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Original Article

Prevalence and Associated Factors of Hypertension: A Community-Based Cross-Sectional Study in a Rural Municipality of Eastern Nepal

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Abstract

Background

Hypertension is a major modifiable risk factor for premature mortality. The 2022 Nepal Demographic and Health Survey report a prevalence of about 20%, yet fewer than 5% of cases are adequately controlled, indicating major gaps in detection and management despite initiatives such as the Hypertension Care Cascade. Evidence from the limited studies in Nepal applying the ACC/AHA 2017 guidelines suggests that lower blood pressure cut-offs improve early identification of individuals at increased cardiovascular risk.

Materials and Methods

A rural community-based cross-sectional study was conducted among 357 adults using multistage random sampling. Data were collected using a pre-tested questionnaire. Blood pressure was measured using standard procedures and classified according to the ACC/AHA 2017 guidelines.

Results

The prevalence of hypertension was 52.1% (n=186). Among hypertensive participants, 61.3% were aware of their condition, 47.8% were receiving antihypertensive treatment, and 33.9% had controlled blood pressure. Age was significantly associated with hypertension (p=0.048), with a higher prevalence of stage 2 hypertension among those aged >60 years. Educational status showed a significant association (p=0.002), with higher prevalence among individuals with no formal education. Physical inactivity and smoking history (pack-years) were also significantly associated (p=0.040). Hypertension was more common among participants from joint or extended families (p=0.016), those reporting financial inadequacy (p<0.001), and certain occupational groups (p<0.001).

Conclusion

This study demonstrates a high prevalence of hypertension as compared to other studies in these settings with low levels of treatment and control. Lack of formal education was significantly associated with high blood pressure category. Socioeconomic, Occupational, lifestyle and behavioural factors were also associated with causation of hypertension.

Keywords: *Hypertension, Prevalence, Rural population, Nepal, Social determinants of health*

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Introduction

Hypertension is the leading modifiable risk factor for cardiovascular disease and premature mortality globally, contributing substantially to the burden of non-communicable diseases (NCDs) in low- and middle-income countries [1–3]. South Asia is experiencing a rapid epidemiological transition characterised by population ageing, urbanisation, and lifestyle change, resulting in a growing prevalence of hypertension alongside persistent communicable disease burdens [4].

Nepal exemplifies this dual burden. Among an estimated 3.9 million adults aged 30–79 years with hypertension, fewer than one-third are aware of their diagnosis, fewer than one-fifth receive treatment, and fewer than one in ten achieve adequate blood pressure control [5]. These gaps are particularly pronounced in rural areas, where access to health services and continuity of care remain limited.

The 2017 American College of Cardiology/American Heart Association (ACC/AHA) guideline lowered the diagnostic threshold for hypertension, revealing a substantially larger at-risk population [6]. Application of these criteria in Nepal has been shown to markedly increase estimated prevalence [7,26]. However, evidence from rural community-based settings using the criteria remains scarce. This study aimed to estimate the prevalence of hypertension and identify associated risk factors in a rural Nepalese population using the guidelines.

Materials and Methods

A community-based cross-sectional study was conducted in a rural area of Nepal between April 15, 2025, and October 15, 2025. The study was carried out in Katahari Rural Municipality. The study population included adults aged 18 years and above who were permanent residents of the selected community and had lived there for at least six months prior to the survey. Pregnant women, individuals who were severely ill, bedridden, or unable to provide informed consent at the time of data collection were excluded. The sample size was calculated to estimate the prevalence of hypertension using an expected prevalence of 24.4% based on previous rural Nepalese studies [9], a 5% level of significance (Z = 1.96), and a relative precision of 20%. The permissible error was 4.88%, resulting in a minimum sample size of 298. After adding 20% to account for non-response and attrition, the final sample size was 357. Data were collected using a pre-tested structured questionnaire adapted from the WHO STEPS instrument [11]. Information on socio-demographic characteristics, behavioural risk factors, and medical history was obtained through face-to-face interviews. Blood pressure was measured using a validated and calibrated digital sphygmomanometer following WHO recommendations. Measurements were taken after at least five minutes of rest in a seated position, two readings recorded five minutes apart and their average used for analysis. The primary outcome was hypertension, defined according to 2017 ACC/AHA guidelines (SBP ≥130mm Hg and/or DBP ≥80mm Hg) [7,26]. Body weight and height were measured, and body mass index was calculated as kg/m². Key variables defined were “awareness of hypertension” as self-reported by a prior diagnosis by a health professional; “treatment” as current use of antihypertensive medication; “controlled blood pressure” as systolic BP <130 mm Hg and diastolic BP <80 mm Hg; “smoking exposure” as assessed using pack-years. Physical activity was categorised based on self-reported activity level. Data collectors received standardised training, and questionnaires were checked for completeness. Data were entered into Microsoft Excel and analysed using SPSS version 27. Descriptive statistics and chi-square tests were applied, with a p-value <0.05 considered statistically significant. Ethical approval was obtained from the Institutional Review Committee of Nobel Medical College Teaching Hospital, and written informed consent was obtained from all participants.

Results

Sociodemographic characteristics of 357 participants by sex showed that most males (52.6%) and females (56.1%) were aged 18–40 years, with similar age distribution (p = 0.629). Marital status, education, and occupation differed significantly by sex, while self-reported financial adequacy was comparable. Heavy work predominated among males, whereas housework was exclusive to females.

Table 1: Sociodemographic profile of the study participants (N=357)

Age Group	Male	Female	P value
18-40	80 (52.6%)	115 (56.1%)	<0.629
41-60	50 (32.9%)	67 (32.7%)	
>60	22 (14.5%)	23 (11.2%)	
Marital Status			
Unmarried or ever married	32 (21.1%)	13 (6.3%)	<0.001
Married	120 (78.9%)	192 (93.7%)	
Type of Education			
Formal Education	40 (26.3%)	80 (39%)	0.012
No formal Education	112 (73.7%)	125 (61%)	
Type of work			
Heavy work	49 (32.2%)	23 (11.2 %)	<.001
Housewife	0 (0.0%)	75 (36.6%)	
Light work	61 (40.1%)	54 (26.3%)	
Unemployed	42 (27.6%)	53 (25.9%)	
Self-financial assessment			
Adequately meet basic requirements	100 (65.8%)	114 (55.6%)	0.052
Inadequate to meet basic requirements	52 (34.2%)	91 (44.4%)	

Percentages are calculated column-wise. Totals may vary across variables due to missing data. Analyses were conducted using available case analysis.

Out of 357 participants, 186 (52.1%) were classified as having hypertension (Stage 1 and Stage 2) according to the ACC/AHA 2017 criteria (Figure 1). Among individuals with hypertension, 114 (61.3%) were aware of their condition, and 89 (47.8%) reported current use of antihypertensive medication. However, only 63 (33.9%) had controlled blood pressure, defined as systolic blood pressure <130 mm Hg and diastolic blood pressure <80 mm Hg.

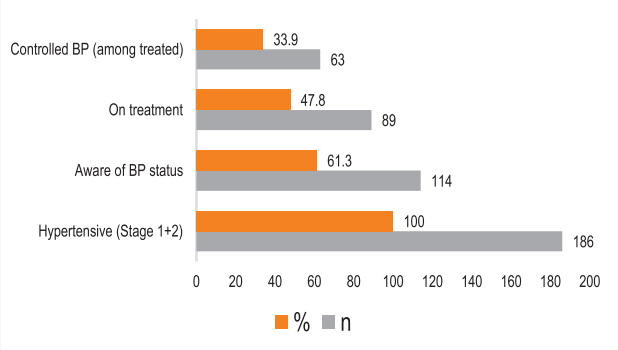

Figure 1: Hypertension care cascade: Prevalence, awareness, treatment, and control

Distribution of blood pressure categories across sociodemographic variables (Table 2) shows that age group was significantly associated with blood pressure status (p = 0.048), with an increasing proportion of Stage 2 hypertension observed in older age groups.

Family type was significantly associated with blood pressure classification (p = 0.016). A higher proportion of individuals with Stage 1 hypertension resided in joint or extended families compared with nuclear families. Educational status showed a strong association with blood pressure category (p = 0.002), with participants without formal education accounting for a larger proportion of individuals with elevated blood pressure and hypertension. Self-financial assessment was also significantly associated with blood pressure status (p < 0.001), with participants reporting inadequate income comprising a greater proportion of those with elevated blood pressure and Stage 2 hypertension.

Table 2: Association between sociodemographic characteristics and blood pressure categories

Variables	Normal BP	Elevated BP	Stage I HTN	Stage II HTN	P-value
Age group					
18-40	84 (60.4%)	17 (58.6%)	60 (56.6%)	34 (41.0%)	0.048
41-60	39 (28.1%)	7 (24.1%)	38 (35.8%)	33 (39.8%)	
>60	16 (11.5%)	5 (17.2%)	8 (7.5%)	16 (19.3%)	
Gender					
Male	58 (41.7%)	17 (58.6%)	41 (38.7%)	36 (43.4%)	0.287
Female	81 (58.3%)	12 (41.4%)	65(61.3%)	47 (56.6%)	
Marital Status					
Unmarried or ever married	10 (7.2%)	5(17.2%)	16 (15.1%)	14 (16.9%)	0.101
Married	129 (92.8%)	24 (82.8%)	90(84.9%)	69 (83.1%)	
House type					
Kachchi or semi pucca	115 (82.7%)	23 (79.3%)	96 (90.6%)	65 (78.3%)	0.114
Pucca	24 (17.3%)	6 (20.7%)	10 (9.4%)	18 (21.7%)	
Family Type					
Nuclear Family	37 (26.6%)	7 (24.1%)	12 (11.3%)	23 (27.7%)	0.016
Joint or Extended Family	102 (73.4%)	22(75.9%)	94 (88.7%)	60 (72.3%)	
Type of Education					
Formal education	60 (43.2%)	3 (10.3%)	28 (26.4%)	29 (34.9%)	0.002
No formal education	79 (56.8%)	26 (89.7%)	78(73.6%)	54 (65.1%)	
Self-financial assessment					
Adequate to meet basic requirements	113 (81.3%)	8 (27.6%)	56(52.8%)	37 (44.6%)	<0.001
Inadequate to meet basic requirements	26 (18.7%)	21(72.4%)	50 (47.2%)	46 (55.4%)	

Percentages are calculated column-wise. Totals may vary across variables due to missing data. Analyses were conducted using available case analysis. Blood pressure was measured in all participants. Percentages may not total 100 due to rounding.

Table 3 shows the distribution of blood pressure categories according to occupational, behavioural, and lifestyle characteristics. Type of work was significantly associated with blood pressure category (p < 0.001). Participants engaged in light work constituted the largest proportion of those with Stage 1 hypertension, while unemployed participants were overrepresented in the elevated blood pressure and Stage 2 hypertension categories. Body mass index was not significantly associated with blood pressure category (p = 0.733), although overweight or obesity predominated across all blood pressure groups.

Among participants with a history of smoking (n = 138), cumulative smoking exposure measured in pack-years was significantly associated with

blood pressure category (p = 0.040). Participants with ≥10 pack-years accounted for a higher proportion of those with Stage 2 hypertension. Alcohol intake during the past year was not significantly associated with blood pressure category (p = 0.781). Physical activity level showed a statistically significant association with blood pressure category (p < 0.001). Mostly physically inactive participants were more common among those with elevated blood pressure and Stage 2 hypertension, whereas moderate to vigorous physical activity was more frequently reported among participants with normal blood pressure and Stage 1 hypertension.

Table 3: Distribution of blood pressure categories according to occupational, behavioral, and lifestyle characteristics

Variables	Normal BP	Elevated Blood Pressure	Stage I HTN	Stage II HTN	P-value
Type of Work (N=357)					
Heavy work	36 (25.9%)	4 (13.8%)	13 (12.3%)	19 (22.9%)	
Housewife	38 (27.3%)	1 (3.4%)	22(20.8%)	14 (16.9%)	<0.001
Light work	45 (32.4%)	5 (17.2%)	42 (39.6%)	23 (27.7%)	
Unemployed	20 (14.4%)	19 (65.5%)	29 (27.2%)	27 (32.5%)	
Body Mass Index (N=357)					
Normal Body Weight	62 (44.6%)	12 (41.4%)	42 (39.6%)	31 (37.3%)	
Overweight or Obese	77 (55.4%)	17 (58.6%)	64 (60.4%)	52 (62.7%)	0.733
H/o Smoking (n= 138)					
>=10 pack years	28 (73.7%)	4 (44.4%)	19 (44.2%)	30 (62.5%)	
<10 pack years	10 (26.3%)	5 (55.6%)	24 (55.8%)	18 (37.5%)	0.040
Alcohol Intake during past 1 year (N=357)					
Yes	83(59.7%)	17 (58.6%)	65 (61.3%)	55 (66.3%)	0.781
No	56 (40.3%)	12 (41.4%)	41 (38.7%)	28 (33.7%)	
Physical Activities (N=357)					
Mostly Physically Inactive	45 (32.4%)	20 (69.0%)	26 (24.5%)	47 (56.6%)	<0.001
Moderate to Vigorous Physical Activity	94 (67.6%)	9 (31.0%)	80 (75.5%)	36 (43.4%)	

Percentages are calculated column-wise. Totals may vary across variables due to missing data. Analyses were conducted using available case analysis.

Discussion

This rural community-based study demonstrates a high prevalence of hypertension (52.1%) when classified using the ACC/AHA 2017 criteria, highlighting a substantial and under-recognised burden of elevated blood pressure in rural Nepal. The observed prevalence is markedly higher than estimates from earlier Nepalese studies that applied higher diagnostic thresholds and thus likely underestimated the true burden of disease. Our findings are consistent with reports from Nepal and other South Asian settings that have documented a sharp rise in hypertension prevalence following the adoption of the guidelines, reflecting the sensitivity of lower blood pressure cut-offs in identifying individuals at cardiovascular risk [7–10,26]. Given the established contribution of hypertension to global morbidity and mortality [1–3], this high prevalence has important implications for population health and health system preparedness in rural Nepal.

Despite a moderate level of awareness of hypertension, treatment initiation and effective blood pressure control were notably inadequate. Fewer than half of individuals with hypertension were receiving antihypertensive treatment, and only around one-third achieved controlled blood pressure. This pattern reflects substantial attrition across the hypertension care cascade, a challenge consistently documented in national surveys and large screening initiatives such as the Nepal Demographic and Health Survey and May Measurement Month campaigns [5,11–14]. These gaps underscore persistent barriers to continuity of care, including limited access to health services, affordability of long-term treatment, and inadequate follow-up in rural settings.

Age emerged as one of the strongest determinants of hypertension, particularly for Stage 2 disease. This finding is biologically plausible and aligns with evidence from Nepal and across South Asia, where vascular stiffening, endothelial dysfunction, and cumulative exposure to behavioural and metabolic risk factors contribute to rising blood pressure with advancing age [8,14, 15,24]. Lower educational attainment was independently associated with hypertension, reinforcing the role of health literacy, awareness of preventive behaviours, and socioeconomic disadvantage in shaping cardiovascular risk profiles [9,16,17].

Regarding lifestyle-related factors, physical inactivity and occupational status showed significant associations with hypertension, reflecting ongoing lifestyle transitions in rural Nepal, including reduced occupational physical activity and changing work patterns [18–20]. Tobacco exposure, assessed cumulatively through pack-years, was significantly associated with hypertension, consistent with regional and global evidence linking smoking to vascular injury, arterial stiffness, and increased sympathetic activity [17,21,22]. These findings highlight the need for integrated behavioural risk reduction strategies within primary health care.

Household and socioeconomic contexts further influenced hypertension risk. Individuals residing in joint or extended family structures had a higher prevalence of hypertension, potentially reflecting psychosocial stress, economic dependency, and complex household dynamics that may adversely affect health behaviours and stress levels [9,23]. Financial inadequacy emerged as a

strong determinant of hypertension, underscoring the impact of socioeconomic inequalities on both exposure to risk factors and access to preventive and curative services [5,16,24].

Interestingly, body mass index was not significantly associated with hypertension in this study. Similar findings have been reported in other Nepalese and South Asian populations and may reflect the phenomenon of normal-weight hypertension, where individuals with relatively low BMI still experience elevated cardiovascular risk due to factors such as central adiposity, poor diet quality, or early-life undernutrition [15,22,25]. This underscores the limitation of relying solely on BMI to assess cardiometabolic risk in South Asian populations and highlights the need for more comprehensive risk assessment approaches.

This study underscores a high and largely unmet burden of hypertension in rural Nepal, shaped by demographic, socioeconomic, behavioural, and household factors. Strengthening community-based screening, improving linkage to care, and addressing social determinants of health are essential to reduce the long-term cardiovascular consequences of hypertension in this setting.

Conclusion

Among the study participants, more than half of them had hypertension (Stage 1 and Stage 2) with higher proportion of them were aware of their condition and reported to have antihypertensive drug but with limited control over blood pressure was observed. Blood pressure status was significantly associated with age, family type, education, income, occupation, and lifestyle factors. Older age was linked to Stage 2 hypertension, while Stage 1 hypertension was more frequent among individuals from joint or extended families. Participants without formal education and those reported to have inadequate income were very common in hypertensive categories. Light workers and unemployed individuals were more commonly hypertensive. Body mass index was not significantly associated, though being overweight and obesity were prevalent. Smoking exposure and physical inactivity were significantly associated with elevated blood pressure and Stage 2 hypertension.

Recommendation

The study emphasises the urgency of strengthening population-level prevention and primary care–based hypertension management in rural settings. Addressing hypertension requires not only clinical interventions but also broader social and economic policies. Community-based blood pressure screening should be expanded within primary health-care systems. Lifestyle interventions targeting physical inactivity and tobacco use should be prioritised. Hypertension programmes must explicitly address socioeconomic and educational inequities. Integration of hypertension management into existing NCD platforms may improve treatment continuity and control.

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Conflict of interest: None

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