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Hypertension and associated risk factor among individuals attending tertiary care center in Sitapur district – A cross-sectional study

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ABSTRACT

Background: Hypertension is a leading global public health issue, significantly contributing to cardiovascular disease, stroke, kidney failure, and premature death. In India, the burden of hypertension is increasing rapidly due to urbanization, sedentary lifestyles, unhealthy diets, and aging populations. Despite being preventable and manageable, hypertension often remains undiagnosed and poorly controlled, especially in rural and resource-limited settings. **Aims and Objectives:** To assess the prevalence of hypertension and identify associated risk factors among the adult population in Sitapur district, Uttar Pradesh. **Materials and Methods:** A cross-sectional study was conducted at the screening outpatient department of the Department of Community Medicine, HIMS, Sitapur. Adults aged 19 years and above were enrolled using systematic random sampling. A total of 500 participants were included. Data were collected through a pretested, semi-structured questionnaire covering sociodemographic, behavioral, psychosocial, and clinical factors. Statistical analysis was performed using Jamovi software, with Chi-square tests for bivariate analysis and multivariate logistic regression to identify independent predictors of hypertension. **Results:** A high prevalence of hypertension was seen in the age group of more than 60 years (37.8%), followed by 28.8% in the age group of 50–59 years. A high prevalence of hypertension was seen in male populations (63.5%) compared to 36.5% which was among the female population. Significant risk factors identified included older age, male sex, smoking, low physical activity, overweight/obesity (body mass index [BMI] ≥25), high waist-to-hip ratio in males, and poor mental health symptoms. Participants aged >60 years had the highest odds of hypertension (adjusted odds ratios: 4.20; 95% confidence intervals: 2.10–8.30). Smoking and higher BMI levels were strongly associated with increased hypertension risk. Physical inactivity and higher socioeconomic status also emerged as significant predictors. **Conclusion:** Targeted public health interventions focusing on lifestyle modification, early screening, and community awareness are essential to address the growing burden of hypertension in rural areas.

Key words: Hypertension; Associated risk factors; Lifestyle; Diets

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INTRODUCTION

Hypertension, or high blood pressure, is one of the most significant global public health challenges of the 21st century. It is a leading cause of morbidity and mortality worldwide, contributing substantially to cardiovascular diseases, stroke, kidney failure, and premature death. According to the World Health Organization, an estimated 1.28 billion adults aged 30–79 years globally are hypertensive, with a disproportionately high burden

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in low- and middle-income countries, including India. Approximately 46% of adults with hypertension are unaware that they have the condition whereas less than half of adults (42%) with hypertension are diagnosed and treated. One of the global targets for non-communicable diseases is to reduce the prevalence of hypertension by 33% between 2010 and 2030.[1]

India is experiencing a rapid epidemiological transition with a rising burden of non-communicable diseases, particularly hypertension. The prevalence of hypertension was observed to be 10.33% out of them it was more common in males as compared to females and prevalence increased as the age increased. The prevalence of hypertension was high among obese and those consuming more salt every day. Factors such as urbanization, sedentary lifestyles, unhealthy diets, increasing stress, and aging populations have led to a growing prevalence of hypertension in both urban and rural areas. Higher age, male sex, tobacco use, obesity, less physical activity, and high salt intake are significantly associated with hypertension.[2]

Early detection and timely intervention are crucial in preventing the long-term complications of hypertension, including heart disease, stroke, and kidney failure. Given that hypertension often remains asymptomatic until serious damage occurs, community-based screening and awareness initiatives are vital, especially in rural populations where health care access is limited. This study was conducted to generate local evidence on the prevalence and associated risk factors of hypertension in the Sitapur district. Understanding these factors in a contemporary Indian rural context provides appropriate public health strategies and health education campaigns to reduce the disease burden.

While hypertension is largely preventable and manageable, it remains underdiagnosed and poorly controlled, especially in resource-limited settings. Understanding the prevalence and associated risk factors both modifiable and non-modifiable is essential for developing effective public health strategies and interventions. This study aims to assess the prevalence of hypertension and determine the associated risk factors of hypertension among the adult population in Sitapur district Uttar Pradesh.

Aims and objectives

The present study was conducted to assess the prevalence of hypertension among the adult population in Sitapur district, Uttar Pradesh. It also aimed to identify the associated risk factors contributing to hypertension in this population.

MATERIALS AND METHODS

This was a cross-sectional study conducted in a screening outpatient department (OPD), Under the Department of Community Medicine, HIMS, Mau, Ataria, Sitapur. Participants were selected through systematic random sampling. On average adult OPD (19 years and above) load in HIMS Sitapur is around 500. The ethical clearance was obtained from the Institutional Ethics Committee Hind Institute of Medical Sciences Sitapur (IEC/IRB NO: HIMS/IRB/2020–2021/01 date June 10, 2021).

Sample size

The sample size was calculated using Cochrane's formula.[3] Assuming a prevalence of hypertension from previous studies of 17% from previous study[3] absolute error of 10% and a confidence level of 95%, the estimated sample size was 500.

Sampling strategy

On each day of data collection (4 times/week) a total of 40 patients (10 from each selected OPD) were enrolled using consecutive sampling on each day of data collection.

Study tools

Data were collected using a pre-tested, semi-structured questionnaire that included: Sociodemographic characteristics, behavioral risk factors, psychosocial variables, anthropometric measurements, and clinical data: blood pressure was measured using a validated digital sphygmomanometer following standard procedures. Three readings were taken at 5-min intervals, and the average of the last two was recorded. Hypertension was defined according to the Joint National Committee 8 guidelines as systolic blood pressure ≥140 mmHg, diastolic blood pressure ≥90 mmHg, or current use of antihypertensive medication.

Statistical analysis

The data were entered in the MS EXCEL. Analysis was carried out using Jamovi v2.3.26.0. Descriptive statistics

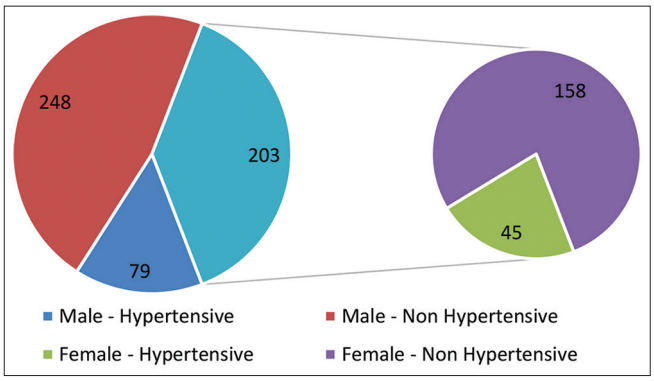

Figure 1: Prevalence of hypertension in the male and female

were used to present the distribution of variables. The Chi-square test was employed for bivariate analysis to assess associations between hypertension and categorical variables. Variables with a P<0.1 in bivariate analysis were included in a multivariate logistic regression model to identify independent predictors of hypertension. Adjusted odds ratios (AORs) with 95% confidence intervals (CIs) were calculated. A P<0.05 was considered statistically significant.

Inclusion criteria

Inclusion criteria were as follows: All patients attending OPD more than 19 years of age and patients provided consent for inclusion in the study were recruited.

Exclusion criteria

Exclusion criteria were as follows: Patients below 19 years of age or suffering from chronic obstructive pulmonary disease or other emergencies were excluded.

RESULTS

A high prevalence of hypertension was seen in the age group of more than 60 years (37.8%), followed by 28.8% in the age group of 50–59 years; least prevalence was seen in 30–39 age groups (9.9%). A high prevalence of hypertension was seen in male populations (63.5%) compared to 36.5% which was among the female population. Most participants were Hindu (79.5% hypertensive vs. 80.0% non-hypertensive), followed by Muslims. Educational levels were comparable, with nearly half of both groups being illiterate, and no significant difference was observed (P=0.286). Most participants were married (85.5% hypertensive, 88.4% non-hypertensive), Occupational status was similarly distributed, with unskilled workers comprising the majority in both groups (54.8% hypertensive and 53.7% non-hypertensive; P=0.729). Socioeconomic status varied significantly (P=0.001), with a higher proportion of hypertensive individuals falling into the lowest socioeconomic class (11.3%) compared to non-hypertensive individuals (2.2%) (Table 1 and Figure 1).

Table 1: Sociodemographic factors related to hypertension

Variable	Hypertensive (%)	Non-hypertensive (%)	P-value
Residence			
Rural	111 (89.1)	381 (93.8)	0.102
Urban	13 (10.9)	25 (6.2)	
Age (years)			
<29	12 (10.8)	75 (18.5)	0.0001
30–39	11 (9.9)	83 (20.4)	
40–49	27 (24.3)	97 (23.8)	
50–59	32 (28.8)	85 (20.9)	
>60	42 (37.8)	66 (16.3)	
Gender			
Male	79 (63.5)	248 (61.0)	0.599
Female	45 (36.5)	158 (39.0)	
Religions			
Hindu	99 (79.5)	325 (80.0)	0.0029
Muslim	17 (13.6)	57 (14.0)	
Education			
Illiterate	61 (49.2)	205 (50.4)	0.286
Primary	35 (28.2)	138 (33.9)	
Secondary	23 (18.6)	51 (12.5)	
Graduate and above	5 (4.0)	12 (3.0)	
Marital status			
Unmarried	10 (8.1)	34 (8.4)	0.202
Married	106 (85.5)	360 (88.4)	
Divorced/widowed	8 (6.5)	12 (2.9)	
Occupation			
Unskilled worker	68 (54.8)	218 (53.7)	0.729
Semiskilled worker	7 (5.6)	33 (8.1)	
Skilled worker	12 (9.7)	31 (7.6)	
homemaker	37 (29.8)	124 (30.6)	
Type of family			
Nuclear	57 (45.9)	190 (46.8)	0.871
Joints	67 (54.1)	216 (53.2)	
Socioeconomic status			
I	14 (11.3)	9 (2.2)	0.001
II	9 (7.3)	29 (7.1)	
III	10 (8.1)	44 (10.8)	
IV	34 (27.4)	118 (29.1)	
V	57 (45.9)	206 (50.8)	

Smoking was significantly higher among hypertensives, with fewer non-smokers (67.2% vs. 79.6%, P=0.006). Physical activity levels also differed significantly (P=0.018), with hypertensives having a greater proportion engaged in mild activity and fewer in heavy activity. Symptoms of poor mental health were more common in hypertensives (25.8% vs. 17.8%, P=0.048). Body mass index (BMI) distribution varied markedly (P<0.001), with hypertensives showing higher rates of overweight and obesity. Waist-to-hip (W/H) ratio risk was significantly associated with hypertension in males (P=0.002) but not in females (P=0.787) (Table 2).

Age was a strong predictor of hypertension. Compared to individuals under 29 years, those aged 40–49 (AOR: 2.40; 95% CI: 1.20–4.80; P=0.013), 50–59 (AOR: 2.90; 95% CI: 1.50–5.50; P=0.001), and >60 years (AOR: 4.20; 95% CI: 2.10–8.30; P<0.001) had significantly increased odds of hypertension. Among males, those with a high W/H ratio were more likely to be hypertensive (AOR: 1.90; 95% CI: 1.30–2.80; P=0.002). Participants in the highest socioeconomic class (Class I) had significantly higher odds of hypertension compared to those in Class V (AOR: 3.80; 95% CI: 1.60–9.20; P=0.003). Compared to non-smokers, individuals who smoked 1–5 cigarettes/day had 2.1 times higher odds of being hypertensive (AOR: 2.10; 95% CI: 1.10–4.00; P=0.025), and those who smoked 5–10 cigarettes/day had nearly 3 times higher odds (AOR: 2.90; 95% CI: 1.10–7.90; P=0.034).

Participants with no physical activity had significantly higher odds (AOR: 2.90; 95% CI: 1.20–7.10; P=0.018) compared to those engaged in heavy physical activity. Participants with BMI 25–29.9 had more than 3 times the odds of hypertension compared to those with normal BMI (AOR: 3.20; 95% CI: 1.80–5.60; P<0.001), and those with BMI >30 had even higher odds (AOR: 4.50; 95% CI: 1.20–17.1; P=0.023). Individuals reporting symptoms of poor mental health had 1.6 times higher odds of hypertension compared to those without such symptoms (AOR: 1.60; 95% CI: 1.00–2.60; P=0.048). Bivariate and multivariate analyses show significant associations with risk factors (e.g., BMI, smoking, physical activity, and comorbidities) (Table 3).

DISCUSSION

The present study was conducted to study the Prevalence and Associated Risk Factors of Hypertension – Cross-Sectional Study in India. Most participants in both groups lived in rural areas, with 89.1% of hypertensive and 93.8% of non-hypertensive individuals residing rurally; however, this difference was not statistically significant (P=0.102). Contradictory findings were reported in another study.[4] In our study majority of participants were in rural areas as compared to urban areas.

Table 2: Distribution of participants according to associated risk factors of hypertension

Variable	Category	Hypertensive (n, %)	Non-hypertensive (n, %)	P-value
Family history of hypertension	Yes	5 (4.0)	7 (1.7)	0.130
	No	119 (96.0)	399 (98.3)	
Alcohol use	Yes	7 (5.6)	14 (3.4)	0.272
	No	117 (94.4)	392 (96.6)	
Smoking	No smoking	83 (67.2)	323 (79.6)	0.006
	1–5 cig/day	21 (17.0)	27 (6.7)	
	5–10 cig/day	5 (4.0)	7 (1.7)	
	10–15 cig/day	6 (4.9)	14 (3.4)	
	>15 cig/day	9 (7.3)	21 (5.2)	
Physical activity	0-no activity	9 (7.3)	14 (3.4)	0.018
	1-mild	46 (37.2)	115 (28.3)	
	2-moderate	54 (43.6)	190 (46.9)	
	3-heavy	15 (12.1)	87 (21.4)	
Symptom of poor mental health	Yes	32 (25.8)	72 (17.8)	0.048
	No	92 (74.2)	334 (82.2)	
Stress score	Mild	111 (89.5)	365 (90.0)	0.895
	Moderate	12 (9.7)	36 (8.9)	
	Severe	1 (0.8)	5 (1.2)	
BMI	<18.5	21 (17.0)	113 (27.9)	0.000
	18.5–24.9	69 (55.6)	258 (63.7)	
	25–29.9	29 (23.4)	32 (7.9)	
	>30	5 (4.0)	3 (0.7)	
W/H ratio (male)	No risk	138 (34.0)	26 (21.0)	0.002
	Risk	110 (27.1)	53 (42.7)	
W/H ratio (female)	No risk	14 (3.4)	5 (4.0)	0.787
	Risk	144 (35.5)	40 (32.3)	

BMI: Body mass index, W/H: Waist-to-hip

Table 3: Multivariate logistic regression analysis for factors associated with hypertension

Variable	Category (reference)	Adjusted OR (95% CI)	P-value
Age (years)	<29 (Ref)		
	30–39	1.40 (0.70–2.70)	0.300
	40–49	2.40 (1.20–4.80)	0.013
	50–59	2.90 (1.50–5.50)	0.001
	>60	4.20 (2.10–8.30)	<0.001
Religion	Hindu (Ref)		
	Muslim	0.95 (0.50–1.70)	0.870
Socioeconomic status	Class V (Ref)		
	Class I	3.80 (1.60–9.20)	0.003
	Class II	1.40 (0.60–3.40)	0.423
	Class III	0.90 (0.40–2.00)	0.815
	Class IV	0.95 (0.60–1.60)	0.842
Smoking	No smoking (Ref)		
	1–5 cig/day	2.10 (1.10–4.00)	0.025
	5–10 cig/day	2.90 (1.10–7.90)	0.034
	10–15 cig/day	1.80 (0.70–4.60)	0.213
	>15 cig/day	2.60 (1.10–6.10)	0.031
Physical activity	Heavy (Ref)		
	Moderate	1.50 (0.80–2.80)	0.192
	Mild	2.10 (1.10–4.20)	0.030
	No activity	2.90 (1.20–7.10)	0.018
BMI	18.5–24.9 (Ref)		
	<18.5	0.52 (0.30–0.90)	0.018
	25–29.9	3.20 (1.80–5.60)	<0.001
	>30	4.50 (1.20–17.1)	0.023
Poor mental health	No (Ref)		
	Yes	1.60 (1.00–2.60)	0.048
Waist-hip ratio (male)	No risk (Ref)		
	Risk	1.90 (1.30–2.80)	0.002

BMI: Body mass index, OR: Odds ratio, CI: Confidence interval

Age distribution showed a significant variation (P<0.001), as a higher proportion of hypertensive individuals were older than 60 years (37.8%) compared to 16.3% in the non-hypertensive group, whereas younger age groups (<39 years) were more represented among non-hypertensives. Gender proportions were similar, with males constituting 63.5% of hypertensives and 61.0% of non-hypertensives (P=0.599). Religion also differed significantly between the groups (P=0.0029), with most participants being Hindu (79.5% hypertensive vs. 80.0% non-hypertensive), followed by Muslims. Educational levels were comparable, with nearly half of both groups being illiterate, and no significant difference was observed (P=0.286). Most participants were married (85.5% hypertensive, 88.4% non-hypertensive), and marital status did not differ significantly (P=0.202). Occupational status was similarly distributed, with unskilled workers comprising the majority in both groups (54.8% hypertensive and 53.7% non-hypertensive; P=0.729). The family type was evenly split between nuclear and joint families across groups, showing no significant difference (P=0.871).[2,5]

Socioeconomic status varied significantly (P=0.001), with a higher proportion of hypertensive individuals falling into the lowest socioeconomic class (11.3%) compared to non-hypertensive individuals (2.2%). Similar findings have also been reported in previous studies.[6,7]

The analysis of associated risk factors showed no significant difference in the family history of hypertension (P = 0.130) or alcohol use (P = 0.272) between hypertensive and non-hypertensive groups. However, smoking was significantly more common among hypertensives, with a lower proportion of non-smokers (67.2% vs. 79.6%, P = 0.006). Similar findings have been reported in other studies.[8,9]

Physical activity levels also differed significantly (P=0.018), with hypertensives having a greater proportion engaged in mild activity and fewer in heavy activity.[7,8] Symptoms of poor mental health were more common in hypertensives (25.8% vs. 17.8%, P=0.048), whereas stress scores showed no significant difference (P=0.895). The same results were found in different study different parts of India.[10,11]

BMI distribution varied markedly (P<0.001), with hypertensives showing higher rates of overweight and obesity.[9,10] W/H ratio risk was significantly associated with hypertension in males (P=0.002) but not in females (P=0.787). These findings suggest smoking, physical inactivity, poor mental health symptoms, elevated BMI, and W/H ratio (in males) are important risk factors associated with hypertension in this population. Similar results were found in another study.[11,12]

Age was a strong predictor of hypertension. Compared to individuals under 29 years, those aged 40–49 (AOR: 2.40; 95% CI: 1.20–4.80; P=0.013), 50–59 (AOR: 2.90; 95% CI: 1.50–5.50; P=0.001), and >60 years (AOR: 4.20; 95% CI: 2.10–8.30; P<0.001) had significantly increased odds of hypertension. Among males, those with a high W/H ratio were more likely to be hypertensive (AOR: 1.90; 95% CI: 1.30–2.80; P=0.002). Similar findings reported in another study[13] Socioeconomic status also played a role. Participants in the highest socioeconomic class (Class I) had significantly higher odds of hypertension compared to those in Class V (AOR: 3.80; 95% CI: 1.60–9.20; P=0.003). Other classes did not show statistically significant associations. Those in the highest socioeconomic class had greater odds, possibly due to sedentary lifestyles and dietary transitions.[14-16]

Smoking was significantly associated with increased odds of hypertension. Compared to non-smokers, individuals who smoked 1–5 cigarettes/day had 2.1 times higher odds of being hypertensive (AOR: 2.10; 95% CI: 1.10–4.00; P=0.025), and those who smoked 5–10 cigarettes/day had nearly 3 times higher odds (AOR: 2.90; 95% CI: 1.10–7.90; P=0.034). Smoking more than 15 cigarettes/day was also significantly associated with hypertension (AOR: 2.60; 95% CI: 1.10–6.10; P=0.031). Supportive findings were seen in the previous study.[7]

Physical activity levels were inversely related to hypertension. Participants with no physical activity had significantly higher odds (AOR: 2.90; 95% CI: 1.20–7.10; P=0.018) compared to those engaged in heavy physical activity. Mild activity was also associated with increased odds (AOR: 2.10; 95% CI: 1.10–4.20; P=0.030), while moderate activity showed no statistically significant association.[7]

BMI showed a strong positive association with hypertension. Participants with BMI 25–29.9 had more than 3 times the odds of hypertension compared to those with normal BMI (AOR: 3.20; 95% CI: 1.80–5.60; P<0.001), and those with BMI >30 had even higher odds (AOR: 4.50; 95% CI: 1.20–17.1; P=0.023). Conversely, being underweight was associated with lower odds (AOR: 0.52; 95% CI: 0.30–0.90; P=0.018). These findings are consistent with previous Indian studies highlighting the role of BMI as a major modifiable risk factor for hypertension.[7,17,18]

Mental health symptoms were also significantly associated with hypertension. Individuals reporting symptoms of poor mental health had 1.6 times higher odds of hypertension compared to those without such symptoms (AOR: 1.60; 95% CI: 1.00–2.60; P=0.048).[19,20]

Limitations of the study

The limitation of present study was being a cross-sectional study, it captures data at a single point in time and does not allow for the establishment of causal relationships between risk factors and hypertension and the study was conducted at a single tertiary care center, which may limit the generalizability of the findings to the wider population of the Sitapur district or other regions and data on some risk factors, such as smoking, alcohol use, and family history, were self-reported, which may be subject to recall bias or social desirability bias.

CONCLUSION

Age, smoking, physical inactivity, obesity, central adiposity (in males), socioeconomic status, and mental health symptoms were all independently associated with increased odds of hypertension. These findings reinforce the need for comprehensive and multisectoral strategies that address lifestyle behaviors, promote physical activity, implement tobacco cessation programs, and integrate mental health services into primary care. Targeted public health interventions focusing on high-risk groups particularly older adults, smokers, the physically inactive, and those with elevated BMI or central obesity are critical for controlling the hypertension epidemic. Moreover, the associations observed call for increased awareness, routine screening, and early management, especially in community settings.

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