

Original Research Article

## **Studies on Coronary Heart Disease (CHD) Risk between Reproductive Age Group and Post-Menopausal Age Group Female Population of Bankura District of West Bengal, India**

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### **ABSTRACT**

The aim of our study is to investigate the cardiovascular status of the females of reproductive age group (RAG) and post menopausal age group (PMAG) of Bishnupur city of Bankura District of West Bengal, India. Forty subjects (N= 40; n=20 for RAG and PMAG respectively) were considered for our study. Body Mass Index is evaluated from the height and weight of subjects of the two different groups. Diastolic blood pressure, systolic blood pressure, pulse pressure, pulse rate and respiratory rates of subjects of the two groups are recorded and considered to find their respective cardiovascular status and risk factors.

The findings of the two groups are compared to find the predisposition of obesity, hypertension, tachycardia, and hyperventilation and associated Coronary Heart Disease (CHD) risk, if any, in postmenopausal women of Bishnupur city of Bankura District of West Bengal, India.

Our studies reveal that the post menopausal age group women of the Bishnupur City of Bankura District exhibit symptoms of risk of Coronary Heart Disease (CHD) and other cardiovascular diseases. Change in daily habits, modification of daily diet and life style are strongly recommended along with regular medical consultation in order to avoid such risks in post menopausal women. Also regular evaluation of health status and risk management is necessary for women of post menopausal age group.

**Key words:** Body Mass Index, Coronary Heart Disease (CHD), reproductive age group, post menopausal age group, obesity, hypertension, tachycardia, hyperventilation.

### **INTRODUCTION**

Menopause is considered as spontaneous and natural cessation of menstruation in women. <sup>[1]</sup> Menstrual periods can stop for some time and then start again in some women. The reasons can be sickness or pregnancy etc. For this reason only after a full year of cessation of period, a woman is considered to have been through menopause. <sup>[2]</sup> A study reveals that the prevalence of menopause (natural and surgical) has remained unaltered in Indian women from 1992-93 to 2005-06. <sup>[3]</sup> Studies

also show that women belonging to lower socioeconomic strata of the society are prone to earlier onset of menopause <sup>[1, 3]</sup> and thus may not utilize their complete reproductive age. <sup>[3]</sup> It is also reported that those women from poor socioeconomic part of the society who reach menopause at an earlier age already have more number of children compared to women from higher socioeconomic strata of society. <sup>[1]</sup> It has been found motherhood before 16 years of age is also associated with higher prevalence and earlier onset of menopause

in women. [3] For most women around the world, menopause happens between the age of 48 and 55 years. Early menopause is a natural menopause between the ages of 40 and 45 years. On the other hand, premature menopause is a natural menopause before the age of 40 years. [4] Perimenopause or "the menopausal transition," is actually the time period that leads up to a woman's last period.

Menopause occurs due to normal physiological process. There occur changes in the levels of female hormones estrogen and progesterone. These hormonal changes cause certain symptoms. Menopause comes in women with both physical and psychological symptoms. Physical symptoms include amenorrhoea (irregular periods), hot flushes, night sweats, palpitations, decreased libido (sex drive) etc. Psychological symptoms of menopause are like mood swings, irritability, increased anxiety, insomnia, poor pattern of sleep, insomnia, loss of memory etc. Symptoms and experiences vary from individual to individual. Some of these symptoms may last for months or even years after a woman's period ceases. After menopause, a woman is in post-menopause, which lasts for the rest of her life. [2] Post menopausal age group women are at risk of several physiological problems due to changes in their hormonal pattern. Estrogen and progesterone level decreases and this leads to several alterations in various physiological processes. Osteoporosis and genito-urinary problems in post menopausal women are widely reported in India. [5] Studies reveal that the female sex hormone, oestrogen, plays significant role in preventing bone loss by effecting the secretion or release of cytokines. These cytokines influence bone remodeling. [5] It is evident from investigations that considerably high proportion of postmenopausal women population are victims to several physiological problems which include vasomotor symptoms, urge incontinence, multiple somatic symptoms (backache, joint aches and pains, lack of

concentration and dizziness) etc. [6] There is no report if any significant changes in blood pressure, rate of respiration, body mass index and pulse rate etc. basic cardiovascular marker physiological parameters in females of post menopausal age group (PMAG). We have studied the cardiovascular status in PMAG females of Bishnupur City of Bankura District of West Bengal India. We have also conducted a comparative analysis of the above mentioned parameters between females of reproductive age group (RAG) and PMAG of same geographical region. Such studies are necessary to get an idea about risk of developing Coronary Heart Disease (CHD) in post menopausal women, if any, so that changes in their life style, dietary adaptations, and therapeutic interventions etc. precautionary measures can be adapted in time to protect those PMAG women from cardiovascular risks.

## **MATERIALS & METHODS**

### **Selection of subjects**

We conducted the study on 40 female subjects of Bishnupur city of Bankura District of West Bengal, India. By oral questionnaire method it was confirmed that all subjects of reproductive age group (RAG) were having their normal menstrual cycle without any clinical symptom or irregularities. It was also confirmed that all subjects of post menopausal age group (PMAG) had undergone menopause.

The subjects were randomly selected and categorized into two groups: reproductive age group (RAG) consisting of female subjects whose ages were between 40-45 years [Mean age was 42 yrs  $\pm$  1.58 (Mean  $\pm$  S.E.)] and post menopausal age group (PMAG) consisting of female subjects whose ages were between 50-55 years [Mean age was 43yrs  $\pm$  2.03 (Mean  $\pm$  S.E.)].

Subjects with some chronic diseases like diabetes, pulmonary disorder or subjects with reported cardiac ailments were excluded from the study. Also subjects who were on any kind of regular medication

were not included in the study in order to ensure homogeneity of sample groups.

We measured some physiological parameters, to know about the physiological status of these female subjects. Our prime objective was to get an idea about the cardiovascular status of those subjects and to find if there is any difference in it between the two groups.

Measurement of Body Weight and Evaluation of Body Mass Index (BMI)

Body weight of all subjects was measured using digital weighing machine.

BMI was calculated by using weight and height measurements by the following formula:  $BMI = \text{Weight (kg)} / \text{Height (m}^2\text{)}$

### Blood Pressure Measurement

Systolic and diastolic blood pressures of subjects were measured by using sphygmomanometer and pulse pressure was calculated by deducting diastolic blood pressure value from systolic blood pressure value of that subject. The values are expressed in mm of Hg.

### Pulse rate (beats/minute)

Pulse rate of subjects was measured from radial artery on the wrist by feeling and counting the beats of pulse for one minute which is expressed as beats/minute.

### Respiratory Rate (cycles/minute)

Respiratory Rate was counted in subjects by standard method (taken breathing air mainly expiration air from nostril on the back of our palm). Number of expirations in one minute was counted and expressed as cycles/minute.

### Statistical Evaluation

Each parameter was measured at least three times in each individual. Data are presented as Mean  $\pm$  S.E.M. Significance of difference of mean values of different parameters between subjects of RAG and PMAG. All results were analyzed using One Way Analysis (ANOVA). Statistical analyses were performed using Microcal origin version 8.0 for windows.

## RESULTS

Our studies reveal some interesting findings. Figure 1 shows that the body

weight (Kg) of females of post menopausal age group (PMAG) are significantly higher ( $P < 0.01$  Vs. RAG) than that of the reproductive age group (RAG) females of the Bishnupur region of Bankura District of West Bengal. This finding is evident from the fact revealed in figure 2, as well. Figure 2 reveals that the BMI of PMAG females are also significantly higher ( $*P < 0.01$  Vs. RAG) than that of RAG females of the Bishnupur region of Bankura District of West Bengal.

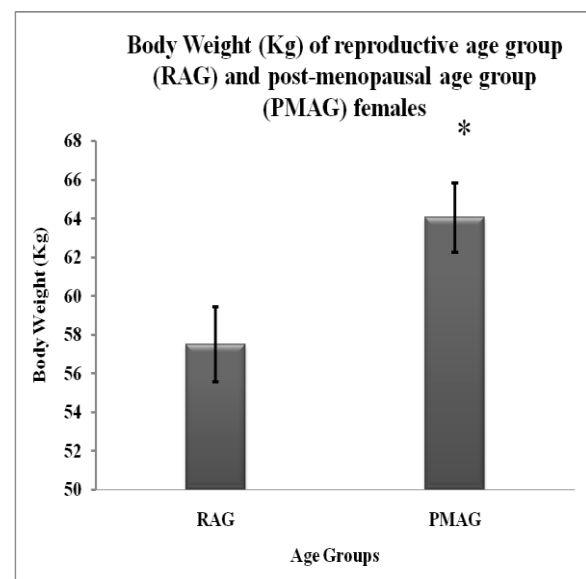


Figure 1: Body Weight (Kg) of reproductive age group (RAG) and post-menopausal age group (PMAG) females of Bishnupur city of Bankura District of West Bengal, India. Values are Mean  $\pm$  SEM;  $*P < 0.01$  Vs Control

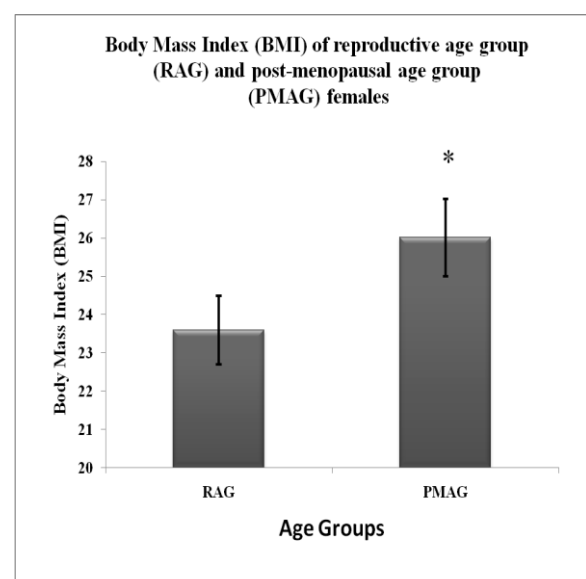


Figure 2: Body Mass Index (BMI) of reproductive age group (RAG) and post-menopausal age group (PMAG) females of Bishnupur city of Bankura District of West Bengal, India. Values are Mean  $\pm$  SEM;  $*P < 0.01$  Vs Control.

Figure 3 shows that PMAG females of Bishnupur city of Bankura District have hypertensive tendencies. RAG females have normal systolic blood pressure while that of PMAG females is found to be significantly higher compared to that of RAG females (\*P<0.01 Vs. RAG) Diastolic blood pressure of PMAG females is higher than that of normal (Fig.3) and indicates hypertensive condition. On the other hand, from figure 3 it is evident that diastolic blood pressure of females of both the age groups is normal and there is no significant difference in diastolic blood pressure between RAG and PMAG females of Bishnupur city of Bankura District. Pulse pressure is found to be normal in females of RAG and that in PMAG is found to be significantly higher (\*P<0.01 Vs. RAG) than RAG females of the Bishnupur City of Bankura District of West Bengal, India.

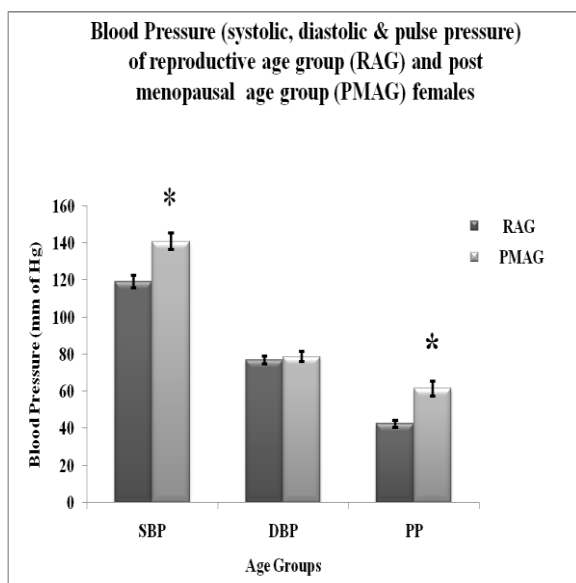


Figure 3: Blood Pressure (systolic, diastolic & pulse pressure) of reproductive age group (RAG) and post menopausal age group (PMAG) females of Bishnupur city of Bankura District of West Bengal, India. Values are Mean  $\pm$  SEM; \*P<0.01 Vs Control

Figure 4 shows that pulse rate (beats/minute) of PMAG females is significantly higher (\*P<0.01 Vs. RAG) than that of RAG females of Bishnupur City of Bankura District of West Bengal. Figure 5 Depicts that respiratory rate (cycles / minute) of PMAG females is also significantly higher (\*P<0.01 Vs. RAG)

than that in RAG females Bishnupur City of Bankura District of West Bengal.

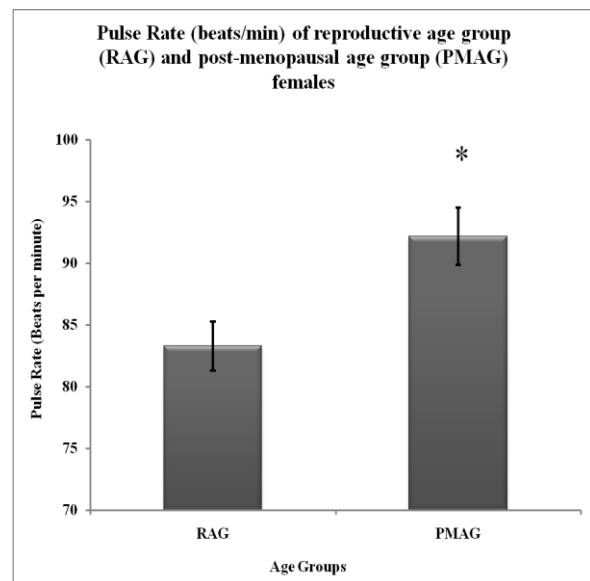


Figure 4: Pulse Rate (beats/min) of reproductive age group (RAG) and post menopausal age group (PMAG) females of Bishnupur city of Bankura District of West Bengal, India. Values are Mean  $\pm$  SEM; \*P<0.01 Vs Control

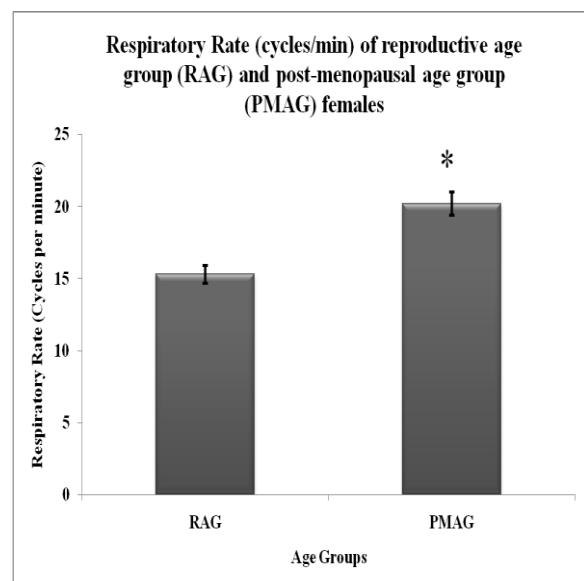


Figure 4:Respiratory Rate (cycles/min) of reproductive age group (RAG) and post menopausal age group (PMAG) females of Bishnupur city of Bankura District of West Bengal, India. Values are Mean  $\pm$  SEM; \*P<0.01 Vs Control

## DISCUSSIONS

Body Mass Index (BMI) is the ratio of body weight of person in kilograms and the square of height in meters. [7] BMI is related to age at menopause. Studies reveal that greater the BMI, the later is the age at menopause. [8] The influence of menopause on BMI is

definite but there are several other factors which are also involved in determining BMI of a person. Experts recommend increasing physical activities in order to prevent such enhancement in BMI and adiposity common in mid-life, in post menopausal women. [9,10]

A generalized observation reveals that there is always a tendency of increase in blood pressure and developing hypertension in women following years of menopause. Some experts hold the opinion that it occurs due to sudden changes in the level of female hormones, especially estrogen. While other groups of experts say that it is actually the increase in BMI that causes obesity and hypertension in post menopausal women. [11] Studies show that many women develop vasomotor symptoms in menopause transition. With menopause comes decline in level of the female hormone estrogen which in turn acts as a risk factor for coronary heart disease (CHD) and women are postmenopausal women are found to be hypertensive. Our study also reveals similar scenario among the post menopausal females we have studied in Bankura District of West Bengal, India. [12] Women with low risk for CHD, if recognized can be treated with proper medical intervention and hormonal prescription in the initial years of post menopause. [11] Hormonal Therapy (HT) was prescribed earlier to handle CHD in post menopausal women if recognized but studies showed that HT may impose negative effect on cardiovascular system of postmenopausal women. [13] Decrease in the level of estrogen is also known to cause an elevation in the level of serum cholesterol and tendency to gain weight in women. Women with genetic predisposition of diabetes are at greater risk of developing diabetes during their post menopausal ages and diabetes is known to have detrimental effect on cardiac tissue and diabetic patients are often known to develop diabetic cardiomyopathy. [14] Few on hand remedies for restricting hypertensive tendencies in post menopausal women are weight management, following a healthy diet

containing enough supplements of fruits and vegetables (rich in vitamins and minerals), to avoid consumption of processed food and convenient and fast foods, exercise, avoid smoking, avoid consumption of alcoholic beverages, avoid salt intake in their daily diet and off-course to visit the physician and be on regular medication if prescribed. [13] Every possible measure should be taken by post menopausal women to keep their blood pressure normal in order to avoid hypertension as high blood pressure causes strain on heart and leads to various types of coronary heart diseases (CHD) including atrial fibrillation. [14] The mechanism of decreased level of estrogen in postmenopausal ages in development of hypertension is multifactorial. Estrogen, the female hormone regulates various physiological events in a female body. The hormone works through receptors called Estrogen Receptors (ERs) which are found in the nucleus and on the plasma membranes both. Those are of two types, ER $\alpha$  and ER $\beta$ . Role of ERs in regulation of cardiovascular tone and risk of CHD work through various mechanisms which include inhibition of the vascular RAAS (renin-angiotensin-aldosterone system), regulation of bioavailability of Nitric Oxide, inhibition of growth of vascular smooth muscle cell (VSMC), inhibition of the endothelin system, inhibition of the sympathetic part of autonomic nervous system etc., [15-19]

Increased rate of heart beat than normal (72beats/minute) is termed as tachycardia though clinically more than 100 beats/min is recognized tachycardia. [20] Decreased estrogen level in post menopausal women is associated with widening of coronary arteries. It also inhibits constriction of coronary arteries which leads to increased pressure inside the vessels and results in increased number of heart beats per minute. Fall in level of estrogen also causes a fall in HDL, the good cholesterol and LDL (bad cholesterol) tends to increase. [21] Estrogen also regulates heartbeat by modulating autonomic nervous system (ANS) specially the sympathetic



nervous system. [19] As we studied pulse rate (which is actually a count of heart beats per minute) in women of Bishnupur city of Bankura of West Bengal, India, we found that the women belonging to the post menopausal age group have high rate of heart beat. Though the mean average of the values of pulse rate of PMAG women were not found to be more than hundred but yet they exhibited higher rate of heart beat compared to those of RAG women of the same geographical region. Studies reveal that women after menopause experience increased heart rate and even often palpitations. The incidences of experiencing palpitations are much common in perimenopausal women (who have menopause but not more than 12 months). Increased hear rate is also considered as an indicator of coronary insufficiency and is a preliminary marker symptom for evaluation of cardiovascular status in an individual. [20,21]

An alteration in life style, regular exercise and alternative medicine along with proper diet and exercise is the best recommendation for post menopausal women who are experiencing an increased heart rate or in whom a raised pulse rate is noted. Variation in the beat-to-beat interval is termed as Heart rate variability (HRV) and studies show that this phenomenon is also exhibited by some postmenopausal women if not all. Investigations reveal that postmenopausal women who are physically active show higher level of HRV those of less active postmenopausal women of same age group. This finding is recognized as a cardio protective mechanism by the heart of few postmenopausal women who are physically active. [21]

Also abstain from smoking and consumption of alcoholic beverages and proper sleep and reduced intake of red meats, whole grains, stimulants like caffeine, is recommended for regulation heart beat in PMAG women. [22,23] Studies show that depressed people show increased hear rate and are at higher risk of CHD. Some experts suggest that avoidance of

depression is also essential in postmenopausal women to avoid increased heart rate and CHD risks. [24]

Rapid breathing is termed as hyperventilation. Deep breathing is also considered as hyperventilation. Hyperventilation is also termed as 'over breathing'. We observed increased rate of respiration or hyperventilation is in postmenopausal women in Bishnupur City of Bankura District of West Bengal. Such hyperventilation and hyperventilation induced other associated problems in post menopausal women are primarily brought about due to decreased level of estradiol in blood which is evident from the fact that supplementation of estradiol in postmenopausal women with variant angina can suppress hyperventilation induced attacks. The probable mechanism suggested behind such observation is estradiol supplement induced improvement of endothelial function. [25] Hyperventilation is considered as a symptom of CDH risk and other cardiovascular ailments. Such observation should immediately be followed by proper diagnostic and clinical evaluations of various cardiovascular parameters in subjects.

## CONCLUSION

Various factors are involved in regulation of our various physiological processes and occurrences. Studies conducted on post menopausal females from different geographical regions of the world have shown variable observations and hence, ethnicity is a major concern while studying and interpreting menopausal symptoms in women. [10] Even genetic predisposition is an important determining factor for various conditions and symptoms leading to CHD risks in postmenopausal women. And a genetically linked population normally inhabits a particular geographical area. [26] Hence such kind of studies on evaluation of CHD risks in postmenopausal women is necessary in various geographical areas to develop a detailed idea about the exact scenario and vulnerability of post

menopausal women to CHD. A close observation of a proper discrete and detailed picture of CHD risks in postmenopausal age group women will help to develop tools for prevention and protection of the middle aged women from being susceptible to CHD induced morbidity. This postmenopausal physiological changes induced risk of CHD is the reason for increased morbidity of middle aged women due to CHD than men of similar age group. Following menopause, changes in lifestyle with regular exercise and increased physical activity is essential to beat the risks of CHD in postmenopausal women. Diet and food habit is an important and one of the most significant factors in postmenopausal women. A proper nutritional assessment is essential [27] in those women and a proper balanced diet with supplements of enough vitamins, minerals, dietary fibres, low in calorie, void of alcoholic beverages, low in other stimulant beverages like tea & coffee and low in carbohydrate and fat, containing moderate to low amount of simple protein should be recommended. The diet should be rich in foods from the food groups of green leafy vegetables, fruits, other vegetables, fibres etc., On the other hand foods like red meat, fats & oils, jiggery should be strictly avoided. Fried and too much spicy foods should be avoided. And intake of fibrous foods, little indigenous spices various spice herbs and roots including curry leaves, turmeric, pepper etc. can be used to make the food palatable for those women. Use of such spices will add to the antioxidant defence of the body and will strengthen the immune system as well. They also have cardio protective properties. [27] Post menopausal women being recognized in the risk group for CHD should be made aware of the precautionary measures and they should regularly go for clinical evaluation and medical interventions. Besides, joint and collaborative contributions from cardiologists and gynecologists are required to fight the various postmenopausal cardiovascular risks including CHD. Researchers all around the world should

evaluate the health status and CDH risks in post menopausal women in their respective geographical regions should share their findings and act globally for developing tools and precautionary measures for reducing the rate of morbidity in postmenopausal women due to CHD. Measures to keep the middle aged women, the aged mothers of the societies healthy, and to evaluate their health conditions, and improve those are necessary and inevitable needs for a well developed healthy Globe with better health possibilities.

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