PREVALENCE OF PREHYPERTENSION AND ASSOCIATED MAJOR BEHAVIOURAL RISK FACTORS AMONG YOUNG ADULTS IN A RURAL COMMUNITY OF BANKURA DISTRICT IN WEST BENGAL
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ABSTRACT: In 2003, the seventh report of the Joint National Committee (JNC 7) proposed the term Prehypertension for elevated blood pressure values below 140/90 mm of Hg to more accurately justify the tendency of blood pressure to rise with age. Prehypertension is considered as a precursor of clinical hypertension which in turn has emerged as a major health problem. The objectives of the study were to estimate the prevalence of Prehypertension as well as to find out major behavioural risk factors associated with Prehypertension among the study population. It was a community based descriptive cross-sectional study conducted in rural field practice area of Community Medicine Department of BSMC in Bankura district from February to April 2014 among the permanent resident young adults (age 18-35 years) of Descriptive analysis, chi-square and from the 2x2 (contingency) table OR were calculated. Prehypertension was found to be 43%. The proportion of prehypertensives was much higher in the male subjects (60.2%) compared to the females (39.8%). Age, alcohol intake, tobacco use, extra salt intake and physical activity were significantly related with Prehypertension but physical exercise, BMI and were not significantly related to it in this study. Prevalence of Prehypertension was found to be substantially high in rural area of Bankura District. Lifestyle modifications can achieve a downward shift in the overall blood pressure, thus reducing the risk of Prehypertension and cardiovascular disease.

KEYWORDS: Prehypertension, Risk factor, Rural community, Young adults.

INTRODUCTION: Prehypertension was first described as early as 1939 by Robinson and Brucer, who defined it as a BP in the range of 120-139/80 - 89 mm of Hg. Later, the clinical importance of Prehypertension was established in 2003 when the Joint National Committee (JNC 7) in its 7th report proposed that the tendency of blood pressure to rise with age can be more accurately predicted in individuals who are ‘Prehypertensive’ i.e. with blood pressure values elevated above normal but below 140/90 mm of Hg. Presently, ‘Prehypertension’ is considered as a precursor of clinical hypertension which in turn has emerged as a major health problem, being responsible for 57% of stroke deaths and 24% of coronary heart disease deaths in India as of 2003-04.

In a further study, Vasan et al analysed data from over 9000 participants of the Framingham cohort who were aged between 35 and 94 years at the outset, and found that the rate of progression to hypertension over a four-year follow-up period was significantly higher among persons with blood pressure readings in the Prehypertensive range, compared to those who had normal blood pressure, with values of cumulative incidence over the 4 year period.
ranging between 17.6% and 49.5% among prehypertensives and 5.3% and 16% among normotensives.  

There are many factors related to both pre and manifest hypertension which can be divided into non-modifiable and modifiable ones. Among the modifiable factors, the existence of behavioural risk factors have been studied comprehensively using the WHO-STEPS guidelines which has subsequently confirmed their role in the development of hypertension.

The focus of our study was to determine the prevalence of prehypertension among young adults in the age group between 18-35 yr as the importance of early detection cannot be overemphasized, while a rural community was selected as people hailing from such a community share a few common features like they mainly belong to poor class, are of homogeneous type, having lack knowledge regarding prehypertension and usually have poor access to health care delivery systems.

As the need for early detection of prehypertension and necessary life style modifications for the prevention of later complications has been well established, the objectives of our study were:

1. To estimate the prevalence of Prehypertension among the young adults in a rural community of Bankura district.
2. To find out major behavioural risk factors associated with Prehypertension among the study population.

**METHODOLOGY:** Our study was a community based descriptive cross-sectional study conducted in rural field practice area of Community Medicine Department of BSMC in Bankura district from February to April 2014 among the permanent resident young adults (age 18-35 years).

Person with serious illness, mentally unsound person, visiting relatives and pregnant women were exempted from this study. Through SRS one sub-centre (Amarkanan) from Gangajalghati block was taken and from it required eligible sample populations were collected through house to house visit with the help of health workers (ASHA).

The sample size was taken to be 225 using the formula \( n= \frac{Z^2 \cdot P \cdot Q}{L^2} \). Allowable error was fixed at 20% with 95% confidence interval, taking prevalence of prehypertension among adults to be 30%.  

After taking ethical clearance from Institutional Ethics Committee, permission from concerned community personnel and written inform consent of participants, data were collected by using a pre-designed, pre-tested and semi structured questionnaire. Questionnaire was prepared from the WHO STEPS questionnaires and few modifications were done during translation to local language (Bengali). Questionnaire was validated by a group of experts. Anthropometric and clinical examinations were carried out for measurement of weight, height, BMI and blood pressure. Standard procedures were followed during the measurements.

**Operational Definitions:**

**Diagnostic Criteria for Prehypertension:**

- A systolic blood pressure of ≥ 120 to <140 mm Hg and/or a diastolic blood pressure of ≥ 80 to <90 mm Hg
• Measured on two separate occasions with a minimum interval of at least five minutes between the two measurements with the help of same instrument.
• A participant receiving therapy with antihypertensives was categorized as having hypertension.

BMI was categorized as per WHO BMI classification for Asian population.

Data were entered in MS excel spread sheet and calculated by application of SPSS 20, software. Descriptive analysis, chi-square and from the 2X2 (contingency) table OR were calculated.

RESULTS: Total number of study subjects was 225 all of whom were Hindu. Males were predominant, comprising about 55% of the study subjects. Mean age of the study population was 27.9±5.9 years. Among them general caste was 43.1% but maximum members were scheduled caste (48.0%). 75.1% of study subjects were married. As per socio-economic status BPL (Below Poverty Line) were in majority (68%). Regarding the educational status about 44% of study subjects were illiterate and only 15% had educational qualification of higher secondary or above. Main occupation of the study population was Daily wage labour (DWL) which was about 45% and only 1% of the study subjects were service holders. 4% of the study subjects had past history of hypertension.

Prehypertension was found to be 43% whereas hypertension was detected to be 11% in the study subjects. Among the total number of prehypertensives (n=98), majority were found to have ‘only diastolic prehypertension’ (n=39) while those having ‘both systolic as well as diastolic prehypertension’ numbered 31. [Figure 1 & 2].

Table 1 shows that the percentage of prehypertensives was much higher in the male subjects (60.2%) compared to the females (39.8%) but the percentage of normotensives were almost same in both sexes.

Figure 1: Pie diagram showing the distribution of study population according to blood pressure category.
Figure 2: Cylindrical diagram showing distribution of Prehypertensive category.

Table 1: Sex wise distribution of study population according to BP category (n=225)

| BP category  | Normotensive (%) | Prehypertensive (%) | Hypertensive (%) | Total |
|--------------|------------------|---------------------|------------------|-------|
| Male         | 50(48.5)         | 59(60.2)            | 15(62.5)         | 124   |
| Female       | 53(51.5)         | 39(39.8)            | 9(37.5)          | 101   |
| Total        | 103(100.0)       | 98(100.0)           | 24(100.0)        | 225   |

| Risk factors          | Sex          | Total (%) |
|-----------------------|--------------|-----------|
| Alcohol intake        | Male (%)     | Female (%)|          |
| Yes                   | 33(26.6)     | 0(0.0)    | 33(14.7) |
| No                    | 91(73.4)     | 101(100.0)| 192(85.3)|
| Total                 | 124(100.0)   | 101(100.0)| 225(100.0)|
| Extra salt intake     |              |           |          |
| Yes                   | 60(48.4)     | 57(56.4)  | 117(52.0)|
| No                    | 64(51.6)     | 44(43.6)  | 108(48.0)|
| Total                 | 124(100.0)   | 101(100.0)| 225     |
| Tobacco use           |              |           |          |
| Yes                   | 77(62.1)     | 70(69.3)  | 147(65.3)|
| No                    | 47(37.9)     | 31(30.7)  | 78(34.7) |
| Total                 | 124(100.0)   | 101(100.0)| 225     |
**Table 2: Sex wise distribution of study population according to different behavioural risks for pre hypertension (n=225)**

| Type of activity | Sedentary | Moderate | Hard | Total |
|------------------|-----------|----------|------|-------|
| Sex              |           |          |      |       |
| Male             | 21(16.9)  | 75(60.5) | 28(22.6)| 124(100.0) |
| Female           | 15(14.8)  | 78(77.2) | 8((8.0)| 101(100.0) |
| Total            | 36(16.0)  | 153(68.0)| 36(16.0)| 225(100.0) |

| Physical exercise | Yes | No | Total |
|-------------------|-----|----|-------|
| Sex               |     |    |       |
| Male              | 44(35.5)| 80(64.5)| 124(100.0)|
| Female            | 4(3.9) | 97(96.1)| 101(100.0)|
| Total             | 48(21.3)| 177(78.7)| 225(100.0)|

Table 2 shows alcohol addiction to be 14.7% in the study subjects, all of whom were males, while ‘Extra salt intake’ was more among females (56.4%) compared to males (48.4%). Another notable feature in this table is that the percentage of females using tobacco (69.3%) was higher compared to the males (62.1%). Also, in terms of ‘type of physical activity’ majority of the study population performed moderate type of activity with females (77.2%) having substantial superiority over the males (60.5%). Lastly, majority of the study population avoided leisure time physical exercise, with only 21.3% subjects engaging in it. Among females, only 3.9% engaged in leisure time physical activity.

In our study, survey of habit for the consumption of food substances considered to be protective to the development of raised BP showed that the:

- Average number of days/week of fruit consumption was 0.72 days/wk and the average number of servings per day was 0.91 in the week last; and
- Average number of days/week of vegetable consumption was 6.08 days/wk.

Figure 3 depicts that among the study group 40% were ‘underweight’, 52% were normal weight while the rest were ‘overweight/obese’ as per WHO BMI classification for Asian population.

**Figure 3. Ring diagram showing BMI category of study population.**
A comparative study of the presence of different risk factors between the Normotensive and Prehypertensive subjects among the study population is shown in Table 3. The measurement of the strength of association between the risk factors and prehypertension was done by Odds Ratio (OR) from contingency tables.

Significant relationship of Prehypertension was found with different risk factors such as alcohol intake [OR=2.6 (1.15-6.21)] (p<0.019), extra salt intake [OR=2.8(1.59-4.99)] (p<0.000), tobacco use [OR=2.04 (1.13-3.68)] (p<0.017), physical activity [OR=10.4(3.49-30.92)] (p<0.000) and age [OR=2.09(1.16-3.76)] (p<0.012).

But Physical Exercise [OR=1.70(0.86-3.35)] (p<0.121) and BMI category [OR=1.55(0.56-4.27)] (p<0.385) had no significant relation with Prehypertension category in this study.

| Factors             | Prehypertension vs Normotension (OR with 95% CI) | P value |
|---------------------|--------------------------------------------------|---------|
| Alcohol intake      |                                                  |         |
| Yes                 | 2.6(1.15-6.21)                                   | 0.019   |
| No (reference)      |                                                  |         |
| Extra salt intake   |                                                  |         |
| Yes                 | 2.81(1.59-4.99)                                  | 0.000   |
| No (reference)      |                                                  |         |
| Tobacco use         |                                                  |         |
| Yes                 | 2.04(1.13-3.68)                                  | 0.017   |
| No (reference)      |                                                  |         |
| Type of activity    |                                                  |         |
| Sedentary          | 10.4(3.49-30.92)                                 | 0.000   |
| Rest (reference)    |                                                  |         |
| Physical exercise   |                                                  |         |
| Yes (reference)     | 1.70(0.86-3.35)                                  | 0.121   |
| No                  |                                                  |         |
| Age                 |                                                  |         |
| 18-24yrs (reference)| 2.09(1.16-3.76)                                  | 0.012   |
| 25-35yrs            |                                                  |         |
| BMI                 |                                                  |         |
| <23 (reference)     | 1.55(0.56-4.27)                                  | 0.385   |
| ≥23                 |                                                  |         |

Table 3: Comparison of behavioural risk factors for Prehypertension vs. Normotension (n=201)

**DISCUSSION:** Prehypertension is now recognized as an important public health problem. Nevertheless, the prevalence of Prehypertension varies considerably in different countries, which may be due to ethnicity, as well as various local factors, such as climate and lifestyle. The prevalence of hypertension has also increased during the last decade.6
About 43.5% of study population were Prehypertensive. Only 10.6% were hypertensive, out of which 4% had past history of hypertension in this study. High prevalence of Prehypertension observed in this study was similar to that reported elsewhere in India, like Himachal Pradesh,7 Central India8 and Kerala.9

In this present study the proportion of pre-hypertension was higher among males (60.2%) compared to that in females (39.8%). This concurs with the observation made by a study that males (42.9%) had higher Prehypertensive values when compared to females (34.2%) among rural population of Davanagere.10 Khanam et al. in a study in Bangladesh showed that the prevalence of pre-hypertension was significantly higher among adult men (33.6%) compared to adult women (30.3%) in rural area.11 In our study, we found that increasing age is an independent risk factor for pre-hypertension. Other studies also found that age to be a significant risk factor for pre-hypertension.12

As age is a non-modifiable risk factor, other modifiable risk factors should be controlled through some interventions like avoidance tobacco use, reduction of alcohol as well as salt intake and promotion of leisure time physical exercise etc. Khanam et al, in their study found that increasing BMI is an independent and important risk factor for both pre-hypertension and hypertension.11 Relationship of higher BMI with Prehypertension was also observed in other studies.13,14 In this present study only 8% of study population was observed to be overweight/obese. So no significant relation was established with Prehypertension.

A large proportion of Prehypertensive individuals of our study were found to be indulging in adverse dietary practices such as intake of added salt; lacked adequate physical activity and had addiction to tobacco as well as alcohol. It is well recognized that higher salt intake is associated with higher blood pressure and reduction in salt intake lowers blood pressure. For example, the Intersalt study which investigated the association between 24 h sodium excretion and blood pressure revealed that a higher sodium intake by 100 mmol/day (2.3 mg/day) was reflected in higher SBP/DBP by approximately 3-6/0-3 mm Hg.15

In present study age, tobacco use, alcohol intake, extra salt intake and physical activity were significantly related with Prehypertension but physical exercise and BMI were not significantly related to raised blood pressure. In others studies it was found that being overweight is a primary risk factor for Prehypertension and other risk factors include a family history of hypertension, a sedentary lifestyle, eating high sodium foods, smoking and excessive alcohol intake.16,17

A major limitation of our study was it lacked proper survey on healthy food habit and physical activity measurement was more interview based than objective.

CONCLUSION: In conclusion, our study provides important information on the high burden of Prehypertension prevalent in a rural population. Prevalence of Prehypertension was found to be substantially high in rural area of Bankura District. Also prevalence of associated risk factors was high among rural people. Lifestyle modifications such as reducing intake of excess salt in diet and reducing smoking can achieve a downward shift in the overall blood pressure, thus reducing the risk of hypertension and cardiovascular disease.
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