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Burden of Hypertension in a Rural Community of Western Nepal: A Cross-Sectional Study

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ABSTRACT

Introduction

Hypertension is a modifiable risk factor for cardiovascular disease with rising burden in low- and middle-income countries (LMIC) like Nepal. However, reliable community level data from rural Terai regions are scarce. This study was conducted to determine the prevalence of hypertension and to identify its socio-demographic and behavioural risk factors among a rural village of Rupandehi district.

Methods

A community-based cross-sectional study was carried out in Materiya Village of Rupandehi district, Nepal, from April to July 2025. A total of 290 adults were recruited using systematic sampling, and data were collected with a structured case proforma. Hypertension was defined according to the 2025 ACC/AHA criteria. Descriptive statistics summarized data, and chi-square test, ANOVA, and t-test were applied.

Results

The mean age of the participants was 39.30±13.9 years, 71.4% were female, and 50% were illiterate. The overall prevalence of hypertension was 46.9%, with males having a significantly higher prevalence (60.2%) than females (41.5%). Prevalence increased progressively with age, from 27.6% in the 20-29 years group to 66.7% in those ≥60 years. Hypertension was significantly associated with alcohol consumption, occupation, and marital status. Only 19% of the hypertensive participants were on treatment.

Conclusion

This study reveals an alarmingly high burden of hypertension (nearly one in two adults) in the rural western Terai region of Nepal, while awareness and treatment remained low. The strong links with male gender, advancing age, alcohol use, and certain occupations suggest the urgent need for targeted, community-based screening and need for lifestyle modifications.

Keywords

Blood pressure; community-based; hypertension; rural Nepal; risk factors

INTRODUCTION

Hypertension is a leading cause of morbidity and mortality worldwide and a major modifiable risk factor for cardiovascular diseases (CVD), stroke, chronic kidney disease, and premature death.[1] Approximately 1.4 billion adults aged 30 to 79 years are hypertensive globally, representing about one third of this age, with majority from low-and middle-income countries (LMICs) like Nepal.[2] Its pathophysiology reflects a complex interplay of genetic predisposition, increased sympathetic activity, activation of renin-angiotensin-aldosterone system (RAAS), oxidative stress via NADPH oxidase, endothelial damage, and vascular remodeling[3], further influenced by socio-demographic, behavioral and environmental factors.[4,5]

In Nepal, psychosocial stress related to economic migration and shifting social structure, sedentary lifestyles, high salt intake and dietary patterns containing oily and processed food may have fueled its prevalence.[6,7] According to the WHO, nearly one in four people in Nepal are hypertensive, and only less than 5% their condition under control, reflecting the major gaps in detection and management.[8] A cross-section study in the western part of Nepal reported the age- and sex-adjusted prevalence of hypertension to be 28%.[9] In Nepal Demographic and Health Survey (NDHS) 2016, almost one- fifth of 13304 adults were found to be hypertensive, while in another nationwide survey of 13598 participants aged 15-69 years, 18% were reported to be hypertensive.[10]

Despite these large surveys, granular data remain limited. Materiya Village, Omsatiya Rural Municipality, Rupandehi district represents a similar rural Terai community of Nepal where the risk of hypertension is high, yet the data remain scarce. This study, therefore, aims to determine the prevalence of hypertension and find the associated socio-demographic, lifestyle, and psychological risk factors among the adults of this rural community.

METHODS

This community-based cross-sectional study was conducted in Omsatiya Rural Municipality, Ward no 4 of Rupandehi, district, Nepal. The study was aimed to find out the prevalence of hypertension and to identify the socio-demographic, lifestyle and psychological factors associate with it. Data collection was carried in a period of four months from April 2025 to July 2025, after obtaining approval from institutional review committee (IRC) of Universal College of Medical Sciences (UCMS/IRC/07/25) Bhairahawa. Male and female adult residents of the Village from 20 to 70 years who were able to provide consent and were willing to participate in the study were included and those unable to respond to the interview, declined consent and were pregnant were excluded from the study.

The sample size was calculated based on an estimated hypertension prevalence of 19.5% from similar previous study[11] with a 95% confidence interval and 5% margin of error.

$n=Z^2.P(1-P).\ r/d^2$

Z= 1.96 (for 95% confidence level)

P= 0.195 (prevalence from a similar previous study)

d= 0.05 (assuming a margin of error of 5%)

r = 1 (assuming no design effect)

So, the estimated required sample size is approximately 242. Adjustment after considering a 10% non-response rate the sample size is 269. So, in this study, 290 participants were included in total, exceeding the calculated sample size.

A two-stage approach, combining village selection through convenient sampling and household selection through systematic sampling, was used. Materiya Village (Omsariya, ward no 4) was chosen based on accessibility and logistical feasibility. Starting from a randomly chosen household, every alternate household was included using a systematic sampling procedure. If a selected household refused to participate in the study or was vacant, the immediate next household was approached. In the households with more than one eligible adult, all eligible members who were present during the visit and provided consent were enrolled in the study.

Data was collected using a well-structured case proforma. This proforma captured sociodemographic variables including age, sex, education, occupation, marital status, household addresses; medical history including history of hypertension,

duration since diagnosis, current use of antihypertensive medication, family history of hypertension, history of diabetes, heart disease or kidney disease; life style characteristics: smoking status, alcohol consumption, dietary habits and physical activity; psychological factors including self-reported stress and sleep patterns and anthropometric and blood pressure measurement. Physical activity was assessed by self-reported exercise frequency and categorized as daily,weekly, occasionally, and rarely based on participants response. Before data collection for the study, pilot sampling was done in 15 households (30 participants) in the same village to check the clarity, flow, and time required, and necessary preparation was done, and changes were made before the main survey.

Three trained data collectors and one supervising investigator were involved in data collection. Before collection, they all underwent through an extensive homework and discussion on the objectives of the study, informed consent procedures, case proforma recording procedure, and standardized anthropometric techniques and blood pressure recording protocols. The aneroid manometer type of sphygmomanometer was well calibrated against a mercury reference device before the study and periodically checked during the field work. Blood pressure measurement was done by both palpatory and auscultatory techniques, adhering to the standard recommendation for BP measurement techniques by the American Heart Association (AHA).[12]

Data Management and Statistical Analysis

All completed proformas were checked for completeness and consistency. Data were entered in Microsoft excel and cleaned data was exported to SPSS (version 20) for analysis. The data was handled and stored with ethical standards to protect confidentiality. Relevant descriptive statistical measures were carried out to summarize data. Chi-square test, ANOVA and t-test were applied. A p-value less than 0.05 was considered to be statistically significant.

RESULTS

A total of total 290 participants were included in the study, among them majority, 207 (71.4%) were female. The mean age of the participants was 39.30±13.94. The background characteristics of the participants are presented in Table 1. The majority of the participants were in 20-29 years of age group (30.3%), housewives by occupation (65.2%), Illiterate (50%), nonsmokers (95.2%), non-alcoholic (85.9%), engaged in daily physical activity (76.9%), married (90%), and had normal body mass index (54.8%). Among 136 hypertensives, only 26 (19.11%) were on antihypertensive therapy.

The mean systolic blood pressure (SBP) and diastolic blood pressure (DBP) across the age group and gender are shown in Table 2. There was progressive increase in mean BP with advancing age group and the difference was statistically significant ($p < 0.01$ for both SBP and DBP). Males had higher range of SBP (121.06±17.54 mmHg) and DBP (77.08±13.13 mmHg) compared to female (SBP: 116.73±16.75 mmHg; DBP: 73.32±11.92), though statistically significant difference was found only in DBP ($p=0.019$).

The mean age of the hypertensives was 43.78 ± 13.67 years. The prevalence of hypertension (defined according to AHA /ACC 2025 guidelines as SBP≥130 mmHg and DBP≥ 80 mmHg) across the age groups and the gender is presented in table 3. The overall prevalence of hypertension was 46.9% with higher rate in male (60.2%) than in female (41.5%), and the difference was statistically significant ($p=0.016$). The prevalence of hypertension increased with age, being lowest in 20-29 years of age group (27.3%) and highest in ≥60 years age group (68.8%), with statistically significant trends across age group ($p<0.01$).

The prevalence of hypertension according to various sociodemographic characteristics and behavioural risk factors is shown in Table 4. Hypertension was significantly associated with occupation, marital status, and alcohol consumption. Among the 26 participants receiving antihypertensive medication, 21 had uncontrolled blood pressure, giving prevalence of 80.8%, based on ACC/AHA criteria of SBP ≥130 mmHg and or DBP ≥80 mmHg.

Table 1. Background characteristics of study participants (N= 290)

Variables	Number (n)	Proportion (%)
Age group		
20-29	87	30.3
30-39	64	22.1
40-49	56	19.3
50-59	50	17.2
60 and above	33	11.4
Gender		
Female	207	71.4
Male	83	28.6
Occupation		
Driver	9	3.1
Farmer	40	13.8
Housewife	189	65.2
Job	12	4.1
Laborer	20	6.9
Painter	2	0.7
Student	18	6.2
Education		
Illiterate	145	50
Primary	78	26.9
Secondary	59	20.3
Higher Education	8	2.8
Anti-Hypertensive use		
Yes	26	9
No	264	91
Smoker		
Yes	14	4.8
No	276	95.2
Alcoholic		
Yes	41	14.1
No	249	85.9
Activity		
Rarely	22	7.6
Occasionally	23	7.6
Weekly	22	7.6
Daily	223	76.9
Marital Status		
Single	28	9.7
Married	261	90.0
Divorced	1	0.3
BMI		
<18.5(underweight)	20	6.9
18.5-24.99 (Normal)	159	54.8
25.0-29.99 (pre-obese)	76	26.2
30 and more (Obese)	35	12.1

Table 2. Mean systolic and Diastolic blood pressure across age group and gender

Age group	Systolic BP (mmHg) (mean ± SD)	Diastolic BP (mean ± SD)
20-29	109.31±11.67	69.33±10.14
30-39	113.47±13.57	72.78±11.94
40-49	121.96±15.94	78.79±13.14
50-59	126.64±20.07	76.88±12.56
60 and above	129.64±17.78	79.70±11.82
p-value	<0.001	<0.001
Gender		
Male	121.06±17.54	77.08±13.13
Female	116.73±16.75	73.32±11.92
p-value	0.051	0.019

Table 3. Prevalence of Hypertension across different age group and gender

Characteristics	Total n(%)	Normal (<120 mmHg and <80mm Hg)	Elevated 120-129 mmHg and <80 mmHg	Hypertension (≥130 mmHg and ≥80mmHg)	Percentage of Hypertensives in total population	Proportion among Hypertensives
Gender						
Male	83	28 (33.74%)	5 (6.02%)	50 (60.24%)	17.24%	36.76%
Female	207	103 (49.76%)	18 (8.70%)	86(41.54%)	29.66%	63.24%
Total	290	131 (45.17%)	23 (7.93%)	136 (46.89%)	46.89%	100%
Age group						
20-29	87	56 (64.36%)	7(8.04%)	24(27.60%)	8.28%	17.65%
30-39	64	33 (51.56%)	4(6.25%)	27(42.19%)	9.31%	19.85%
40-49	56	18(32.14%)	5(8.93%)	33(58.93%)	11.38%	24.26%
50-59	50	16(32.00%)	4(8.00%)	30(60.00%)	10.34%	22.06%
60 and above	33	8(24.24%)	3(9.10%)	22(66.66%)	7.59%	16.18%
Total	290	131 (45.17%)	23 (7.93%)	136 (46.89%)	46.90%	100%

p-value: Gender: 0.016, Age group: <0.001

Table 4. Prevalence of Hypertension according to various population characteristics and behavioural risk factors

Variables	Normal	Elevated	Hypertension	Total	p-value
Occupation					0.012
Driver	1(11.10%)	0(0%)	8(88.90%)	9	
Farmer	15(37.5%)	2(5.00%)	23(57.5%)	40	
Housewife	92(48.68%)	16(8.46%)	81(42.86%)	189	
Job	5(41.66%)	1(8.34%)	6(50.00%)	12	
Laborer	4(20.00%)	1(5.00%)	15(75%)	20	
Painter	1(50.00%)	0	1(50.00%)	2	
Student	13(72.22%)	3(16.67%)	2(11.11%)	18	
Total	131 (45.17%)	23 (7.93%)	136 (46.89%)	290	

Marital Status					0.02
Single	19(67.86%)	4((14.28%)	5(17.86%)	28	
Married	112(42.92%)	19(7.28%)	130 (49.80%)	261	
Divorced	0	0	1(100%)	1	
Total	131 (45.17%)	23 (7.93%)	136 (46.89%)	290	
Smoker					0.78
Yes	5(35.71%)	1(7.14%)	8(57.15%)	14	
No	126(45.65%)	22(7.80%)	128(46.35%)	276	
Total	131 (45.17%)	23 (7.93%)	136 (46.89%)	290	
Alcoholics					0.01
Yes	12(29.27%)	1(2.43%)	28(68.30%)	41	
No	119(47.80%)	22(8.85%)	108(43.35%)	249	
Total	131 (45.17%)	23 (7.93%)	136 (46.89%)	290	

DISCUSSION

This community-based cross-sectional study conducted in a rural setting of Rupandehi district, Nepal, found a very high burden of hypertension (47%) using 2025 ACC/AHA guidelines (≥130/80 mmHg), rising sharply with age, and with only 19% of hypertensives on treatment. Similar patterns are observed globally as per WHO reports which shows one in three adults worldwide are hypertensive (≥140/90), with their number doubled between 1990 and 2019, from 650 million to 1.3 billion, mostly in low/middle-income countries.[13] The overall rate of hypertension in the present study is also in alignment with the study of Kibria et al., which shows that under the new guidelines, 44.2% of adults in Nepal are hypertensive.[14] Similarly, a systematic review and meta-analysis projecting the trends of hypertension in Nepal estimated that 32% of Nepali were hypertensive (using the older definition) for 2016 to 2020.[15] Comparatively, rural studies in Nepal vary; a cross-sectional study in rural area of Nepal reported 30.8% cases of undiagnosed hypertension[16], whereas in eastern rural Nepal found 52.1% of such cases.[17] These variations can be due to methodological differences, including sampling and definitions, but collectively agree that hypertension is prevalent silently in the rural areas of Nepal. It highlights that hypertension, a major risk factor for cardiovascular mortality is no longer confined to the urban population but is widespread throughout Nepal. This condition can be more threatening as the population in the urban areas are benefitted from better health care facilities and health education while rural areas lag behind in these sevices.[18]

Hypertension prevalence was significantly higher in males (60.2%) than females (41.5%), consistent with the gender disparity observed nationally and globally.[19,20,21] This male predominance may reflect the psychological and behavioural risk factors such as occupational stress, smoking, and alcohol consumption A progressive age-related increase in hypertension was observed with significant trends, showing that older adults had dramatically higher blood pressure, which is quite consistent with older studies within the country and globally.[15,1] A physiological explanation behind this mechanism can be multifold, including, stiffening of arteries, endothelial dysfunctions, and oxidative stress with aging.[3]

We identified several risk factors as expected. Overweight and obesity (BMI ≥25 in around 38%) were common, and although our study found high physical activity, excess weight was recognized as a causative factor for hypertension.[22] Alcohol consumption, an established modifiable risk factor, was also found to be strongly associated, as 68% of the drinkers were hypertensive versus 34% of non-drinkers (p=0.001), corroborating a 2024 meta-analysis showing a causal relationship of alcohol consumption with hypertension risk.[23] We found no association between smoking and hypertension, possibly due to

low smoking rates among the participants of our sample as more than two third of the participants were female. Occupation showed significant associations, with the highest prevalence in drivers (88.9%) and laborers (75%), which may be due to sedentary/ stressful work and irregular dietary patterns. Althogh these occupations showed statistically significant association with hypertension, the number of participants of these professions are low, so we suggest that larger studies should be conducted to identify the specific oocupations groups at higher risk. Similarly, in Nepal, a recent white-collar study reported occupational risks due to sedentary life style[24], and in a South Asian study, Gupta et al. tied manual labor to hypertension via physical strain and low health literacy.[6] Married individuals were found to have a higher prevalence of hypertension when compared to singles, possibly reflecting stresses and marriage related economical burdens in rural households. One of the key findings of the study was that only 19% the hypertensives were under medication and alarmingly, a high proportion of those receiving treatment still had uncontrolled blood pressure, suggesting a poor BP control despite ongoing therapy. These results highlight significant gaps in care including, faliure to optimize drug despite evevated readings, poor patient adherence, negligence towards proper monitoring, and other clinical or lifestyle-related factors. These findings indicate the need for implementing structured hypertension management programs, including regular home monitoring, closer follow-up, treatment review and reinforcement of lifestyle modification among hypertensive patients.

The strengths of our study include standardized AHA-compliant BP measurements and comprehensive risk measurement assessments in an underrepresented rural terai community of Nepal. These findings have profound implications for Nepal's NCD strategy, aligning with WHO's 2025 call for primary care integration.[25] The implications of our findings are clear for public health practices. The high prevalence of hypertension in rural settings suggests that frequent screenings should be done. Community health workers who have successfully led the hypertension education efforts elsewhere in Nepal could be mobilized for screening and counselling the people regarding the changes in lifestyle. Early detection and intervention are crucial, as only a few Nepalese know their status[26] and so many cases go untreated until complications arise. Implementing the strategies regarding primary care blood pressure monitoring will help close this gap, and on the prevention side, policies should target the identified risks. Community interventions such as smoking and alcohol awareness, dietary and marital counselling may reduce the burden. Furthermore, community-based life-style modification programs including yoga and meditation[27] targeting stress reduction and awareness programs promoting physical activity and combating obesity through nutrition are also warranted.

CONCLUSION

Hypertension in rural Nepal is found to be far more common than previously recognized, affecting nearly half of the adults with only 19% receiving treatment, and a vast majority remaining undetected and uncontrolled. These findings reveal a huge gap in rural health services and suggest an urgent community-based screening, awareness programs and lifestyle modifications. Preventing hypertension in community is not only essential to prevent cardiovascular deaths but also to provide health equity for rural majority of Nepal.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest with respect to the research, authorship, and/or publication of this article.

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