DOI: 10.21088/ijra.2454.9118.12126.5

Indian Journal of Research in Anthropology
Volume 12, Number 1, January-June 2026

ORIGINAL ARTICLE

Assessment of Hypertension and Associated Factors among the Middle-Aged and Elderly Males of Paschim Medinipur, West Bengal, India

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HOW TO CITE THIS ARTICLE:

Kundu Arunima, Roy Shimul. Assessment of Hypertension and Associated Factors among the Middle-Aged and Elderly Males of Paschim Medinipur, West Bengal, India. Ind J Res Anthropol 2026; 12(1): 47-57.

ABSTRACT

Aims: This study investigates the prevalence of hypertension among the middle aged and elderly males of Paschim Medinipur. The study also tries to examine the associated factors of hypertension.

Settings and design: To achieve these aims, a cross-sectional study was conducted with 200 participants (100 tribal and 100 non-tribal) from different villages in the Midnapore Sadar block of Paschim Midnapore district.

Methods and material: Participants were selected using purposive sampling method. Interview, structure schedule and anthropometric measurement techniques were used to collect data directly from the participants.

Statistical analysis used: Chi-square test, correlation and regression have been performed to find out the results.

Results: The result of the study shows very high prevalence of hypertension among all socio-economic and demographic groups. Significant associations were identified between hypertension and several socioeconomic and nutritional factors, including age group (χ^2=10.762; $p \leq 0.05$), BMI (χ^2=29.363; $p \leq 0.05$), MUAC (χ^2=12.255; $p \leq 0.05$), WC (χ^2=8.289; $p \leq 0.05$), and WHR (χ^2=13.034; $p \leq 0.05$). The elderly population (OR=2.584) and obese individuals according to BMI (5.390), WC (3.308) and WHR (2.651) has higher risk of being hypertensive.

Conclusions: The study highlights the importance of controlling obesity for proper management of hypertension.

KEYWORDS

• Hypertension • Systolic blood pressure • Diastolic blood Pressure • Nutritional status • Central obesity

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➢ **Received:** 20-01-2026 ➢ **Accepted:** 24-02-2026

Key Messages: With a very high prevalence, hypertension is a serious threat to the health and well-being of middle-aged and elderly individuals. Controlling obesity and lifestyle choices is important in the management of hypertension.

INTRODUCTION

Hypertension is one of the serious public health concerns, and the morbidity and mortality burden related to hypertension is on the rise, especially in developing countries.[1,2] American College of Cardiology (ACC) and the Centre for Disease Control (CDC) have more recently adopted a new guideline for hypertension and recommended a new standard for hypertension, i.e. SBP ≥130mmHg and DBP ≥80mmHg[3,4], which was used to assess the level of hypertension of the participants.

Hypertension is implicated in approximately 7.5 million fatalities annually[5,6] and elevates the risk for cardiovascular disease (CVD), renal failure, and myocardial infarctions.[5-8] An array of factors influencing hypertension has been identified, including socio-demographic variables, sleep disturbances, smoking, alcohol intake[10], Body Mass Index (BMI), and levels of physical activity[5,7-8,11-13], dietary sodium consumption[14], and socio-economic conditions.[15-16] Notably, the Global Burden of Disease (GBD) study estimates that approximately 1.6 million hypertension related deaths and 33.9 million cases of hypertension occur in India in every year.[17] Globally, with around 1.28 billion adults aged between 30-79 is affected by hypertension, constituting nearly two-thirds of the population in low- and middle-income countries.[18]

High sodium intake, excessive alcohol consumption and obesity are significantly associated with high blood pressure.[18-23] Whereas diets abundant in fruits, vegetables, and whole grains are important for blood pressure management.[24] Management of lifestyle factors are important for the management of hypertension.[25-26] Biological factors such as age and nutritional status significantly influence blood pressure levels.[27] Hypertension is often asymptomatic, and the affected individual can remain unaware of this condition.[28] Also, prehypertensive individuals are at greater risk of developing hypertension than normotensive persons.[1, 7-8] On the contrary, Lower blood pressure can cause many problems, such as dizziness and syncope[1].

Like many developing regions, Paschim Medinipur is undergoing demographic, socio-economic, and epidemiological transitions that elevate the incidence of chronic diseases. Given that hypertension is a primary target for mitigating global cardiovascular disease risk, this study aims to investigate hypertension prevalence among the middle-aged and older population. The literature highlights the seriousness of hypertension in recent times by highlighting the importance of understanding socio-economic and lifestyle factors to prevent and manage hypertension. Understanding the seriousness of the background, the present study tries to understand the hypertension situation among elderly males in Paschim Medinipur. The specific objectives are as follows.

Objectives:

1. To assess the prevalence of hypertension among middle-aged and elderly males of Paschim Medinipur, West Bengal.
2. To examine the correlation between anthropometric variables and blood pressure.
3. To examine the risk factors associated with hypertension.

MATERIALS AND METHODS

A cross-sectional study was conducted among 200 male participants residing in different villages of Paschim Midnapore district, West Bengal. The participants were selected through purposive sampling methods considering their age. The minimum age of the participant is 45 years and there is no criterion for the upper age limit for the study (85 years is the upper age limit found in the population). Primary data includes socio-demographic, anthropometric, and blood pressure-related data. Structured schedule and interview methods were used to collect socio-demographic and lifestyle related data. Blood pressure-related data was collected using an OMRON sphygmomanometer after 5min resting time. All the anthropometric data were collected maintaining a standard procedure.[29] As many lifestyle practices, work pattern and its associated physical labor is

different among the male and females of the selected area, a separate study is needed to understand the influencing factors of hypertension, and the present study only considers the male population. Data was analyzed using the Statistical Package for Social Science (SPSS) version.[16] Appropriate statistical tests have been done and the significance level has been set at $p \leq 0.05$. As many of the participants were pre-literate, verbal consent was taken from the study participants. Before data collection the objectives and procedure were explained to the participants and participation in this study was voluntary. Elderly males who were willing to participate voluntarily, have no physical disability, don't suffering from a terminal illness and available during data collection were included in the study. Blood pressure is classified according to the classification proposed by the American College of Cardiology (ACC) on clinical practice guidelines and recommended by the Centre for Disease Control (CDC).[3] According to CDC, 2025 and ACC guidelines blood pressure is divided into four categories viz, Normal (SBP: <120 mmHg and DBP: <80 mmHg), Elevated (SBP: 120-129 mmHg and DBP: <80 mmHg), Hypertension stage 1 (SBP: 130-139 mmHg and DBP: 80-89 mmHg) and Hypertension stage 2 (SBP: ≥140 mmHg and/or DBP: ≥90 mmHg). Nutritional status was determined using the cut-off for WHO Asia Pacific guidelines,[30] WC category,[32] MUAC category,[31] and WHR category.[32]

RESULTS

Table 1 illustrates the distribution of socio-demographic, nutritional, and lifestyle characteristics of the study population. Regarding family structure, 34 percent of participants come from nuclear families, and 66 percent are part of joint families. The findings reveal that 44.5 percent of participants are unemployed, and 55.5 percent are employed (which includes Business, corporate, and government jobs). Concerning education, the majority (87%) of them studied up to 10 standards, and only 13% of individuals did more than secondary education. The majority of participants (72%) earn 11000 or less, and 28 percent earn more than 11000 rupees.

Table 1 also details the nutritional status and lifestyle variables. According to BMI classifications, 32.5 percent of the participants were underweight, 17 percent were overweight, and 13.5 percent were obese. Overall, malnutrition is very high among the participants. According to MUAC classifications, 41.5 percent were underweight. Most participants consume fast food (64.5%), Alcohol (51%), and extra salt (84.5%) regularly. As per NHS-UK guidelines, adults are advised to engage in at least 150 minutes of physical activity weekly, but among the study participants, only 29 percent reported doing regular physical activity.

Table 1: Socio-economic, nutritional and lifestyle characteristics of the elderly people

Socio-economic, nutritional and lifestyle factors							
Variables	**Category**	**n**	**%**	**Variables**	**Category**	**n**	**%**
Ethnicity	Non-tribe	100	50	***Education***	Up to 10th Std.	174	87
	Tribe	100	50		10th+ Std.	26	13
Type of family	Nuclear	68	34	***Age***	Less than 60	92	46
	Joint	132	66		60 and above	108	54
Employment	Yes	111	55.5	***Income***	≤11000	144	72
	No	89	44.5		>11000	56	28
BMI	Underweight	65	32.5	***MUAC***	Underweight	83	41.5
	Normal	74	37		Normal	117	58.5
	Overweight	34	17	***WHR***	Normal	144	72
	Obese	27	13.5		Obese	56	28
Smoking	No	119	59.5	***WC***	Normal	119	59.5
	Yes	81	40.5		Obese	81	40.5
Fast food	No	71	35.5	***Physical activity***	No	142	71
	Yes	129	64.5		Yes	58	29
Extra salt	No	31	15.5	***Alcohol***	No	98	49
	Yes	169	84.5		Yes	102	51

Table 2 presents the mean and standard deviation (SD) of the anthropometric variables, derived variables, and blood pressure measurements within the study population. The average values for the anthropometric variables—including height, weight, waist circumference (WC), hip circumference (HC), and mid-upper arm circumference (MUAC)—are as follows: 158.7 cm (SD ±6.66), 52.89 kg (SD ±1.16), 79.68 cm (SD ±11.32), 83.92 cm (SD ±8.54), and 24.07 cm (SD ±3.47), respectively. The mean values for the derived variables—body mass index (BMI) and waist-hip ratio (WHR)—are 20.94 (SD ±4.20) and 0.94 (SD ±0.07), respectively. Additionally, the mean measurements for systolic blood pressure (SBP) and diastolic blood pressure (DBP) are 130.22 mmHg (SD ±20.04) and 80.77 mmHg (SD ±10.12), respectively.

Table 2: Mean and SD of anthropometric variable, and BP of the study population

Anthropometric variable	Mean	SD	Derived variable	Mean	SD
Height	158.7	±6.66	BMI	20.94	±4.20
Weight	52.89	±1.16	WHR	0.94	±0.07
WC	79.68	±11.32	Blood Pressure (BP)	Mean	SD
HC	83.92	±8.54	SBP	130.22	±20.04
MUAC	24.07	±3.47	DBP	80.77	±10.12

Table 3 represents the Pearson's correlation (two-tailed) between blood pressure and anthropometric variables. The results show that all the anthropometric and blood pressure variables have a statistically significant positive correlation with each other. Both SBP and DBP have low levels of correlation with all the anthropometric indicators, viz, WHR, BMI, MUAC, and WC. SBP and DBP have a strong correlation among themselves. While most anthropometric variables have moderate to strong correlations among them.

Table 3: Correlation between anthropometric variables and blood pressure

	Pearson correlation (two-tailed)					
Variables	**DBP**	**SBP**	**WHR**	**BMI**	**MUAC**	**WC**
DBP	1					
SBP	0.629**	1				
WHR	0.141*	0.205**	1			
BMI	0.162*	0.248**	0.441**	1		
MUAC	0.150*	0.201**	0.357**	0.713**	1	
WC	0.193**	0.264**	0.717**	0.776**	0.674**	1

*=statistically significant at the 0.05 level, **= statistically significant at the 0.01 level

Table 4 shows the distribution of blood pressure among the participants. Systolic Blood Pressure (SBP) shows 31 percent of participants fall under stage 2 category followed by stage 1 category (24.5%) and elevated (14%) while 30.5 percent of participants are normal. Diastolic Blood Pressure (DBP) shows 28 percent of participants fall under stage 2 category while 33 percent of participants are in stage 1 category. Distribution of overall hypertension shows that 40 percent are in normal (Normal category includes normal and elevated category), 29 percent are hypertensive stage 1 and 31 percent include hypertensive stage 2.

Table 4: Hypertension status of the study participants

Blood pressure	Category	n	%
SBP	Normal	61	30.5
	Elevated	28	14
	Stage 1	49	24.5
	Stage 2	62	31

table cont....

Blood pressure	Category	n	%
	Normal+elevated	78	40
DBP	Stage 1	66	33
	Stage 2	56	27
	Overall hypertension		
Blood Pressure	n		%
Normal	44		22
Elevated	36		18
Hypertensive stage 1	58		29
Hypertensive stage 2	62		31

Table 5 shows the association between nutritional status and hypertension in the study population. The result shows statistically significant association between hypertension and nutritional status in different parameters, namely, BMI, MUAC, WC and WHR. Notably, nearly half of obese participants have stage 2 hypertension. Similarly, obese participants according to WC and WHR category also shows very high percentage of hypertension. This table shows that nutritional status is highly associated with hypertension.

Table 5: Relation between hypertension and nutritional status

Variable	Category	Normal	Stage 1	Stage 2	Chi-square
BMI	Undernutrition	40 (61.5%)	13 (20%)	12 (18.5%)	29.363**
	Normal	25 (33.8%)	30 (40.5%)	19 (25.7%)	
	Overnutrition	8 (23.5%)	8 (23.5%)	18 (52.9%)	
	Obese	7 (25.9%)	7 (25.9%)	13 (48.1%)	
MUAC	Undernutrition	50 (52.1%)	25 (26%)	21 (21.9%)	12.255**
	Normal	30 (28.8%)	33 (31.7%)	41 (39.4%)	
WC	Normal	55 (46.2%)	36 (30.3%)	28 (23.5%)	8.289**
	Obese	25 (30.9%)	22 (27.2%)	34 (42%)	
WHR	Normal	52 (52.5%)	24 (24.2%)	23 (23.2%)	13.034**
	Obese	28 (27.7%)	34 (33.7%)	39 (38.6%)	

*=statistically significant at the 0.05 level, **= statistically significant at the 0.01 level

Table 6 outlines the relationship between sociodemographic factors and hypertension. The factors examined include ethnicity, family structure, occupation, education level, age group, and income. The findings reveal that elderly persons (60 years and above) are much more hypertensive than below 60 years individuals. Hence, age group is significantly associated with hypertension (χ^2= 10.762**; $p \leq 0.05$). Other factors like education, age, and income categories, type of family, economic pursuit does not demonstrate a significant association with hypertension within the study population. Additionally, the table assesses the relation between hypertension and various lifestyle factors, such as physical activity, alcohol consumption, smoking, fast food intake, and salt consumption. However, no statistically significant associations were identified between these lifestyle factors and hypertension. This result maybe due to the similar lifestyle practices among the participants.

Table 6: Association between hypertension and other variables

Associated factors		Normal	Stage 1	Stage 2	χ^2
Ethnicity	Non-Tribal	34 (34%)	29 (29%)	37 (37%)	4.123
	Tribal	46 (46%)	29 (29%)	25 (25%)	
Type of family	Nuclear	26 (38.2%)	20 (29.4%)	22 (32.4%)	0.147
	Joint	54 (40.9%)	38 (28.8%)	40 (30.3%)	

Economic pursuits	Yes	51 (45.9%)	30 (27%)	30 (27%)	3.810
	No	29 (32.6%)	28 (31.5%)	32 (36%)	
Education	Up to primary	48 (42.1%)	34 (29.8%)	32 (28.1%)	1.090
	Above primary	32 (37.2%)	24 (27.9%)	30 (34.9%)	
Age	Less than 60	45 (45.5%)	34 (34.3%)	20 (20.2%)	10.762**
	60 and above	35 (34.7%)	24 (23.8%)	42 (41.6%)	
Income	<=11000	60 (41.7%)	42 (29.2%)	42 (29.2%)	0.920
	>11000	20 (35.7%)	16 (28.6%)	20 (35.7%)	
Fast food	Yes	54 (41.9%)	32 (24.8%)	43 (33.3%)	3.156
	No	26 (36.6%)	26 (36.6%)	19 (26.8%)	
Extra salt in food	Yes	68 (40.2%)	49 (29%)	52 (30.8%)	0.034
	No	12 (38.7%)	9 (29%)	10 (32.3%)	
Physical activity	No	60 (42.3%)	38 (26.8%)	44 (31%)	1.468
	Yes	20 (34.5%)	20 (34.5%)	18 (31%)	
Alcohol consumption	Yes	42 (41.2%)	30 (29.4%)	30 (29.4%)	0.254
	No	38 (38.8%)	28 (28.6%)	32 (32.7%)	
Smoking	Yes	23 (38.3%)	14 (23.3%)	23 (38.3%)	2.496
	No	57 (40.7%)	44 (31.4%)	39 (27.9%)	

*=statistically significant at the 0.05 level; **= statistically significant at the 0.01 level

Table 7 details the risk factors of hypertension in the study population. The result shows that elderly individuals have statistically significant higher risk of hypertension compared to individuals aged less than 60 years. Obese individuals have significantly higher risk of being hypertensive compared to their counterparts. Obese individuals, according to the WC and WHR category have 3.3 and 2.6 times more chance of being hypertensive than normal individuals. Compared to underweight individuals, overweight and obese individuals have more than 5 times the risk of being hypertensive.

Table 7: Binary logistic regression analysis to understand the risk of hypertension among different groups

Risk factors of Hypertension		Exp (B)	Sig. Lower	95% C.I. for EXP (B)	
				Upper	
Age	Bellow 60 years®				
	Older adults (60+ years)	2.584**	0.006	1.321	5.056
MUAC	Underweight®				
	Normal	1.929	0.170	0.755	4.929
WHR	Normal®				
	Obese	2.651*	0.024	1.139	6.170
WC	Normal®				
	Obese	3.308*	0.027	1.145	9.551
BMI	Undernutrition®				
	Normal	2.762*	0.023	1.154	6.614
	Overweight	5.103*	0.013	1.408	18.496
	Obese	5.390*	0.014	1.399	20.770
Constant	Constant	0.279	0.001		

*=statistically significant at the 0.05 level; **= statistically significant at the 0.01 level

Abbreviations:
BMI: Body Mass Index
MUAC: Mid-Upper-Arm-Circumference
WC: Waist Circumference
WHR: Waist-Hip Ratio
SBP: Systolic Blood Pressure
DBP: Diastolic Blood Pressure

DISCUSSION

Many studies have been done highlighting the vulnerability of older individuals to hypertension and the importance of understanding the prevalence and risk factors among the Indian population.[33-35] The current study findings align with the findings of this research and further try to elucidate the intricate relationship between nutritional status (in different parameters) and hypertension. Many studies have already been done to found that metrics like BMI, MUAC, WC and WHR can be used as indicators to assess the risk of hypertension.[36-45]

The present study result shows that the mean SBP in the population is 130.22 mm/Hg, which is considered higher than the cutoff of hypertension of SBP used in this paper. So, the mean SBP in the population is more than the cutoff of hypertension. The mean DBP is 80.77 ± 10.12 mm/Hg and this mean value is higher than the cutoff value of hypertension.[46-47] The result also shows statistically significant positive correlation between different anthropometric and blood pressure variables. This means that with the increase in the anthropometric variables value, blood pressure also increases, along with increases the chance of being hypertensive. Similar results can also be found in other studies,[48-52] concreating the use of anthropometry as covariates of hypertension.

As per blood pressure classification, a very high prevalence of hypertension can be observed among the middle-aged and elderly participants of Paschim Medinipur. According to SBP classifications, only 30.5 percent of participants were normal, and another 14 percent had elevated blood pressure, making it only 44.5 percent of normotensive participants. And the majority (55.5%) of the participants are hypertensive, according to SBP categories. In the case of DBP, the situation is even worse, with only 39 percent normotensive and 61 percent hypertensive participants. The result is very concerning as the overall hypertension is very high (60%). Among the hypertensive participants, 31 percent fall under the hypertension stage 2 category. Many other studies also reported a high prevalence of hypertension among older individuals.[53,33, 54-55] The study tries to assess the relationship of hypertension with nutritional status (in different parameters). Blood pressure has statistically significant association with nutritional status in all parameters used in this study, viz. BMI ($\chi2=29.363$; $p\leq0.05$), MUAC ($\chi2=12.255$; $p\leq0.05$), WC ($\chi2= 8.289$; $p\leq0.05$), WHR ($\chi2=13.034$; $p\leq0.05$). Many other studies also reported significant association between blood pressure and nutritional status.[56,48-49] This study also tried to examine the socio-economic and demographic factors associated with hypertension in the study population. No other socio-economic factor except age has a significant relationship with hypertension. Hypertension levels of the participant are statistically significantly associated with age group ($\chi2=10.762$; $p\leq0.05$), where elderly individuals show much higher percentage of hypertension than middle aged individuals. The variables that have statistically significant relationship with hypertension were further tested (Binary Logistic Regression) to assess the risk of hypertension in different groups. Elderly individuals have higher odds (OR=2.584) (more than double) of being hypertensive compared to their counterparts.[57-58] This result reveals the vulnerability of hypertension among the elderly population. All the obesity parameters also show much higher odds of being hypertensive than their counterparts, detailing the importance of management of nutritional status, specifically obesity, to the prevention and management of hypertension.

CONCLUSION

The present study revealed that hypertension is concerningly high among the study participants. Though there are group differences, in all socio-economic and demographic groups, the prevalence of hypertension is very high. The mean SBP and DBP are higher than the cutoff values of hypertension. Anthropometric variables have a statistically significant correlation with the blood pressure of participants, making them important co-variates of hypertension. Age and nutritional status in different parameters have a statistically significant relationship with hypertension. Among the related factors, age group and obesity parameters show a higher risk of being hypertensive among the elderly and obese individuals. Though age cannot be controlled, the present study highlights the importance of controlling obesity for proper management of hypertension. This study recommends further in-depth studies better to understand all the related factors of hypertension in management.

Acknowledgement: We are thankful to the participants who voluntarily participated in this study.

Conflict of interest: We declare no known conflict of interest in the present study.

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