high levels of 64% in urban and 59% in the rural population. Lack of treatment of Hypertension significantly increases the risk of ischemic heart disease, and the rural population where only 7% are on treatment of hypertension, recorded 52% ischemic changes in ECG. Conversely in urban areas where 49% of the females are being treated for Hypertension, ischemic changes of 34% were noted in the females. Thus our study show that being Overweight significantly increases risk of Hypertension which further predisposes to Ischemic heart disease when left untreated, and in rural females with more untreated hypertension a significantly higher finding of ischemic heart disease was noted.

Limitations of the study

The study was a sample study conducted in only a few districts of West Bengal and do not truly reflect the actual population mean of the individual parameters of the whole population of West Bengal. This study is only reflective of the prevalent cardiovascular scenario of the rural and urban population, but in no way should this study be assumed to be a guide to actual quantitative assessment, which requires large scale and numerous sampling which is not possible in individual studies.

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Conflicts of interest

None.

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