

# Anthropometric Factors and Hypertension in an Indian Community

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**Abstract:** Aims and objectives: Now-a-days, hypertension is a serious emerging cardiovascular problem throughout the world. The main aim of this study is to determine the prevalence of hypertension according to the anthropometric factors within the Scheduled Caste community of the District Nadia, West Bengal, India. Methods: A house-to-house population based survey was conducted within the Scheduled Caste community of the district Nadia, West Bengal, India, by the author (Dr. Maharaj Biswas) himself, interviewed the participants using pretested structured standard questionnaire. Data regarding hypertension (age, sex, weight, height, waist, hip, salt intake, oil intake, blood pressure etc.) were taken carefully from 2,453 participants between 10.00am–4.00pm. Data were analyzed using chi-square test and z-statistic. Results: The overall crude prevalence of pre-hypertension, ISH, IDH, normotensive and SDH were 20.09%, 7.54%, 6.48%, 50.02% and 15.85% respectively in the studied people. Both chi-square test and z-test identified that both blood pressure and hypertension were significantly associated with increasing BMI and WHR. Conclusion: The prevalence of hypertension provided a significant increase within the Scheduled Caste Community of the District Nadia, West Bengal, India based on certain anthropometric factors.

**Keywords:** Anthropometric factors, blood pressure, hypertension, Scheduled Caste community, normotensive, cardiovascular disease.

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## I. INTRODUCTION

Hypertension is a common health problem in developed countries and a major risk factor for cardiovascular diseases (1), and affects approximately 26% of the adult population worldwide (2). Hypertension is an important independent predictor of cardiovascular disease, cerebrovascular accidents and death (3). Epidemiological studies have revealed a strong relation between obesity and hypertension (4). Obesity alone possibly accounts for 78% and 65% of essential hypertension in men and women as revealed in the Framingham's study (5). The prevalence of obesity and central body obesity is significantly higher in hypertensive group compared to the normotensive one (6). The incidence of hypertension is increasing day by day due to changes in lifestyle and environment. Hypertension is a major contributor to cardiovascular morbidity and mortality in industrialized countries (7). Multivariable analysis indicates that the baseline body mass index and weight gain are important determinants of future hypertension, and that systolic rather than diastolic baseline blood pressure is the major determinant of progression. The Framingham study suggested that persons are with normal or higher normal blood pressure return for follow-up blood pressure checkups at 5 years intervals (8).

In the present study, a door to door population based survey was conducted to estimate the current prevalence and distribution of hypertension according to various risk factors, but here only the anthropometric risk factors-wise incidence of hypertension within the Scheduled Caste community of the District Nadia, West Bengal, India, in individuals aged 20-70years, were studied. This information regarding the risk factors of hypertension will help to recommend specific life style interventions and to assess their impact on the control of hypertension.

## II. MATERIALS AND METHODS

### Data collection:

A door to door survey was conducted within the SC people of within the Scheduled Caste Community of the District Nadia, West Bengal, India. The methodological details of the study have been conducted in three villages (i.e. Chowgachha of block Krishnaganj, Bagula of block Hanskhali and Priyanagar of block Chakdaha) of the District Nadia (9). About 2,453 SC people of three selected villages of the district Nadia, WB, India were interviewed using pretested structured standard questionnaire to collect data regarding hypertension. All the individuals aged  $\geq 20$  years were considered as participants for this study. Hypertensive (SBP/DBP  $\geq 140/90$  mmHg for  $\geq 18$  years of age) individuals were diagnosed according to the seventh report of American JNC, 2003 (10). Blood pressure, heart rate, body weight, height and waist and hip circumference were measured accurately using standard instruments. Besides these, biochemical parameters of blood (e.g. blood glucose, lipid profile, electrolytes etc.) and urine samples (e.g. electrolytes) were also measured using standard instruments and techniques. Here only obesity-related hypertension was highlighted. Anthropometric measurements including height, weight, waist and hip were measured for calculating BMI and WHR using standard formula weight in kg/height in  $m^2$  and waist/hip ratio respectively. BMI was used to define normal (19-24  $kg/m^2$ ) overweight (25-29  $kg/m^2$ ), obesity (30-39  $kg/m^2$ ) and extreme obesity (40-54  $kg/m^2$ ) (11). Central obesity as per Indian criteria was defined as WHR  $> 0.88$  in males and  $> 0.81$  in females (12). Blood pressure in different BMI and WHR groups were compared with control group. Here, control are those with normal hypertensive factors like blood pressure, BMI, WHR, serum lipid profile and glucose level, take low salt and fat diet, do exercise regularly etc. otherwise cases.

### Statistical analysis:

Data were expressed as Mean  $\pm$  SEM or SD, and were analyzed using Chi-square test and z-test at both 5% and 1% level of significance. SPSS 12.0 software for windows was used to analyze the data.

## III. RESULTS

The prevalence of normotensive, PH, ISH, IDH and SDH in overall and according to anthropometric factors was given in the Table no-1 and Figure no- 1 and 2. The overall crude prevalence of normotensive, PH, ISH, IDH and SDH in studied people were 50.02%, 20.09%, 6.48%, 7.54% and 15.85% respectively (Figure no-1). The prevalence of hypertension in 15-19.9, 20-24.9, 25-29.9 and  $\geq 30$   $kg/m^2$  BMI groups were 8.09%, 14.34%, 26.80% and 29.05% respectively (Table no-1 and Figure no-2). The prevalence of hypertension in 0.8-0.89 and 0.9-0.99 WHR groups were 8.71% and 19.33% respectively (Table no-1 and Figure no-2). There was a significant increase of blood pressure in 25-29.9  $kg/m^2$  ( $p < 0.05$  for SBP and  $p < 0.01$  for DBP) and  $\geq 30$   $kg/m^2$  ( $p < 0.01$  for both SBP and DBP) BMI groups compared to the control group (Table no-2). Significant increase of blood pressure was also found in 0.9-0.99 WHR ( $p < 0.01$  for both SBP and DBP) group in relation to the control one. On the other hand, blood pressure was not significantly changed in the people with  $< 0.9$  WHR and  $< 25$   $kg/m^2$  BMI compared to the control group. Significant association between prevalence of hypertension with increasing BMI ( $\chi^2 = 104.509$ , d.f. = 3,  $p < 0.01$ ) and WHR ( $\chi^2 = 45.596$ , d.f. = 1,  $p < 0.01$ ) was also noticed in this study (Table no-3 and 4).

**Table-1: Overall and anthropometric factors wise prevalence of HTN within the Scheduled Caste Community of the District Nadia, West Bengal, India**

Anthropometric factors		Number	Normal (%)	Prevalence of hypertension (%)			
				ISH	IDH	PH	SDH
<b>Total population surveyed (N)</b>		2,453	50.02	6.48	7.54	20.09	15.85
<b>BMI (Kg/m)</b>	<b>15-19.9</b>	803	63.38	5.23	4.60	18.67	8.09
	<b>20-24.9</b>	976	54.71	5.12	5.87	19.97	14.34
	<b>25-29.9</b>	526	26.80	9.69	13.30	23.38	26.80
	<b><math>\geq 30</math></b>	148	29.05	10.81	14.18	16.89	29.05
<b>WHR</b>	<b>0.8-0.89</b>	803	59.40	6.47	4.85	20.54	8.71
	<b>0.9-0.99</b>	1,650	44.84	6.48	9.45	19.87	19.33

Table-2: Variation of blood pressure in relation to anthropometric factors within the Scheduled Caste Community of the District Nadia, West Bengal, India

Anthropometric factors		SBP±SEM	z -value	DBP±SEM	z -value
Control		117.13±0.51	-	78.35±0.41	-
BMI (Kg/m)	15-19.9	115.67±1.62	0.90	76.11±1.18	1.89
	20-24.9	117.70±1.01	0.56	78.29±0.51	0.11
	25-29.9	122.30±2.08	2.48*	82.80±0.76	5.98**
	≥30	130.20±1.07	12.21**	89.74±1.06	10.74**
WHR	0.8-0.89	117.30±0.41	0.41	77.57±0.49	1.59
	0.9-0.99	125.89±0.48	18.25**	86.93±0.71	12.08**

\*=Significant at 5% level and \*\*= Significant at 1% level

Table-3: Table showing the increased body mass index wise distribution of hypertension within the Scheduled Caste Community of the District Nadia, West Bengal, India

BMI groups	15-19.9	20-24.9	25-29.9	≥30	Total
Hypertensive	65	140	141	43	389
Non-hypertensive	738	836	385	105	2,064
total	803	976	526	148	N=2,453

$\chi^2 = 104.509$ , d.f.= 3,  $p < 0.01$

Table-4: Table indicating the waist hip ratio- wise distribution of hypertension within the Scheduled Caste Community of the District Nadia, West Bengal, India

WHR groups	0.8-0.89	0.9-0.99	Total
Hypertensive	70	319	389
Non-hypertensive	733	1,331	2,064
Total	803	1,650	N = 2,453

$\chi^2 = 45.596$ , d.f. = 1,  $p < 0.01$

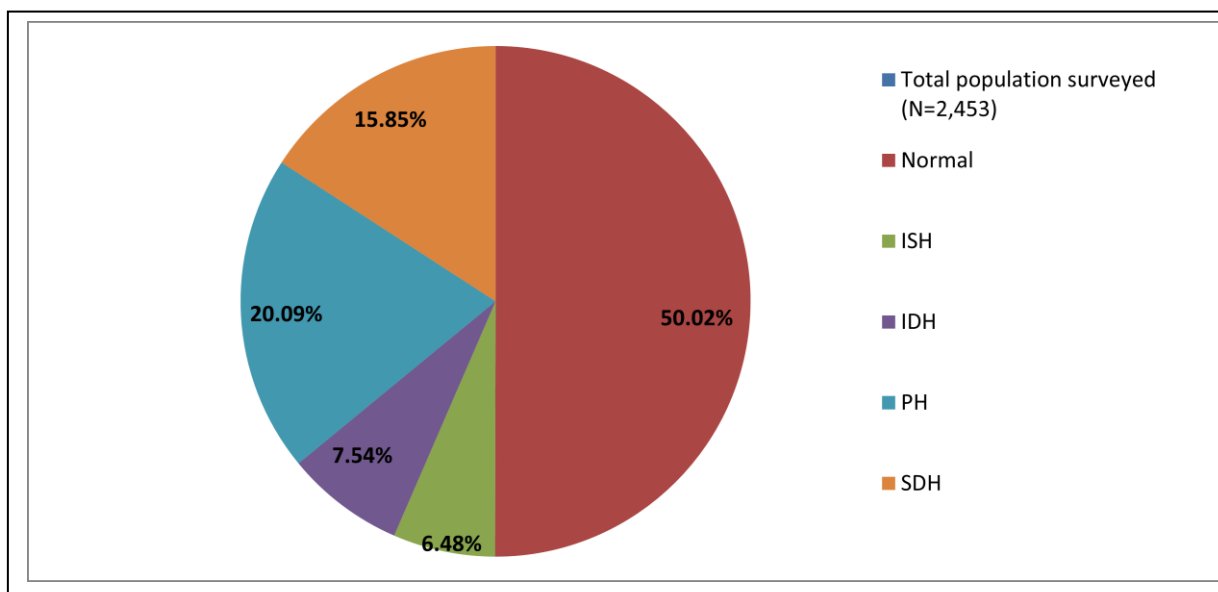


Fig. 1: Overall crude prevalence of hypertension within the Scheduled Caste Community of the District Nadia, West Bengal, India

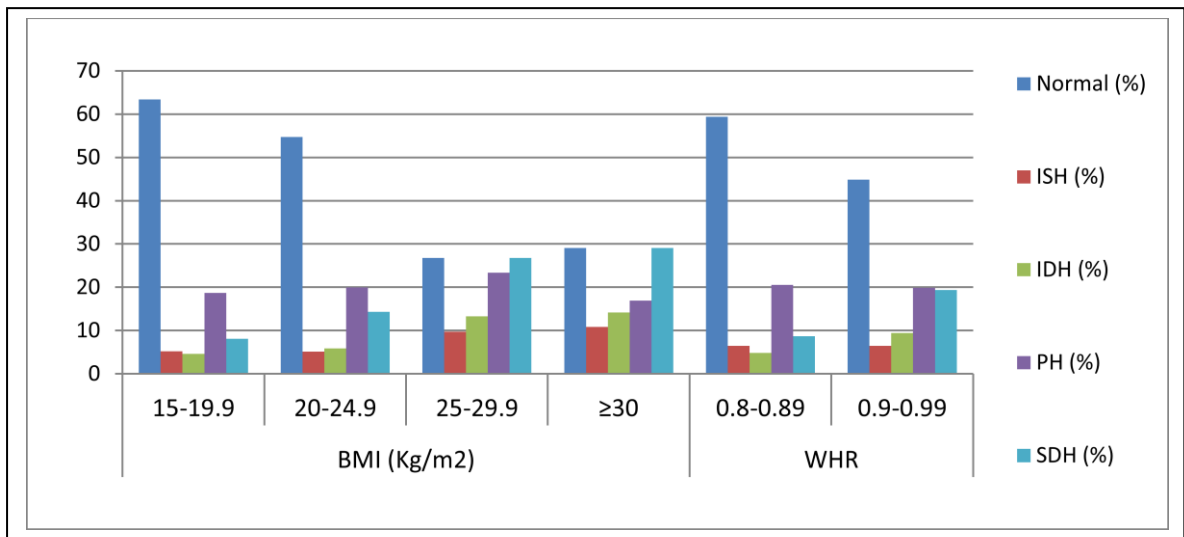


Fig. 2: Anthropometric factors and prevalence of HTN within the Scheduled Caste Community of the District Nadia, West Bengal, India

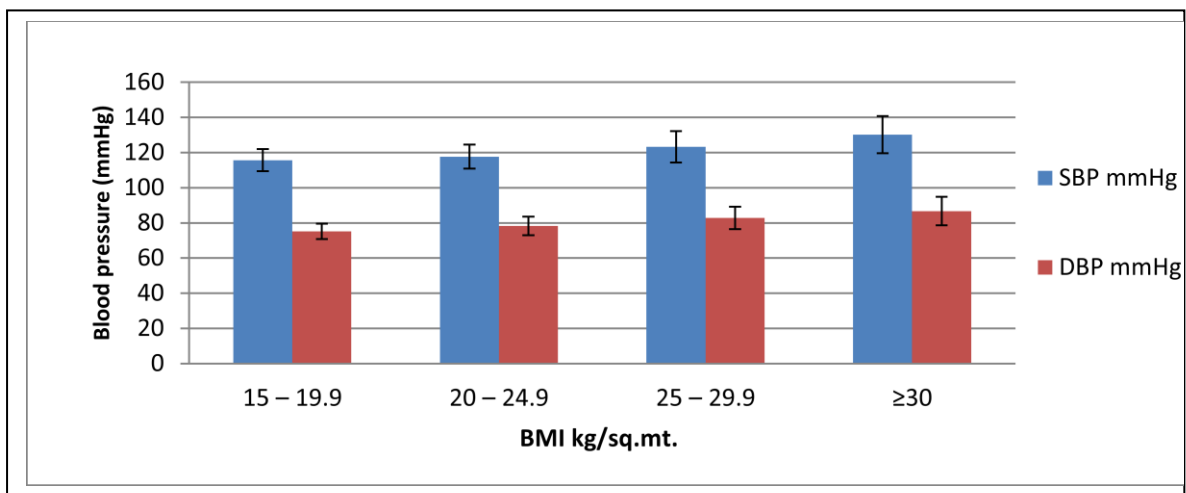


Fig. 3: Body mass index-wise distribution of blood pressure within the Scheduled Caste Community of the District Nadia, West Bengal, India. Data were presented as Average ± SD

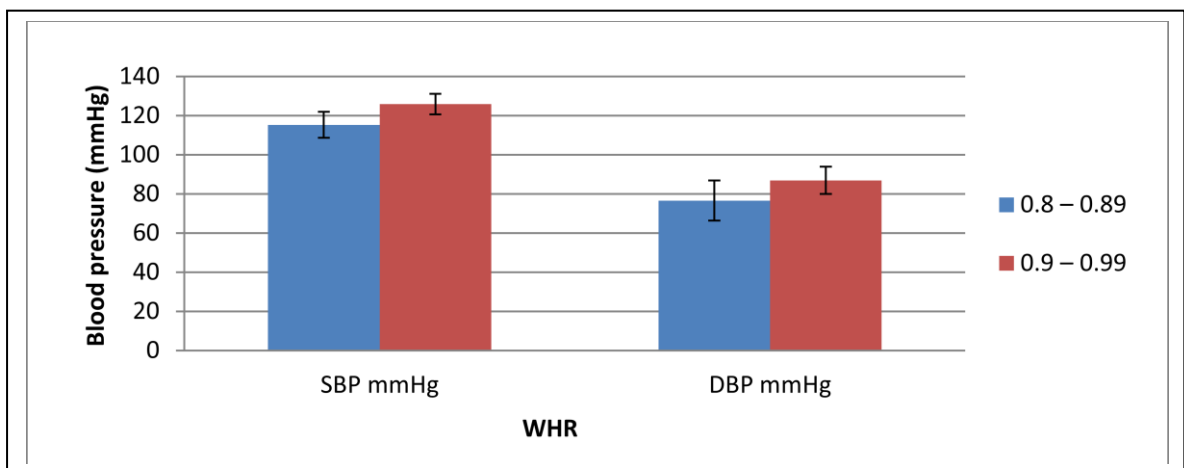


Fig. 4: Waist hip ratio wise distribution of blood pressure within the Scheduled Caste Community of the District Nadia, West Bengal, India. Data are presented as Average ± SD

#### IV. DISCUSSION

Like this study, many epidemiological studies on hypertension were conducted worldwide to find out factors relating to the development of hypertension or other cardiovascular diseases. In their studies it was found that hypertension was associated with obesity and central obesity (6, 9, 11, 13).

Hypertension was higher in males than females. This kind of work was also reported by some other workers. In some studies it was observed that males showed higher incidence of hypertension than females (14, 15).

A positive association was observed between body mass index and development of hypertension. The persons having  $BMI \geq 25$  showed higher risk of hypertension (26.80%). Similar findings were reported by a number of studies on hypertension, where these studies also marked that the prevalence of hypertension was also higher in those candidates who were suffering from obesity problems (14, 15). The occurrence of hypertension was increased gradually with increase of body mass index. The prevalence of hypertension in  $\leq 19.9$  kg/m<sup>2</sup>, 20-24.9 kg/m<sup>2</sup> and  $\geq 25$  kg/m<sup>2</sup> groups of BMI were 9.27%, 23.23% and 29.62% respectively (9).

The prevalence of HTN was higher in persons with central obesity (Indian criteria), as reflected by a high WHR, than those with low WHR. 8.71% and 19.33% HTN are found in 0.8-0.88 and 0.9-0.99 WHR group respectively. These compatible findings were reported by some other workers. They found that hypertension was very common in higher central obesity group than normal (16). In another study it was found that the prevalence of hypertension in 0.8-0.89 and 0.9-0.99 waist hip ratio groups were 0.7.89%, 23.12% respectively (9).

#### V. CONCLUSION

The overall crude prevalence of hypertension in this study was 15.85%. From this study it can be concluded that the incidence of hypertension was gradually increased with increase of various kind of anthropometric factors like body mass index ( $BMI \geq 25$  kg/m<sup>2</sup>) and central obesity ( $WHR \geq 0.9$ ).

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