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Research Article

PREVALENCE AND ASSOCIATED FACTORS OF HYPERTENSION AMONG RURAL TRIBAL ADULTS IN A SUBDIVISION OF DARJEELING DISTRICT, WEST BENGAL

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A B S T R A C T

Background: Hypertension being a prevalent non-communicable disease in India is studied for many years. But studies among the tribal population in West Bengal has rarely being done.
Objective: The study aims to estimate the prevalence of hypertension and its socio-demographic determinants among the tribal adult population.
Methods: A community based cross-sectional study was conducted in June 2014 to May 2015 in the four rural blocks of Siliguri subdivision, West Bengal. The study interviewed 172 tribal participants aged 25-64 years using a pre-designed and pre-tested schedule. Participants were selected by two-stage cluster sampling. Blood pressure was measured, and anthropometric measurements were taken. Descriptive statistics and multivariable logistic regression were applied to find out the determinants of hypertension.
Results: Overall prevalence of hypertension among 172 participants was 22.1% (95% CI: 16.5%, 28.8%) and 41.3% (34.2%, 48.8%) were pre-hypertensive. Multivariable logistic regression analysis showed odds of hypertension was significantly higher among middle aged participants (35-44 years) (AOR: 4.4; 95%CI: 1.1, 17.2), physically inactive (AOR: 11.9; 95%CI: 1.4, 101.4) and participants who had abdominal obesity (AOR: 5.9; 95%CI: 1.8, 18.8). Among the hypertensives 42.1% (16/38) were aware of their hypertension status, 15.8% were under treatment and 10.5% had controlled hypertension.
Conclusion: Hypertension prevalence was high among the adult tribal population of rural Siliguri. Level of awareness and treatment was low among the participants. Raised prevalence of hypertension was associated with middle age, physical inactivity and abdominal obesity.

INTRODUCTION

Cardiovascular diseases (CVD) remains the major cause of all-cause deaths globally and in India.[1] Evidence suggested that raised blood pressure (BP) or hypertension is the leading preventable cause of cardiovascular disease (CVD).[2,3] In spite of having many sound guidelines and treatment options hypertension is often poorly managed disease of community.
Though the cause of hypertension is often unknown, but factors like age, sex, ethnicity somewhat contributes to it. Modifiable factors like smoking, harmful use of alcohol, physical inactivity, overweight or obesity, high salt intake, stress and air pollution also influence the likelihood of hypertension.[4] Hypertension alone is attributed to 10.8% of all the deaths and 4.6% of DALYs in India.[5]

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The prevalence of hypertension in India ranges from 25% to 35%, of these only 25% of rural Indians are aware of their hypertensive status and are being treated respectively. Moreover, only 10% of hypertensives in rural India have their blood pressure under control.[6]

In recent decades, the tribal population of the country are also experiencing rising prevalence of hypertension.[7] Acculturation, age, education, physical inactivity, alcohol consumption, overweight/obesity are associated with hypertension in tribes.[7-10]In this context, there was paucity of research about the burden and associated factors of hypertension among the tribal population of northern West Bengal. So, this study was conducted to measure the prevalence of non-communicable disease (NCD) risk factors (tobacco use, alcohol use, unhealthy diet, physical inactivity, overweight/obesity, abdominal obesity and raised blood pressure or hypertension) among the tribal population of Siliguri subdivision of Darjeeling district, West Bengal. The secondary objective was to assess the socio-demographic factors associated with them. In this article we have focused on

raised blood pressure or hypertension and its determinants. The other risk factors of NCDs were described in a separate article.

MATERIALS AND METHODS

Study design

The study was a descriptive cross-sectional study, reported as a part of another larger study which aims to explore the behavioural and biological risk factors of non-communicable disease among the rural tribal population of Siliguri.

Study setting and duration

The study was conducted in the four community development blocks (Matigara, Phansidewa, Naxalbari, Kharibari) of Siliguri sub division of West Bengal during June 2014 to May 2015. Siliguri is situated at the base of Himalayan mountains and known as gateway of North-eastern India. The four blocks in this study are surrounded by the Sub-Himalayan ranges and neighbouring states of Bihar and countries like Bangladesh and Nepal. The four blocks contain 22 gram panchayats and two census towns - Bairatisal and Uttar Bagdogra.[11]

Study subjects

The study subjects were adult tribal population aged 25-64 years who were resident of Siliguri subdivision for at least one year. Pregnant women and seriously ill persons were excluded from the study.

Sample size and sampling

Sample size of 180 was estimated taking 50% anticipated prevalence of hypertension, 10% absolute precision, 20% non-response rate and 1.5 design effect. Study subjects were recruited by two stage cluster sampling technique. In the first stage of sampling, 30 villages were selected from the four community development blocks of Siliguri subdivision by population proportion to size. Then sampling frame of tribal population of the selected villages were prepared with the help of local health workers and electoral list. From the sampling frames six households were selected by simple random sampling from each of the 30 selected clusters. Then one eligible study subject was selected from each household by Kish method.[12]

Data Collection

A pre-designed and pre-tested questionnaire based on WHO STEPS[12] instrument was used to collect data. Data were collected after visiting each household in the community. Six enlisted schedule tribe households from eachidentified cluster was visited and one eligible subject was selected from each household in the study. A maximum of three visits were done before declaring as non-respondent if the eligible subject was found absent on first visit. Study subjects were explained about the purpose and procedures of the study and written informed consent was obtained before the interview. During the interview, socio-demographic details (age, sex, education, occupation, income, tribe) were first asked; followed by behavioural factors like tobacco use, alcohol consumption, dietary habits and physical activity pattern.

During the interview the participants were asked to sit quietly with his/her legs uncrossed. After the interview on socio-demographic and behavioural factors physical measurements were done. First, blood pressure was measured. If participants have moved around during the interview, they were asked to rest for 15 mins after the interview. Three blood pressure measurements were taken. The participants were asked to rest for three minutes between each of the readings. Blood pressure measurement was performed following standardized steps according to WHO STEPS guidelines[12] using sphygmomanometer. The mean of the second and third readings were considered final. After that, height, weight and waist circumference were measured by standardized techniques[12].

Outcome Variable

The outcome variable of this study was raised blood pressure or hypertension.

Independent Variables

The independent variables of this study were age, gender, education, occupation, marital status, tobacco use, alcohol consumption, physical inactivity, unhealthy diet, overweight/obesity and abdominal obesity.

Operational definitions[12]

Hypertension was defined as systolic (SBP) and/or diastolic blood pressure (DBP) > 140/90 mmHg and/or history of intake of anti-hypertensive medication in the past two weeks.

According to Joint National Committee (JNC seventh report) classification of raised blood pressure or hypertension was categorized as normal BP: SBP < 120 and DBP < 80 mm of Hg; pre-hypertension: SBP 120-139 and/or DBP 80-89 mm of Hg; stage 1 hypertension: SBP 140-159 and/or DBP 90-99 mm of Hg; and stage 2 hypertension: SBP >160 and/or DBP > 100 mm of Hg.

Current tobacco use was defined as history of smoking or use of smokeless tobacco within the past 30 days.

Current alcohol consumption was defined as consumption of alcohol within the past 30 days. Physical inactivity was defined as less than 150 minutes of moderate-intensity physical activity or < 600 MET-minutes per week.
Unhealthy diet was defined as eating less than five servings of fruits and/or vegetables per day.

Overweight was defined as body mass index (BMI) > 25 kg/m^2.

Abdominal obesity was defined as waist circumference ≥ 90 cm in men and ≥ 80 cm in women.

Statistical analyses

Data were double checked for consistency and completeness and entered in Microsoft excel. Data were organized and presented using the principles of descriptive statistics. Continuous data were visually assessed by histogram and statistically by Shapiro-Wilk test for normality. Categorical data were expressed in proportions with 95% Confidence interval (CI) and mean with standard deviations (SD) was calculated for continuous data. Chi-square and independent t test were applied as test of significance for categorical and continuous data respectively. Multivariable logistic regression analysis by entry method was applied for identifying the factors associated with hypertension. A two-sided p value of < 0.05 was considered statistically significant. Data were

analysed in IBM SPSS Statistics for Windows Version 22.0 (Armonk, NY: IBM Corp).

Ethical Consideration

Ethical clearance was obtained from Institutional Ethics Committee of North Bengal Medical College, Darjeeling. Participants were informed about the purpose and process of the study and written informed consent were taken.

RESULTS

Background Characteristics

A total of 172 subjects could finally be studied out of 180 sample population. The mean age of the participants was 42.10 +11.3 years. Among the participants 51.7% were women, 64.5% Hindu, 31.4% Christian, 4.1% Buddhist, 78.5% were currently married and 14.5% were widowed. Majority of the participants (54.1%) were belonged to socio-economic class IV (Modified B G Prasad scale), 26.7% belonged to class III, 12.2% to class II, 4.1% and 2.9% to class V and I respectively. Most of the participants (69.8%) were current tobacco user either smoking (cigarette, bidis) or using any form of smokeless tobacco (Khaini, gutkha, snuff, pan masala with tobacco etc.). Alcohol was consumed by 40.7%, most of the participants (96.5%) consumed diet less in vegetable and/or fruit, and only few participants were physically inactive (2.9%). Gender wise distribution of background characteristics, behavioural and physical risk factors were shown in Table 1.

Prevalence of Hypertension

A total of 38 participants had systolic blood pressure raised >140 mmHg and/or diastolic blood pressure > 90 mmHg or were currently on medication for raised blood pressure. Overall, the prevalence of hypertension among the participants was 22.1% (95% CI: 16.5%, 28.8%). Prevalence was higher in men 22 (26.5%; 95% CI: 18.2, 36.9) compared to women 16 (18.0%; 95% CI: 11.4, 27.2) without any statistically significant difference (p =0.178). Moreover, 41.3% (95% CI: 34.2%, 48.8%) of participants were pre-hypertensive. On grading of hypertension 9.2% (95% CI: 5.8%, 14.6%) and 10.5% (95% CI: 6.7%, 15.9%) of the participants had stage I and stage II hypertension (according to JNC VII criteria) respectively.

Mean systolic BP among the participants was 126.0 + 26.4 mm Hg, no significant difference was observed in men and women. Mean diastolic BP of participants was 80.5 + 13.2 mm Hg with significant difference between men and women. Gender wise distribution of mean SBP, DBP and Body mass index (BMI) of the participants were tabulated in Table 2.

Health Seeking Behaviour, Awareness, Treatment and Control of Hypertension Among Participants

Overall, 77 (44.8%) participants had measured their blood pressure previously. Health care seeking behaviour of participants about blood pressure measurement was significantly ($p < 0.001$) high among women (57.3%) compared to men (31.3%). Among the 38 hypertensives 16 (42.1%) were aware of their hypertension status. Other 22 (12.8%, n=172) of participants were diagnosed with hypertension at the time of the interview. The awareness of hypertension was comparable in women and men (43. 8% in women Vs 40.9% in men, $p > 0.05$). Only 6 (15.8%, n=38) of hypertensives were currently on medication for hypertension. And only 4 (10.5%, n=38) of hypertensives had controlled hypertension. (Figure 1)

Determinants of Hypertension in Participants

Table 3 describes the socio-demographic and behavioural determinants of hypertension among the participants. On bivariate analysis, age, overweight and abdominal obesity were found to be statistically significant and physical inactivity was also found as marginally significant. Gender, education, occupation, current tobacco and alcohol use and unhealthy diet were found not to be associated with hypertension.

On multivariable logistic regression analysis, middle aged 35-44 years participants showed 4.4 times higher odds (AOR 4.4, 95% CI: 1.1, 17.2) of hypertension compared to young adults. The other age group of 45-54 years and 55-64 years participants although shows raised odds of hypertension but it was not statistically significant. On multivariable analysis, physical inactivity and abdominal obesity showed 11.9 times and 5.9 times higher odds of hypertension. Although male gender showed higher odds of hypertension compared to females and home maker, labourer and unemployed/retired participants showed higher odds of hypertension compared those working in service/business, they were not statistically significant. Further, tobacco use, alcohol consumption, unhealthy diet and overweight did not show significant higher odds of hypertension.

Table 1 Gender wise distribution of background characteristics of the participants (N = 172)

Variables	Men No (%)	Women No (%)	Both No (%)
Age (years)			
25-34	23 (27.7)	24 (27.0)	47 (27.3)
35-44	25 (30.1)	29 (32.6)	54 (31.4)
45-54	18 (21.7)	22 (24.7)	40 (23.3)
55-64	17 (20.5)	14 (15.7)	31 (18.0)
Education			
Illiterate	38 (45.8)	64 (71.9)	102 (59.3)
Literate	45 (54.2)	25 (28.1)	70 (40.7)
Occupation			
Service/Business	11 (13.3)	3 (3.4)	14 (8.1)
Unemployed/retired	9 (10.8)	3 (3.4)	12 (7.0)
Homemaker	0 (0.0)	54 (60.7)	54 (31.4)
Labourer	63 (75.9)	29 (32.6)	92 (53.5)
Current tobacco user	78 (94.0)	42 (47.2)	120 (69.8)
Current alcohol drinker	54 (65.1)	16 (18.0)	70 (40.7)
Unhealthy diet[$]	81 (97.6)	85 (95.5)	166 (96.5)
Physically inactive	2 (2.4)	3 (3.4)	5 (2.9)
Overweight	11 (13.3)	10 (11.2)	21 (12.2)
Abdominal obesity	10 (12.0)	35 (39.3)	45 (26.2)

Table 2 Gender wise distribution of mean blood pressure and BMI

Variables	Men	Women	Overall	P value[$]
Mean BMI (+ SD)	21.2 (+ 2.9)	19.9 (+ 3.2)	20.6 (+ 3.1)	< 0.05
Mean SBP (+ SD)	129.4 (+ 25.2)	122.8 (+ 27.1)	126.0 (+ 26.4)	0.104
Mean DBP (+ SD)	83.2 (+ 11.9)	77.9 (+ 13.9)	80.5 (+ 13.2)	< 0.05

BMI – Body mass index, SBP – Systolic blood pressure, DBP – Diastolic blood pressure

[$]p value between men and women (independent t test)

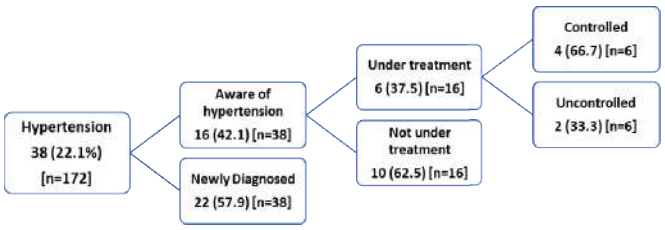

Figure 1 Awareness, treatment and control of hypertension among the participants

Table 3 Factors associated with hypertension among the participants

Covariates	Categories	Crude Odds Ratio (95% CI)	P value	Adjusted Odds Ratio* (95% CI)	P value
Age (years)	25-34	1 (Referent)		1 (Referent)	
	35-44	3.2 (1.1, 9.7)	0.04	4.4 (1.1, 17.2)	<0.03
	45-54	2.1 (0.6, 7.0)	0.23	2.5 (0.5, 11.5)	0.24
	55-64	4.0 (1.2, 13.2)	0.02	3.6 (0.7, 18.8)	0.13
Gender	Female	1 (Referent)		1 (Referent)	
	Male	1.6 (0.8, 3.4)	0.18	1.8 (0.4, 7.6)	0.43
Education	Literate	1 (Referent)		1 (Referent)	
	Illiterate	0.7 (0.3, 1.5)	0.34	0.5 (0.2, 1.6)	0.26
Occupation	Service/ business	1 (Referent)		1 (Referent)	
	Unemployed/ retired	4.3 (0.6, 28.3)	0.13	7.2 (0.6, 84.0)	0.12
	Home maker	1.2 (0.2, 6.3)	0.83	2.9 (0.3, 30.7)	0.38
	Labourer	1.9 (0.4, 9.1)	0.43	5.1 (0.6, 40.5)	0.12
Current tobacco user		2.2 (0.92, 5.48)	0.08	1.4 (0.4, 4.6)	0.60
Alcohol use		1.6 (0.8, 3.3)	0.19	1.3 (0.5, 3.6)	0.60
Physical inactivity		5.6 (0.9, 35.2)	0.05	11.9 (1.4, 101.4)	0.02
Unhealthy diet[#]		1.4 (0.2, 12.7)	0.75	1.5 (0.1, 18.4)	0.75
Overweight		5.1 (1.9, 13.1)	< 0.001	2.5 (0.8, 8.2)	0.12
Abdominal obesity		4.2 (1.9, 8.9)	< 0.001	5.9 (1.8, 18.8)	< 0.01

[#] Diet less than 5 servings of vegetable and/or fruits per day. *Adjusted for other variables in the model.

DISCUSSION

Prevalence of Hypertension

The present study represented the prevalence, pattern and determinants of hypertension in tribal population of northern West Bengal. The tribal population of northern West Bengal showed rising prevalence of hypertension when compared to the pooled prevalence among Indian tribes.[7] However when individual states were considered the prevalence was found to be comparable to the tribes of Assam,[13] Andhra Pradesh, Maharashta[14] and Madhya Pradesh.[15] However, findings from studies conducted among overall population reported a rising trend of hypertension in Delhi,[16] West Bengal,[17, 18] and Kerala[19]. The probable explanation could be that these studies were mostly conducted in the urban and slum population who were more exposed to changing lifestyles due to ongoing demographic transition and urbanization. This highlights the fact that tribal population experiences lower burden of hypertension compared to overall population. Similar findings were observed in systematic reviews conducted among general[20] and tribal population of India[7]. The isolated existence and primitive beliefs and customs of tribal people often resist them from modern amenities and lifestyle changes.[21] However, recent evidences comparing the rural-urban prevalence of hypertension have reported that there is an increasing trend of hypertension in rural areas compared to urban areas which was probably due to rapid urbanization and lifestyle changes.[22]

In contrary to the study findings, a survey among tribes in West Bengal conducted by ICMR showed raised prevalence of hypertension (30%) comparable in both men and women.[14] The reported coverage of the survey was only 59% of the selected population. Likewise, another study in Assam done by Hazarika *et al*.[9] found 60.8% prevalence of hypertension, women had higher prevalence than men throughout all age groups. Unlike the present study, studies conducted in other south and north-east region of India in Kerala,[8,23] Tamil Nadu,[24] and Tripura[25] stated higher prevalence of hypertension among tribal people compared to tribes of West Bengal. However, a study carried out by Meshram *et al*.[26] in Maharashtra reported the prevalence of hypertension as 23% which resembled findings of our study.

Furthermore, a considerable proportion of population (44.6% men and 38.2% women) in the present study were pre-hypertensive. Likewise, Meshram *et al*.[26] had reported a comparable prevalence of pre-hypertension (45% men and 39% women) among tribal population in Maharashtra. As evidences suggested, pre-hypertension is a significant risk factor for cardiovascular disease and morbidity[27, 28]. Hence, community-based screening programme for hypertension detection should be a part of primary health care among the tribal population in the study area. In addition, 10% of participants in our study had been diagnosed in stage II hypertension. Similar pattern of hypertension severity was also observed in other surveys in West Bengal[14], Assam[14] and Tripura[25] and Tamil Nadu.[24] The huge proportion of stage II hypertension could be explained as because of unawareness of the participants regarding hypertension that might also be due to lack of education. This further emphasizes the importance of urgent intervention to increase the awareness about hypertension in the study population.

Factors Associated with Hypertension

Though the likelihood of hypertension was high across all age groups compared to younger age group participants, only middle-aged adult participants showed significant difference. Similar observation was reported among the Missing tribes of Assam by Mishra *et al*.[13], in Kani tribes of Kerala[23] and tribal population of Maharashtra.[26] Several studies have reported men as a significant risk factor of hypertension.[13,18,19,23] However, in our study men showed higher odds of hypertension but the relation was not significant. In the present study the odds of hypertension were significantly higher among participants with abdominal obesity and insufficient physical activity. Similar risk factors of hypertension were reported from Maharashtra[26] and Kerala.[8] Men, service/business occupation, central obesity, alcohol and tobacco use were the identified risk factors for hypertension among tribes in Maharashtra; whereas male gender, high age, low education, alcohol consumption, sedentary behaviour, overweight/obesity increases the risk of hypertension among the tribes of Kerala.[8, 23] In another study by Radhakrishnan *et al*. in Tamil Nadu smoking, alcohol consumption and positive family history were factors that increased the risks of hypertension.[24] Moreover, in a national level survey among tribes in India illiteracy, low income, tobacco and alcohol use were identified as the risk factors for hypertension. [14] Likewise, in our study tobacco and alcohol use, labour, homemaker and unemployed participants showed higher chances of hypertension, though the relationships were not significant. Nevertheless, we should not overlook the fact that our study population was experiencing huge burden of risk

behaviours like tobacco and alcohol use, poor dietary habits. Hence, further exploration of these factors is suggested in future.

Awareness, Treatment and control of Hypertension

It has been noted that less than half of hypertensives (42.1%) in the present study were aware of their hypertension status, among the hypertensives 37.5% were under treatment and 66.7% of those under treatment had controlled blood pressure. From literature the "rule of halves" stated that "half of hypertensive patients are not aware of their hypertensive status (remain undiagnosed), half of those with known hypertension do not receive any treatment and half of those who are treated, do not achieve control for hypertension."[29] Further, studies have also been highlighted the existence of "Rule of halves" in hypertension diagnosis, awareness, treatment and control in India.[30, 31] Our study to some extent supports this supposition.

When considered the proportion among all hypertensives, only 15.8% of known hypertensives were under treatment and only one in ten of hypertensive participants had their blood pressure under control. Gupta *et al*. performed a 25 years of trend analysis from 1991 to 2014 in hypertension awareness, treatment and control in an urban population of western India. The study found an increasing trend of awareness (from 13% to 56%), treatment (from 9% to 36%) and control (from 2% to 21%) among hypertensive participants.[32] The higher awareness, treatment and control of prevalence in western India compared to current study implies the importance of social determinants of health. With higher education, income and social status the level of hypertension awareness, treatment and control also increases.[8, 33] Similarly, our study supports the findings from a systematic review on hypertension in India that has reported the hypertension awareness, treatment and control was lower when in rural areas compared to urban communities.[20]

Strengths and Limitation

The major strength of this study was that, this was the first attempt to explore the burden and associated factors of hypertension among the tribal population of northern part of West Bengal. Secondly, the study was community-based and conducted by visiting households from the selected villages which was scattered throughout the study area; thus, a representative population was included in the study. Yet, our study also has certain limitations. First, diagnosis of hypertension should ideally be done based on the average of two or more blood pressure readings following standardized method, on each of two or more visits. However, in this study we have diagnosed participants as hypertensive based on three blood pressure readings taken on a single visit. This might over-estimate the prevalence of hypertension. Second, the sample size of the study was small when we want to compare the prevalence, awareness, treatment and control of hypertension across ages, gender and other socio-demographic factors. Hence, future study including larger participants could help to explore tribe specific socio-demographic determinants of hypertension. Third, history of extra salt intake was a common habit of the participants but due to non-specific response about the quantity of salt intake it was excluded from the analysis. Four, other social determinants of health like culture, beliefs and attitude towards hypertension were not explored in this study. Further, factors for low level of awareness, treatment and control was not explained here. Exploration of multi-dimensional aspects of epidemiology of hypertension could help in better understanding and strategic planning of hypertension control.

CONCLUSION

High prevalence of hypertension was detected among the tribal population of northern West Bengal compared to rest of tribes of India. Middle age group, physical inactivity and abdominal obesity were significant determinants of hypertension among participants. Besides, the awareness, treatment and control of hypertension among participants was very low. High prevalence combined with low awareness of hypertension among the participants implies critical burden in the study area. Urgent community-based intervention to raise the awareness of hypertension in participants is needed to regulate the future burden of hypertension among tribal population of study area.

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