

## Assessment of Cardiovascular Disease Risk among Perimenopausal Women : A Cross-sectional Study in a Rural Area of West Bengal

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### Abstract:


**Introduction :** Cardiovascular disease (CVD) has become the leading cause of mortality in the world, more so in the perimenopausal age group due to decreased levels of estrogen and diminished ovarian function because of ageing. **Objective:** To find out the magnitude of CVD risk among perimenopausal women residing in rural Bengal and its associated determinants. **Method:** A cross-sectional study was conducted in a rural area of Barasat block I during April-July 2021 on 150 peri-menopausal women selected by cluster sampling. A pre-designed pretested questionnaire was used for data collection and a 10-year probability of CVD risk was assessed using Framingham Risk Score. Logistic regression analysis was done to find out the associated factors. **Results:** Intermediate & high CVD risk was present in 28 (18.7%) and 63 (42%) participants, respectively. Among 150 participants, 62% were hypertensive, 44.7% were diabetic, 51.3% with borderline high total cholesterol and 76% had low HDL cholesterol. Factors significantly associated with intermediate to high CVD risk were high mental stress [AOR=6.96, 95%CI=2.17-22.31], family history of chronic illness [AOR=14.46, 95% CI=4.26-49.06] and presence of chronic morbidities [AOR=6.84, 95%CI=1.93-24.22]. **Conclusion:** A significant proportion of perimenopausal women were at risk of developing CVD. Thus, awareness campaigns in the community would help in empowering women in maintaining their health through regular screening and timely intervention when deemed necessary.

**Key Words :** Cardiovascular Risk, Framingham Risk Score, Perimenopause, Rural

### Introduction:

The dawn of the 21<sup>st</sup> century has witnessed the most dramatic improvement in the promotion, prevention and management of disease and healthcare services. With increasing urbanisation and socialisation, the major causes of death and disability have undergone an epidemiological transition from infectious diseases and nutritional deficiencies towards degenerative or chronic diseases such as cardiovascular disease (CVD),

diabetes and cancer, among which CVD has emerged as the leading cause of mortality worldwide. Recent data suggests stagnation in the improvement of incidence and mortality of coronary heart disease, especially among younger women (<55 years).<sup>[1,2]</sup> An estimated 17.9 million deaths are attributed to cardiovascular diseases, thus representing approximately 32% of global deaths. The World Health Organization (WHO) has predicted approximately 23.6 million deaths by 2030 due to cardiovascular diseases.<sup>[3,4]</sup>

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Risk factors of CVD can be broadly classified into non-modifiable (e.g. age, family history) and modifiable (e.g. dyslipidaemia, smoking, diabetes, physical inactivity). Most of these factors are common in men as well as in women.<sup>[5]</sup> Although in general, males are significantly at higher risk of CVD than women, the perimenopausal age group in women has been recognised as an additional cardiovascular risk factor. The remarkable rise in the incidence among women especially in the perimenopausal age is because of the synergistic effect of behavioural and biological risk factors owing to changing lifestyle coupled with a loss of oestrogen protection.<sup>[6]</sup>

Recent data have shown that over the past two decades the prevalence of myocardial infarction has increased in women, especially in their mid life years. Globally, approximately 8.6 million women die from out of which 3.3 million women die of heart attacks.<sup>[3]</sup> Women especially in rural areas, being the foundation figure for each household, have to carry the burden of responsibilities of their families. In addition, they often face the challenges of poverty, illiteracy and discrimination issues due to which they often neglect their health status. Therefore, even on experiencing symptoms, they downplay or ignore them and delay in seeking healthcare.<sup>[7]</sup>

Treatment for CVDs often creates a huge financial burden on the rural as well as the poor sections of society due to high treatment and hospitalization costs.<sup>[8]</sup> Thus, preventive measures and risk reduction for CVD can act as the most cost-effective and feasible option to reduce the disease burden, especially in the case of developing nations like India. Early diagnosis through screening followed by prompt intervention can also retard the progression of the disease towards its irreversible stages.

To estimate the 10-yr probability of the risk of developing cardiovascular disease among individuals, the Framingham Risk Score was devised

based on the findings of the Framingham Heart Study.<sup>[9]</sup> It considers several factors to calculate a score which determines the risk of CVD in an individual. There is a dearth of studies in India utilizing this risk score in rural areas among perimenopausal women. With this backdrop, this study thus envisaged assessing the risk of developing CVD among peri-menopausal women in a rural area of West Bengal and eliciting its associated determinants, if any.

### Method:

This community-based cross-sectional study was conducted from May to July 2021 among women of the peri-menopausal age group (40-55 years) residing in a rural area of Barasat block-I, North 24-Parganas district, West Bengal. It is situated under Barasat Sadar sub-division of North 24-Parganas District, West Bengal which is well connected by train (on Sealdah-Barasat / Bongaon railwayline) and road (besides NH12 via Jessore road) with a total population of 2,94,628. The study area consisted of 68 villages from nine Gram Panchayats, namely, ChhotoJagulia, Ichhapur-Nilganj, Kotra, PurbaKhilkapur, Dattapukur I, Kadambagachi, Paschim Khilkapur, Dattapukur II, Kashimpur. The participants residing in the selected study area for at least 1 year were included in the study and those not providing written informed consent, were critically ill or had diagnosed cardiovascular diseases were excluded from the study.

Due to a dearth of available studies regarding cardiovascular risk among perimenopausal women in a rural study setting of West Bengal, the sample size was estimated considering the prevalence of cardiovascular risk to be 50%. Considering  $P=0.5$ ,  $Z=1.96$  (at 95% confidence interval) and an absolute error of precision to be 10%, the minimum sample size estimated using standard Cochran's formula came to be 96.<sup>[10]</sup> Considering a design effect of 1.5, the sample size came to be 144.

### Sampling:

A two-stage cluster sampling technique was used to select the study participants. The study area consisted of 68 villages, from which in the first stage 15 villages or clusters (each village was denoted as a cluster) were selected randomly. In the second stage, it was decided to take 10 participants from each cluster ( $144/15=9.6\sim 10$ ). Thus, the final sample size came to be 150 ( $15\times 10=150$ ). The study area was visited with the help of maps and local field health workers. After reaching the centre of each village, one direction was chosen randomly by rotating a bottle. Going in the direction of the bottle head, the first house was approached to find out any study participant satisfying the inclusion criteria. If not, then the next adjacent house was visited until 10 participants were selected from each village. In case, the end of the road was reached, the next lane was taken to complete the sample size. This procedure was followed for all 15 clusters.

### Data collection, study tools and parameters :

The study was conducted via face-to-face interviews with a pre-designed structured questionnaire translated into the local language (Bengali). Pretesting of the questionnaire was performed among 30 study participants in a different rural study setting who were not included in the final analysis. The face and construct validity of the questionnaire was checked by public health experts. The questionnaire consisted of the following domains:

- a. Socio-demographic characteristics of the study participants included age in completed years, educational status, religion, caste, family type, occupation and socio-economic status of the family.
- b. Behavioural characteristics of the study participants included dietary behaviour, physical activity (assessed by International Physical Activity Questionnaire-Short Form questionnaire) and history of substance usage (tobacco/alcohol). Physical activity was categorised as “inactive”, “minimally active” and “high” activity as per IPAQ-SF. Participants belonging to the 'inactive' to 'minimally active' category were denoted as having 'low' physical activity, while the rest were classified as having 'high' physical activity.<sup>[11]</sup>
- c. Reproductive health profile comprised of questions which assessed the menstrual cycle pattern, no of childbirth, history of abortion, polycystic ovarian disease (PCOD), age at first childbirth, age of marriage, marital status, complication during pregnancy, history of contraceptive usage
- d. Morbidity status assessed for the presence of comorbidities (e.g.hypertension, diabetes mellitus, obesity and dyslipidaemia), mental stress and family history of chronic disease. The presence of comorbidities was identified with the help of clinical examination (including blood pressure measurement), anthropometry and review of past medical records. Body Mass Index (BMI) was estimated and categorised as per WHO standards.<sup>[12]</sup> Moreover, laboratory investigation of certain blood parameters was performed like fasting blood glucose, serum total cholesterol and HDL cholesterol. Fasting blood glucose  $\geq 126$  mg/dl was taken as cut-off for the presence of diabetes mellitus.<sup>[13]</sup> Cut-off criteria for total blood cholesterol was taken to be 200mg/dl while HDL cholesterol less than 40 mg/dl was taken to be low or undesirable.<sup>[14]</sup> The presence of mental stress was assessed by the Perceived Stress Scale-4 (PSS-4) in which the total scores ranged from 0-16. The cut-off for high mental stress was taken to be 50% of the attainable total scores (=8).<sup>[15]</sup>
- e. The outcome variable of the study was the presence of cardiovascular risk among the study participants. The cardiovascular risk was estimated by the Framingham Risk Score (FRS) in the form of an online calculator which

estimates a 10-year probability of developing heart disease. It takes into account a set of risk factors, namely age, systolic blood pressure, total cholesterol, HDL cholesterol, diabetes, smoking etc. A composite risk score is calculated in the form of a percentage value which determines the risk of developing CVD in the upcoming 10-year period. Accordingly, participants were classified into low risk (FRS<10%), intermediate risk (FRS=10-19%) and high risk (FRS ≥ 20%).<sup>[9]</sup>

#### Data analysis:

Data were analysed using Microsoft Excel (version 2019) and SPSS software (version 16 IBM Corp. USA). Continuous variables were denoted as mean±(standard deviation) or median (interquartile range) while categorical variables were denoted by frequency with percentages. After checking for multicollinearity among the variables (variance inflation factor>10), factors associated with the outcome variable were analysed using univariate logistic regression analysis. All the biologically plausible significant variables (p-value<0.05) at 95% confidence interval in the univariate analysis were then included in the final multivariable model.

#### Ethical issues:

Ethical clearance was obtained from the institutional Ethics Committee of All India Institute of Hygiene & Public Health, Kolkata. The purpose of the study was described and the study was conducted after taking written informed consent from the participants. Data confidentiality and privacy were maintained throughout the study. All other ethical principles as per the Declaration of Helsinki were strictly adhered to.

#### Results:

The mean age of the 150 study participants was 46.25 years (±4.80SD) and the majority (72.7%) of the study participants were Muslims. About 75.3 % of the participants were married. Most of the participants (79.3%) belonged to nuclear families. Among the participants, 43.3% had no formal

education followed by 26.7% with a primary level of education and 22.7% of participants with middle school educational status. About 60% of participants belonged to the OBC caste. Most of the participants (82.1%) were homemakers by profession. According to the modified BG Prasad socioeconomic scale 2020, 62.7% of participants belonged to class-V socioeconomic status.<sup>[17]</sup>(Table 1)

#### Reproductive health profile

Approximately, 65.3% of participants had menarche at age ≥ 12 years. The majority of the participants (70.9%) were with no history of abortion and 74.7% of participants had a history of contraceptive usage. Most (71.5%) of the participants had their first childbirth at the age of <18 years. Most of the participants (76%) had <3 children while most of them (n=130) had no history of PCOD.(Table 2)

#### Behavioral characteristics and morbidity profile of the study participants :

The majority of the participants (77.3%) had low physical activity. Perceived stress scale scores had a median value of 10 (IQR=7-13), thus 58% of the participants were detected to have high mental stress. Around 108 study participants had unhealthy dietary behavior. Among all participants 67(44.7%) were overweight, 66% had a positive history of chronic illness and 56% had a positive family history of chronic illness. Among all participants, 62% were hypertensive and 44.7% were diabetic. Clinical examination revealed that 77 (51.3%) had borderline to high total cholesterol while most of the participants, 114 (76%) had low blood HDL cholesterol. Total 63 (42%) participants had normal fasting blood sugar levels.(Table 3)

#### Estimation of Cardiovascular risk among the study participants :

As per the Framingham Risk Score, 63(42%) participants had high CVD risk, 28 (18.7%) had intermediate and the rest 59(39.3%) participants were at low risk for developing CVD in the upcoming 10-year period.(Figure 1)



**Table 1 : Distribution of Study Participants according to Socio-demographic characteristics (N=150)**

Variables	Categories	n (%)
Age (in completed years)	40-44	55(36.7)
	45-49	50(33.3)
	50-55	45(30.0)
Religion	Hindu	41 (27.3)
	Muslim	109 (72.7)
Educational level	No Formal Education	65(43.3)
	Primary	40(26.7)
	Middle	34(22.7)
	Secondary	8(5.3)
	Higher Secondary	2(1.3)
	Graduate & Above	1(0.7)
Socio Economic Classas per modified BG Prasad scale 2020 <sup>[17]</sup>	Class V	94(62.7)
	Class IV	36(24.0)
	Class III	13(8.7)
	Class II	3(2.0)
	Class I	4(2.7)
Occupation	Homemaker	123(82.0)
	Employed	27(18.0)
Family type	Nuclear	119(79.3)
	Joint	31(20.7)

**Factors associated with cardiovascular risk among the study participants :**

Multivariable logistic regression analysis showed that high mental stress [AOR=6.96, 95%CI=2.17-22.31], family history of chronic illness [AOR=14.46, 95% CI=4.26-49.06], presence of chronic morbidities [AOR=6.84, 95%CI=1.93-24.22] and menstrual cycle irregularity [AOR=4.08, 95%CI=1.07-15.45] to be significantly associated with the presence of intermediate to high risk of cardiovascular risk among the study participants. (Table 4) The non-significant Hosmer-Lemeshow test (p-value>0.05) indicated the goodness of fit of the model while 28-37% of the variance of the outcome variable could be explained by this model.

**Discussion:**

The present study made a novel attempt to assess the 10-year probability of the risk of development of CVD among peri-menopausal women in rural West Bengal and elicit its associated determinants. Although studies regarding Cardiovascular risk factors (CVRF) are available in the Indian population, however not much information is available regarding the prevalence of CVRFs in postmenopausal women.<sup>[18]</sup> The presence of intermediate to high risk of CVD was present in more than half of the study participants which exhibits the grave situation of the health status of rural women of the perimenopausal age group in our country. The mean age of the participants in the current study was

**Table 2 : Distribution of Study Participants according to Reproductive Profile (N=150)**

Variables	Categories	n (%)
Menstrual cycle pattern	Not Regular	108(72.0)
	Regular	42(28.0)
H/o of Abortion	Yes	44(29.1)
	No	106(70.9)
H/o of contraceptive usage	Yes	112(74.7)
	No	38(25.3)
Age at first child birth (in completed years)	<18 years	108(71.5)
	≥18 years	42(28.5)
Complication during pregnancy	Yes	56(37.1)
	No	94(62.9)
Age of Menarche (in completed years)	<12	52(34.7)
	≥12	98(65.3)
Age of marriage (in completed years)	<18	84(56.0)
	≥18	66(44.0)
Number of children	<3	114(76.0)
	≥3	36(24.0)
H/O of PCOD	Yes	20(13.3)
	No	130(86.7)
Marital Status	Married	113(75.3)
	Widowed	29(19.3)
	Separated	8(5.3)

46.25±4.80 years which was found to be quite similar to a study conducted in Faridkot, Punjab by Goyal G et al where the mean age was 44.1±2.38 years.<sup>[19]</sup>

Most of the study participants in the current study were of age 40-49 years, which appeared to be similar to a study conducted in Jammu and Kashmir by Tandon VR et al which shows most of the participants were in the age group 42-49 years, where mean age at menopause 49.35 years.<sup>[20]</sup> Tandon VR et al showed that 56% of their participants were hypertensive, 21% were diabetic, BMI ≥ 25kg/m<sup>2</sup> found in 78% of women, and 30% were with borderline to high total blood

cholesterol(≥ 200 mg/dl) and 21% were with low HDL cholesterol(<40mg/dl). Similar concordant findings were also detected in the current study where 62% of participants were hypertensive, 44.7% were diabetic, 61.4% had BMI ≥ 25kg/m<sup>2</sup>, 62% with borderline to high total cholesterol(≥ 200 mg/dl) and 76% were with low HDL cholesterol.

In an Indian study by Kasliwal et al, diabetes mellitus was present in 55.2%, hypertension in 71.6% of women, and dyslipidemia in 93.9% of women.<sup>[21]</sup> Among all patients 29.3% of women had a family history of premature CVD, 62.9% of women had at least one family member having CVD, 1.7% of

**Table 3: Distribution of Study Participants according to Behavioral and Clinical Profile (N=150)**

Variables	Categories	n (%)
Comorbidities	Absent	51(34.0)
	Present	99(66.0)
Family H/O of chronic illness	Absent	66(44.0)
	Present	84(56.0)
Physical Activity	Inactive	116 (77.3)
	Minimally active	27(18.0)
	High	7(4.7)
Mental Stress	Low	63(42.0)
	High	87(58.0)
Dietary Behaviour	Unhealthy	108(71.5)
	Healthy	42(28.5)
Body Mass Index (In Kg/m <sup>2</sup> )	Underweight (<18.5)	18(12.0)
	Normal (18.5-24.9)	40(26.7)
	Overweight (25-29.9)	67(44.7)
	Obese (≥30)	25(16.7)

women were current smokers and another 3.4% of women had a history of smoking in the preceding 1 year. In this regard, the current study found that 56% of the participants had a positive family history of chronic illness, and 64% had the presence of comorbidities. The study by Kasliwal et al also demonstrated that among all the patients 95.9% had at least one of the five major CVRFs. The alarmingly high prevalence of CVRF in rural areas is an eye-opener considering the present scenario. The presence of a positive family history of chronic diseases as well as the presence of commodities in the study participants was found to be significantly associated with the presence of intermediate to high risk of CVD among the study participants in the current study.

The incidence of myocardial infection in women, although lower than in men, increases dramatically after menopause, which can be attributed mainly to the lack of estrogen and its direct and indirect cardioprotective effects.<sup>[22]</sup> Johnson AR et al in

Bangalore have found that among 1027 perimenopausal women, 11% of women had a high risk of CVD and the prevalence of CVD risk factors was high with the presence of diabetes and hypertension among 20.2% and 53.7% respectively.<sup>[23]</sup> They showed that physically inactive state, unhealthy diet, and single/separated/widowed women had a significant association with having high CVD risk. Obesity is now a well-established risk factor for CAD. Lack of physical activity and unhealthy dietary patterns are one of the major causes of central obesity among women. These findings thus emphasize the need for preventive measures and timely intervention for CVD to reduce the overall burden of the disease among women of the perimenopausal age group.

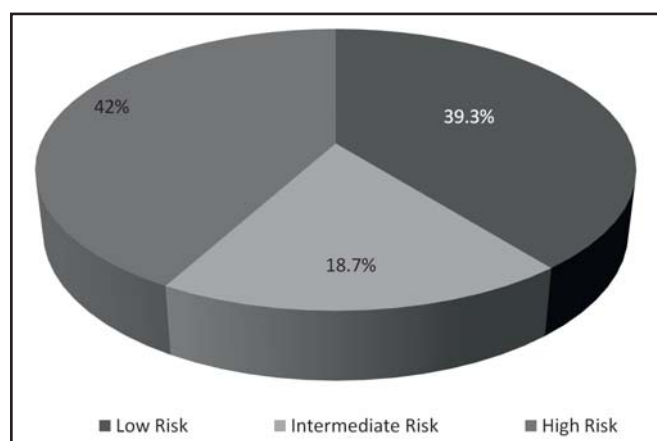
**Limitations:**

Since this study was cross-sectional, the causality of the factors could not be established. Some of the information collected was recall-based, hence bias might be possible.

**Table 4 : Factors associated with intermediate to high CVD risk among the study participants : Logistic Regression Analysis (N=150)**

Variables	Category	Total	Intermediate to High CVD risk present n(%)	Unadjusted Odds ratio (95% CI)	Adjusted Odds ratio (95% CI)
Physical activity	Low	116	81(69.8)	5.52(2.40-12.83)	1.78(0.41-7.73)
	High	34	10(29.4)	1(Ref)	1(Ref)
Mental Stress	Low	63	14(22.2)	1(Ref)	1(Ref)
	High	87	77(88.5)	26.95(11.10-65.43)	6.96(2.17-22.31)
Family H/o chronic illness	Absent	66	14(21.2)	1(Ref)	1(Ref)
	Present	84	77(91.7)	40.85(15.44-108.11)	14.46(4.26-49.06)
Comorbidities	Absent	51	10(19.6)	1(Ref)	1(Ref)
	Present	99	81(81.8)	18.45(7.81-43.57)	6.84(1.93-24.22)
Menstrual cycle pattern	Not regular	108	72(66.7)	2.42(1.17-5.01)	4.08(1.07-15.45)
	Regular	42	19(45.2)	1(Ref)	1(Ref)
Diet	Unhealthy	108	65(60.2)	1(Ref)	--
	Healthy	42	26(61.9)	1.07(0.51-2.23)	--
BMI	Obese/Overweight	58	36(62.1)	1.10(0.56-2.16)	--
	Normal/Undernutrition	92	55(59.8)	1(Ref)	--

CI= Confidence interval, Hosmer-Lemeshow test of significance=0.12, Cox & Snell's  $R^2=0.28$ , Nagelkerke's  $R^2=0.37$

**Figure 1: Distribution of the study participants according to their CVD risk (N=150)****Conclusion:**

The current study showed that Intermediate & high CVD risk was present in 28 (18.7%) and 63 (42%) perimenopausal women respectively. Factors significantly associated with intermediate to high CVD risk were high mental stress, family history of

chronic illness and the presence of chronic morbidities and menstrual cycle irregularity among the study participants. Thus a significant proportion of women at risk of developing cardiovascular disease shortly were detected thus implying that a large number of women will be suffering from CVD events much earlier than believed. It is important to identify these cardiovascular risk factors in perimenopausal patients for early treatment of these CVRFs.

**Recommendations:**

Awareness campaigns at the community level with the help of field health workers can act as a possible solution to improve their knowledge and empower them to take care of their health. Those at increased risk of developing CVD such as those having chronic comorbidities or having positive family history should be counselled to visit their



adjacent health facility at frequent intervals for screening and appropriate intervention if deemed necessary. Education/ awareness regarding these CVRFs among peri-menopausal women is also the need of the hour.

**Declaration:**

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