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# Prevalence and Associated Risk Factors of Hypertension Among Adults in Kamrup District, Guwahati, Assam: A Cross Sectional Study

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## Abstract

**Introduction:** Although hypertension is common, it can be dangerous if not treated promptly. Many people with the condition don't experience any symptoms. However, some may develop symptoms such as headaches, blurred vision, and chest pain. Regular check-ups are the best way to monitor blood pressure levels. According to the WHO, almost 46 % of adults are unaware that they have hypertension; nearly 63% of all deaths in India are caused by non-communicable diseases, with 27% attributed to CVD, which affects 45 % of individuals aged 40 to 69. **Method:** A cross-sectional study was conducted over a 2-months period in May and June 2024. A convenience sampling technique was used to select a total of 545 participants. The data were collected and then entered for analysis. Bivariable regression analyses were performed. AOR with a 95% CI was used as a measure of association. Variables having a p-value < 0.05 were considered to have a significant association with the outcome. **Result:** The prevalence of hypertension among adult in this study was 71.7%. Age 40 – 59 [AOR: 0.409, 95% CI: 0.275, 0.610], Muslim [AOR = 1.628, 95% CI = 1.450, 1.830, p = 0.000], college/University [AOR: 0.185, 95% 0.109, 0.314, p=0], Daily labourer [AOR: 1.941, 95% CI: 0.921,4.093, p=0.040], Family history of hypertension [AOR: 0.509, 95% CI: 0.371,0.699, p=0.000], overweight [AOR = 0.448, 95% CI = 0.290, 0.695, p = 0.000 ], Tobacco used [AOR = 0.588, 95% CI = 0.415, 2.853, p = 0.000], Alcohol consumption [AOR = 0.295, 95% CI =

0.68, 0.520,  $p = 0.000$ ] and used smoking [AOR = 0.333, 95% CI = 0.213, 0.523,  $p = 0.000$ ] had a statistically significant association with having hypertension.

**Conclusion:** There is a relatively high prevalence of hypertension among adults. Associated risk factors such as overweight, regular checking of blood pressure, tobacco use, alcohol consumption, physical activity, and current smoking status have a significant positive association with hypertension. It is important to provide proper training programs and essential services to healthcare professionals. Community-based hypertension screening programs should be developed to prevent this silent and deadly disease.

**Keywords:** Symptoms; Regular check-ups; Non-communicable diseases; Training programs; Essential services

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## 1 Introduction

Hypertension, or high blood pressure, occurs when the force of blood against the artery walls is too high (140/90 mmHg or higher). While it is common, it can lead to serious health issues if left untreated. Many people with high blood pressure do not experience symptoms, so the best way to detect it is by getting the blood pressure checked. As per WHO 2023 survey report an estimated 1.28 billion adults aged 30–79 years worldwide have hypertension, with two-thirds of them residing in low- and middle-income countries.<sup>1,2</sup> Around 46% of adults with hypertension are not aware that they have the condition.<sup>3</sup> Additionally, less than half of adults (42%) with hypertension have been diagnosed and treated, and only about 21% have their hypertension under control.<sup>4</sup> Hypertension is a leading cause of premature death globally. One of the key goals for non-communicable diseases is to decrease the prevalence of hypertension by 33% between 2010 and 2030.<sup>4</sup>

Studies have shown that excessive consumption of salt and fat, alcohol use, physical inactivity, and lack of exercise are considered risk factors for hypertension.<sup>5,6</sup> It is also common among older patients and those living in urban areas. The burden of hypertension in India is expected to increase significantly in the upcoming years due to rapid environmental and lifestyle changes resulting from hazardous working conditions and growing social pressures for survival. In India, the age-adjusted prevalence of hypertension was 11.3%, with a

higher prevalence in men (13.8%) than in women (10.9%).<sup>7,8</sup> The prevalence of hypertension was 12.5% in urban areas and 10.6% in rural locations. The study found that 60.8% of tea garden workers in Assam have high blood pressure. The risk factors for hypertension in this group include older age, consuming locally made alcohol, adding extra salt to food and drinks, and using khaini.<sup>9</sup>

Significant health and economic gains are linked to early detection and effective control of hypertension. Having data on the prevalence of hypertension in a specific area is crucial for developing successful prevention and control strategies.<sup>10,11</sup> Therefore, this study aimed to assess the prevalence of hypertension and its associated factors among adults in Kamrup District, Guwahati, Assam. The results of this study may benefit both urban and rural populations and draw the attention of healthcare managers and professionals to the importance of early detection and proper control of hypertension.

## 2 Methodology

A cross-sectional study was conducted over a 2-months period in May and June 2024 in the Kamrup District of Assam. The study aimed to determine the significant association of risk factors with the prevalence of hypertension. Blood pressure of individual respondents was measured in a sitting position using a standard sphygmomanometer. According to the JNC 8 guidelines, individuals with a systolic blood pressure of  $\geq 140$  mmHg

or higher and a diastolic blood pressure of  $\geq 90$  mmHg or higher were considered to have hypertension.

- **Inclusion criteria:** Participants were above 18 years of age. The participants visiting CHC & PHC Mirza, Health Camp in Jalukbari Flyover Junction and NEM-CARE group of institution Faculty and students. Participants should be seated comfortably in a quiet environment for at least 5 minutes before measuring their blood pressure. The cuff should be placed at heart level, with the back and arm supported. Auscultatory methods were used to identify the systolic and diastolic blood pressure. Blood pressure was measured in both arms during the visit to detect possible differences.
- **Data Collection tools:** The data was collected using the Interview method using a semi-structured self-administered paper-based questionnaire checklist, Anthropometric measurement (Height, Weight & BMI) and Blood pressure measurement after informed consent. Information was collected on demographics to include age, sex, religion, residence, marital status, Educational status and Employment Status. Medical related condition included Family history of Hypertension, History of Diabetes Mellitus and BMI. As part of step one we also collected self-reported information, Do you check your BP, Tobacco use, alcohol consumption, Physical activity, Current smoking status and Frequency of exercise.
- **Statistical Analysis:** **Prevalence** = No of hypertensive/Total no of participants X 100. Chi-square test was used to know if statistically significant association exist between hypertension and their associated risk factors, for all the analysis performed with  $P < 0.05$  was taken as statistically significant.
- **Data Analysis:** Data collected were checked for completeness on each data collection from participant. Data were entered into excel sheet for further data analysis. Body mass index (BMI) was computed by dividing weight in Kg by height in square meters. The generated BMI was then categorized as normal ( $18.5 \text{ kg/m}^2$  -  $<25 \text{ kg/m}^2$ ), overweight  $25 \text{ kg/m}^2$  -  $29.9 \text{ kg/m}^2$ , and obese ( $\geq 30 \text{ kg/m}^2$ ). According to the JNC 8 guidelines, individuals with a systolic blood pressure of  $\geq 140$  mmHg or higher and a diastolic blood pressure of  $\geq 90$  mmHg or higher were considered to have hypertension. Analyses were then conducted to generate descriptive statistics; frequencies and percentages. The prevalence and associated risk factors for hypertension was presented using frequencies and percentages. We conducted the bivariate analysis using binary logistic regression to analyze the factors associated with hypertension.

### 3 Results

A total sample of 545 patients was included in this study; out of these 391 are hypertensions. 275 (50.5%) were female participants and 270 (49.5%) were male. Regarding age most of participants 259 (47.5%) were age group of 40-49 years. Majority of the participants were 314 (57.6%) Hindu religion, 335 (61.5%) rural residence area, 276 (50.6%) Unmarried, 319 (58.5%) College/University in educational status respectively, as Employment Status 230 (42.2%) students, 147 (27.0%) Self-employed, 63 (11.5 %) were Government employee. Under Associated Risk Factors we have divided two section medical related condition & Behavioral Factors, most of participants 419 (76.9%) are having Family history of Hypertension, 410 (75.2%) most of participants are not having history of Diabetes Mellitus (Table 1)

All variables were analyzed using simple (bivariable) logistic regression analysis. From the socio demographic characteristics age in years was significantly associated; 40-59 years and  $>60$  years of participants with hypertension were 57% & 26 % respectively likely to develop complication compared to 18-39 years 16.8% (AOR = 2.96, 95% CI = 2.030, 4.323,  $p = 0.000$  and AOR = 0.409, 95% CI = 0.275, 0.610,  $p = 0.000$ ) respectively. Hindu participants were about 60% whereas Muslim with hypertension were 36.6% likely to develop complication compared to Christian 3% (AOR = 1.628, 95% CI = 1.450, 1.830,  $p = 0.000$ ). College/University participants were more likely to develop complication than those who attained Primary School (AOR = 0.441, 95% CI = 0.288, 0.677,  $p = 0.000089$ ). Compared to government employed participants, self-employer were 46% likely to develop complication (AOR = 0.185, 95% CI = 0.109, 0.314,  $p = 0.000$  and AOR = 1.436, 95% CI = 0.929, 2.216,  $p = 0.05$ ) respectively.

Participants with medical related condition of family history of hypertension 89% were likely develop hypertension compared to no history of hypertension 7.2% (AOR = 6.619, 95% CI = 4.121, 10.633,  $p = 0$  and AOR = 0.509, 95% CI = 0.371, 0.699,  $p = 0.000$ ) respectively. Participants with normal BMI were 50% likely to develop hypertension to those who overweight were 41.9% likely to develop hypertension compared to Obese 3.5 % (AOR = 1.520, 95% CI = 1.133, 2.042,  $p = 0.002$  and AOR = 0.448, 95% CI = 0.290, 0.695,  $p = 0.000$ ) respectively (Table 2).

The odds of having hypertension among participants who were consuming tobacco were 59% higher than in participants who were consuming tobacco 40 % (AOR = 2.118, 95% CI = 1.573, 2.853,  $p = 0.000$ ). Participants who consumed alcohol less than once a week were 32.9% likely to have hypertension compared to those participants who never drinks consume alcohol 40% (AOR = 0.295, 95% CI = 0.168, 0.520,  $p = 0.000$ ) AOR = 2.118, 95% CI = 1.573, 2.853,  $p = 0$ . Participants who used smoking 50.6% likely to have hypertension compared to those participants who consume

**Table 1. Associated Risk Factors of hypertension among Adults (N=545)**

Associated Risk Factors	Frequency (f)	Percentage (%)
<b>A. Medical related condition</b>		
<b>I. Family history of Hypertension</b>		
a. No	101	18.5
b. Yes	419	76.9
c. I don't know	25	4.6
<b>II. History of Diabetes Mellitus</b>		
a. Yes	135	24.8
b. No	410	75.2
<b>III. Body mass index (BMI)</b>		
a. Normal (18.5–24.9)	315	57.8
b. Overweight (25.0–29.9)	37	6.8
c. Obese ( $\geq 30$ )	193	35.4
<b>B. Behavioral Factors</b>		
<b>I. Do you check your BP</b>		
a. Yes	251	46.1
b. No	217	39.8
c. Occasionally	77	14.1
<b>II. Tobacco use</b>		
a. Yes	287	52.7
b. No	257	47.2
c. No Response	1	0.2
<b>III. Alcohol consumption</b>		
a. Never drinks	450	82.6
b. Almost every day	16	2.9
c. About once a week	31	5.7
d. Less than once a week	48	8.8
<b>IV. Physical activity</b>		
a. Active	110	20.2
b. Moderate	339	62.2
b. Inactive	96	17.6
<b>V. Current smoking status</b>		
a. Yes	101	18.5
b. No	444	81.5
<b>VI. Frequency of exercise</b>		
a. Low	215	39.4
b. Moderate	325	59.6
c. Highest	05	01.0

smoking 49.4% (AOR = 0.333, 95% CI = 0.213,0.523, p = 0.000) (Table 3).

**Table 2. Bivariable analyses of associated risk factors of hypertension among Adults (N=545)**

<b>Variables</b>	<b>Hypertension (%) n=391(71.7)</b>	<b>Normotension (%) n=154 (28.3)</b>	<b>AOR (95% CI)</b>	<b>P Value</b>	<b>Z-score</b>
<b>1. Age (in years)</b>					
a. 18 -39	16.8	50	2.962 [2.030, 4.323]	0	5.63
b. 40 - 59	57.1	23.4	0.409 [0.275, 0.610]	0	4.38
c. >60	26.1	26.6	1.02 [0.679, 1.534]	0.46	0.09
<b>2. Sex</b>					
a. Male	51.4	44.8	0.95 [0.861, 1.062]	0.2	0.83
b. Female	48.6	55.2	1.044 [0.936, 1.166]	0.219	0.77
<b>3. Religion</b>					
a. Hindu	60.1	51.3	0.94 [0.846, 1.055]	0.157	1.005
b. Muslim	36.6	46.7	1.628 [1.450, 1.830]	0	8.216
c. Christian	3.3	1.9	0.986 [0.959, 1.015]	0.175	0.933
<b>4. Residence</b>					
a. Rural	61.4	61.7	1.001 [0.893, 1.124]	0.487	0.032
b. Urban	38.6	38.3	0.997 [0.904, 1.101]	0.482	0.044
<b>5. Marital status</b>					
a. Married	48.6	46.7	0.987 [0.889, 1.098]	0.408	0.231
b. Unmarried	49.8	52.6	1.018 [0.913, 1.135]	0.372	0.324
c. Separated	1.5	0.6	0.423 [0.051, 3.544]	0.213	0.793
<b>6. Educational status</b>					
a. Primary	17.6	25.3	1.435 [0.929, 2.216]	0.051	1.628
b. Secondary	7.7	7.7	1.628 [0.507, 2.035]	0.482	0.043
c. High School	15.1	11.1	0.731 [0.413, 1.295]	0.141	1.073
d. College / University	59.7	55.8	0.185 [0.109, 0.314]	0	6.276
<b>7. Employment Status</b>					
a. Government employee	12.8	8.4	0.660 [0.349, 1.249]	0.101	1.275
b. Non-government employee	7.7	9.7	1.269 [0.665, 2.425]	0.234	0.722
c. Self employed	27.8	24.6	0.885 [0.585, 1.339]	0.281	0.578
d. Student	41.9	42.8	1.021 [0.726, 1.437]	0.45	0.123
e. Housewife	2.5	3.2	1.269 [0.427, 3.774]	0.333	0.429
f. Daily laborer	4.3	8.4	1.941 [0.921, 4.093]	0.04	1.743
g. Unemployed	2.3	2.6	1.128 [0.342, 3.718]	0.421	0.198
h. Retired	0.5	-	-	-	-
<b>A. Medical related condition</b>					
<b>I. Family history of Hypertension</b>					
a. No	7.2	47.4	6.619 [4.121, 10.633]	0	7.816
b. Yes	89.3	45.5	0.509 [0.371, 0.699]	0	4.168
c. I don't know	3.5	7.1	1.994 [0.886, 4.491]	0.047	1.668
<b>II. History of Diabetes Mellitus</b>					
a. Yes	24.6	25.3	1.031 [0.680, 1.564]	0.442	0.145
b. No	75.4	74.6	0.989 [0.744, 1.316]	0.471	0.07
<b>III. Body mass index (BMI)</b>					
a. Normal (18.5–24.9)	50.4	76.6	1.520 [1.133, 2.042]	0.002	2.788
b. Overweight (25.0–29.9)	41.9	18.8	0.448 [0.290, 0.695]	0	3.594
c. Obese (>=30)	7.6	4.5	0.592 [0.255, 1.377]	0.111	1.216

AOR, adjusted odds ratio; CI, confidence interval. \*p-value &lt; 0.05. The bold values indicate the significant variables.

Table 3. Bivariable analyses of behavioural factors of hypertension among Adults (N=545)

Variables	Hypertension n=391 (71.7)	(%)	Normotension (%) n=154 (28.3)	AOR (95% CI)	P Value	Z-score
<b>B. Behavioural Factors</b>						
<b>I. Do you check your BP</b>						
a. Yes	47.6		42.2	0.887 [0.633, 1.245]	0.244	0.692
b. No	38.1		42.8	1.158 [0.823, 1.631]	0.199	0.843
c. Occasionally	14.3		13.6	0.952 [0.558, 1.626]	0.428	0.179
<b>II. Tobacco use</b>						
a. Yes	59.6		35.1	0.588 [0.415, 0.835]	0.001	2.970
b. No	40.2		64.9	1.617 [1.183, 2.210]	0.001	3.014
c. No Response	0.3		-	-	-	-
<b>III. Alcohol consumption</b>						
a. Never drinks	40.2		84.4	2.118 [1.573, 2.853]	0	4.944
b. Almost every day	2.8		2.6	0.923 [0.290, 2.944]	0.446	0.134
c. About once a week	24.1		3.2	0.135 [0.054, 0.338]	0.000	4.271
d. Less than once a week	32.9		9.7	0.295 [0.168, 0.520]	0.000	4.222
<b>IV. Physical activity</b>						
a. Active	21.2		17.5	0.825 [0.515, 1.325]	0.213	0.793
b. Moderate	61.4		64.3	1.047 [0.776, 1.413]	0.381	0.302
b. Inactive	17.4		18.2	1.045 [0.648, 1.686]	0.427	0.182
<b>V. Current smoking status</b>						
a. Yes	50.6		16.8	0.333 [0.213, 0.523]	0.000	4.791
b. No	49.4		83.1	1.683 [1.259, 2.253]	0.000	3.509
<b>VI. Frequency of exercise</b>						
a. Low	38.6		41.5	1.076 [0.761, 1.522]	0.339	0.414
b. Moderate	60.6		57.1	0.919 [0.676, 1.250]	0.295	0.536
c. Highest	0.7		1.9	1.692 [0.280, 10.228]	0.283	0.573

## 4 Discussion

Based on this, the prevalence of hypertension in the study setting was 43.8% and most of the participants were new cases and not aware of being hypertensive. This is in line with a study among patients attending the outpatient department at the primary hospitals of Wolkaittegedie zone, Northwest Ethiopia (44.91%).<sup>3</sup> A Cross-Sectional Study in Urban Varanasi (32.9%).<sup>9</sup> A cross sectional study among adults in rural Sylhet district of Bangladesh 18.8% (95% CI 16.3 to 21.5).<sup>10</sup> Community based cross sectional study among adults in central Kerala (38.9%).<sup>12</sup>

Age was identified as a significant risk factor for hypertension. The prevalence of hypertension increased with advancing age. In our study, patients aged >60 years were found to be higher chance of having hypertension compared to patients who were aged 40 – 59 and 18–40 years respectively. This is supported by a cross-sectional study in Dharwad population.<sup>13</sup> Community based cross sectional study among adults in central Kerala.<sup>12</sup> A community-based study in Gondar, Ethiopia<sup>14</sup>, Gimbi, Ethiopia<sup>15</sup> and a study among older adults in rural Ethiopia.<sup>16</sup> This may be due to the biological effect of increased arterial resistance caused by arterial thickening and stiffness that occurs as one ages.<sup>17</sup>

Men exhibit higher prevalence of hypertension and associated risk factors than their female counterparts {M: 185(77.4%) F: 54 (22.6%)} respectively. Similarly, various studies came out with the higher percentage of hypertension in men than women.<sup>2,5,9,18</sup> It is possible that the difference in the prevalence of hypertension between genders could be attributed to biological sex variances and behavioral risk factors such as smoking, alcohol consumption, and physical activity.<sup>19</sup>

In the present study, religion, residence, marital status, educational status, occupational status, was significantly associated with the hypertension. Similarly, various studies came out with a cross-sectional study among hypertensive patients at University of Gondar Comprehensive Specialized Referral Hospital.<sup>5</sup> We speculate that higher education may lead to better knowledge and understanding of hypertension, resulting in a healthier lifestyle for those with higher education.<sup>19–21</sup>

In present study family of hypertension and family history of diabetes mellitus was not associated with hypertension. This finding support with a cross-sectional study among Faculty at an Urban University in Uganda.<sup>22</sup> The present study also revealed that overweight was associated with prevalence

and associated risk factors for hypertension. Similarly, study came out with the cross-sectional study among hypertensive patients at University of Gondar Comprehensive Specialized Referral Hospital.<sup>5</sup>

Interestingly, we have found association between regular check BP, tobacco used, alcohol consumption, physical activity, current smoking status and hypertension. Hypertension was more among physically active subjects as compared to inactive. This study indicated the positive association between alcohol and tobacco use and hypertension. Hypertension was more prevalent in tobacco users and alcohol users as compared to nonusers. As per WHO report, alcohol consumption was the third largest risk factor in the developed countries and tobacco use was being the second major cause of death worldwide.<sup>23,24</sup>

## 5 Conclusion

There is a relatively high prevalence of hypertension among adults in Kamrup District, Guwahati, Assam. Associated risk factors like overweight, regular check BP, tobacco used, alcohol consumption, physical activity, current smoking status had a positive significant association with hypertension. Proper training programs and essential services must be provided to healthcare professionals. Community-based hypertension screening programs should be developed to prevent this silent, deadly disease. Delivery of health education and promotion focusing on healthy nutrition and physical exercise is essential.

## Ethics statement

The studies involving human participants were reviewed and approved by NEMCARE Institute of Nursing Sciences, NEMCARE Foundation, Mirza, Assam. The patients/participants provided their written informed consent to participate in this study.

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## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.



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