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Hypertension Prevalence, Awareness and its Association with Sleep Quality and Stress among Adults in Semi-Urban District of Nepal

Achala Bhattarai[1], Beli Poudyal[1], Mitra Kumari Devkota[1]

[1]Sukraraj Tropical and Infectious Disease Hospital, Teku, Kathmandu

Correspondence: *Achala Bhattarai, Hospital Nursing Inspector, Sukraraj Tropical and Infectious Disease Hospital, Teku, Kathmandu,*

Email: *achala_bt@yahoo.com,* ***Mobile:*** *9861399701*

ABSTRACT

Background: Hypertension is a major public health challenge globally, contributing to cardiovascular morbidity and mortality. Despite its rising prevalence, awareness, treatment, and control remain inadequate. Sleep quality and psychological stress are increasingly recognized as important correlates, yet evidence from Nepal is limited.

Methods: A community-based cross-sectional study was conducted among 300 adults in Ramgram Municipality, Nawalparasi District. Participants were selected using cluster sampling. Data were collected through face-to-face interview using the World Health Organization STEPS questionnaire, the Perceived Stress Scale, and the Pittsburgh Sleep Quality Index, along with anthropometric measurements. Associations between hypertension and socio-demographic, behavioral, and psychosocial factors were examined using chi-square test and logistic regression.

Results: The prevalence of hypertension was 36%, with awareness at 24% and 34.25% newly identified cases. Among hypertensive individuals, 59% were on treatment and 46% had controlled blood pressure. Age was the strongest predictor, with participants aged 61 years and above showing markedly higher odds (Adjusted Odds Ratio = 26.809, $p < 0.001$). Obesity was also strongly associated (AOR = 7.661, $p = 0.001$). Moderate salt intake (5–9 g/day) had protective (AOR = 0.168, $p = 0.020$) effect of hypertension. Poor sleep quality (AOR = 3.406, $p < 0.001$) and very poor sleep quality (AOR = 3.199, $p = 0.044$) significantly increased hypertension risk, while perceived stress showed a non-significant trend (AOR = 1.54, $p = 0.172$).

Conclusion: Hypertension is highly prevalent in semi-urban Nepali population, with low awareness and substantial hidden cases. Age, obesity, salt intake, and poor sleep quality were key determinants. Public health interventions focusing on lifestyle modification, awareness, and early detection are urgently needed to reduce the burden of hypertension in Nepal.

Kewwords: Awareness, hypertension, sleep quality, stress

INTRODUCTION

Hypertension, defined as persistently elevated blood pressure, remains one of the most critical global public health challenges. Clinically, it is diagnosed when systolic pressure is ≥140 mmHg and diastolic pressure is ≥90 mmHg, while pre-hypertension ranges between 120–139 mmHg systolic and 80–89 mmHg diastolic.[1] Recent recommendations consider pre-hypertension an early stage of hypertension and suggest early intervention through lifestyle modification and, when necessary, single-drug therapy.[2] Uncontrolled hypertension can damage vital organs including kidneys, eyes, brain, and heart, leading to complications such as renal failure, stroke, myocardial infarction, and heart failure.[3, 4]

Hypertension arises from a combination of non-modifiable and modifiable risk factors. Age, obesity, and family history[5], along with behaviors such as smoking, alcohol consumption, high salt intake, sedentary lifestyle[6], abnormal sleep[7], and psychological stress[8] significantly increased risk. The condition's asymptomatic nature often results in delayed diagnosis, increasing the likelihood of cerebrovascular events and premature

death. Low awareness, harmful cultural practices, and inadequate treatment exacerbate its burden.[9] Evidence shows that early detection and healthy lifestyle adoption substantially reduce complications.[10]

Globally, awareness of hypertension varies widely between developed and developing countries. In high-income countries, more than 80% of adults with hypertension are aware of their condition.[11] In contrast, awareness remains low in many developing countries.[12-17] In Nepal, national evidence indicates that only about half of hypertensive adults are aware of their condition, with men and rural populations showing particularly low awareness, reflecting substantial gaps in early detection and continuity of care.[18, 19]

Globally, hypertension cases increased from 650 million in 1990 to 1.4 billion in 2024[20], contributing to 7.5 million deaths and 211 million disability adjusted life years.[21, 22] Cardiovascular diseases account for 17 million annual deaths, with most occurring in low- and middle-income countries.[23] Asian populations experience particularly high burden and poorer blood pressure control[24,25], influenced by lifestyle transitions, rising obesity, and low awareness.[26, 27]

Within SAARC nations, Nepal has the highest reported prevalence 33.8% with NCD-related deaths rising substantially in recent years.[19] Despite this growing burden, awareness, treatment, and control rates remain inadequate, underscoring the need for improved prevention and monitoring strategies.[26] Therefore, this study aims to: (1) assess the prevalence of hypertension; (2) identify associated risk factors; and (3) evaluate awareness, treatment, and control patterns to inform targeted interventions.

METHODS

This community-based cross-sectional study was conducted between 15 August and 23 September 2018 in Ramgram Municipality of Nawalparasi District, Nepal. The municipality lies in the Nawalparasi west district of Nepal and is characterized by semi-urban settlement, rapid unplanned urbanization, high migration, and a multicultural population. The study population consisted of adults aged 18 years and above who had resided in the municipality for at least six months. Population data were obtained from the 2011 national census. Among the 16 wards of Ramgram Municipality, four wards were randomly selected for data collection. Individuals diagnosed with mental disorders, memory disorders, or secondary hypertension were excluded from participation.

A probability cluster sampling technique followed by simple random sampling was used. Based on a hypertension prevalence of 20% among Nepali adults as reported by Nepal Demographic Health Survey of 2016 [28], 5% precision, and a design effect of 1.5, the initial calculated sample size was 250. After adding a 20% non-response rate, the final sample size was 300.

The sample size was determined using the Fisher's Exact formula: $N=Z^2P(1–P)/E^2$, where Z = 1.96, P = 0.20, and E = 0.05, yielding N = 250. Accounting for non-response increased the total sample to 300.

Wards (clusters) were selected randomly: Wards 1, 3, 9, and 15. Samples were proportionately allocated according to adult population distribution. Within wards, respondents were selected using random numbers generated in Excel. When selected individuals were not found (15%), replacements were taken from the next 4th or 5th household.

Measurement Tools

Data were collected using structured questionnaires adapted from the World Health Organization STEPS Survey, the Perceived Stress Scale developed by Sheldon Cohen [29], and the Pittsburgh Sleep Quality Index (PSQI).[30] In addition to the questionnaires, anthropometric measurements were taken, including blood pressure, height, and weight, using an OMRON automatic blood pressure monitor, Royal inch tape, and Virgo weighing scale. The questionnaire was organized into four sections covering socio-demographic information, personal characteristics and health behaviors, perceived stress and sleep quality assessment, and anthropometric measurements. To ensure validity and reliability, standardized instruments that had been previously validated both internationally and nationally were employed. Nepali versions of the WHO STEPS survey, PSQI, and the Perceived Stress Scale were used, and content validity was established through expert review by six Nepali professionals. The content validity index scores were high, with 0.966 for the PSS and 0.98 for the PSQI, confirming strong validity. All questionnaires were administered in the local language to enhance comprehension and accuracy of responses.

Data Collection Procedures

Data collection followed a systematic five-step process. First, tool validation was conducted, with questionnaires reviewed by six academic experts, yielding a content

validity index of 0.911, and subsequently approved by the Nepal Health Research Council. Second, two research assistants of health academic background received training on study objectives, procedures, informed consent, interview techniques, and physical measurements to collect data ensuring standardized methods. Third, research assistants visited eligible participants at home, where they were provided with detailed study information and asked to provide written informed consent. Fourth, face-to-face interviews were conducted to collect demographic details, health behaviors, sleep quality using the PSQI, and stress levels using the PSS. Finally, anthropometric measurements were taken, with blood pressure recorded twice at five-minute intervals and a third reading obtained if discrepancies were noted. Height and weight were measured with participants wearing light clothing and no shoes, and body mass index (BMI) was calculated as weight in kilograms divided by height in meter square.

Data Management and Analysis

Data was checked for accuracy and completeness, coded, and analyzed using SPSS version 20. Descriptive statistics included frequencies and percentages for categorical variables and mean with standard deviation for continuous variables. The prevalence, awareness, and newly identified cases of hypertension were summarized. Multivariate and bivariate logistics regression analysis were carried out to explore the associations between hypertension and various characteristics of the respondents. Crude odds ratio (COR) adjusted odds ratio (AOR), p -value and 95% confidence intervals were presented. A p-value < 0.05 was considered statistically significant.

RESULTS

Sociodemographic characteristics of the respondents

Table 1 summarizes the socio-demographic characteristics of the study population, which included 300 adults. Slightly more than half were male (51.7%), while the remainder were female (48.3%). The mean age of participants was 43.28 years, with a median of 42 years and a standard deviation of 14.58. The largest proportion belonged to the 31–45 years age group (36.7%), followed by those aged 46–60 (29.3%), then 18–30 (21.7%), and the smallest proportion from those aged 61 and above (12.3%). In terms of education, 40% had completed secondary-level schooling, 20% had attained higher education, 16% were literate without formal schooling, and 9% were illiterate.

Occupationally, 52.3% of participants were engaged in study, job and business, while homemakers formed 34% and physical workers such as farmers and laborers made up 13%. Ethnically, the largest proportion were Madhesi (36.7%), followed by Brahmin/Chhetri (33.7%), Janajati (18.7%), and Dalits (11%). This distribution highlights the diverse composition of the study population across sex, age, marital status, religion, education, occupation, and ethnicity.

Table 1: Sociodemographic characteristics of the respondents n=300

Variables	Number	Percent
Sex		
Male	155	51.7
Female	145	48.3
Age (in years)		
18-30	65	21.7
31-45	110	36.7
46-60	88	29.3
61and above	37	12.3
mean±SD	43.3±14.6	
Educational categories		
Illiterate	27	9.0
Literate/Primary education	93	31.0
Secondary education	120	40.0
Higher education	60	20.0
Occupation categories		
Manual job	39	13.0
Mental job	157	52.3
Home maker	104	34.7
Caste group		
Brahmin/Chhettri	101	33.7
Janajati	56	18.7
Madheshi	110	36.7
Dalits	33	11.0

Health status and behavior of the respondents

Table 2 presents the personal characteristics and health behaviors of the study participants. About BMI, the majority had normal body weight (54.7%), followed by overweight individuals (35%) and a smaller proportion

classified as thin (10.3%). In terms of salt intake, most participants consumed between 5–9 g per day (62%), while 34% consumed more than 9 g, and only 4% consumed less than 5 g daily.

Family history of hypertension showed that 36% reported a positive history, 45.7% stated they had no family history, and 18.3% were uncertain, often due to parental death or separation. Smoking behavior revealed that 27% were past smokers, while 63% had never smoked. At the time of the study, 16.3% were current smokers and 83.7% were nonsmokers, though some had smoked previously.

Sleep quality varied, with 53.7% reporting good sleep, 39% reporting poor sleep, and 7.3% experiencing very poor sleep within the past month. Perceived stress was notably high, with 80% of participants reporting high stress in daily life, while 20% reported low stress level.

The overall prevalence of hypertension was 36%, yet awareness was lower, as only 24% reported having the condition. Among hypertensive participants, 59% were on treatment, and 46% had their blood pressure under control. Newly identified cases accounted for 34.25% of hypertensives.

Table 2: Health status and behavior of the study participants n=300

Variables	Number	Percent
BMI categories		
Thin	31	10.3
Normal	164	54.7
Overweight	105	35.0
Salt intake categories		
Less than 5 gm/day	12	4.0
5 to 9 gm/day	186	62.0
More than 9gm/day	102	34.0
Family history of high blood pressure		
Yes	108	36.0
No	137	45.7
History of smoking		
Yes	81	27.0
No	219	73.0
Status of smoking		
Yes	49	16.3
No	251	83.7
PSQI sleep quality category		
Good sleep quality	161	53.7
Bad sleep quality	117	39.0
Very bad sleep quality	22	7.3
Perceive stress score		
Low stress	60	20.0
High stress	240	80.0
Hypertension related status		
Hypertension prevalence	108	36%
Awareness (self-known case of HTN)	72	24%
Under treatment of HTN	64	59%
HTN under control	46	46%

Hypertension by respondents' characteristics

The analysis of hypertension prevalence across socio-demographic and behavioral variables revealed several significant associations. Sex was not significantly related to hypertension, with females showing slightly lower odds (COR = 0.93, p = 0.773) compared to males. Age was a major determinant of hypertension. Compared to the youngest group (18–30 years), participants aged 46–60 years had over five times higher odds (COR = 5.38, p < 0.001), while those aged 61 years and above had more than fifteen times higher odds (COR = 15.27, p < 0.001). Occupational categories suggested lower odds among physical workers (COR = 0.50, p = 0.102), though this was not statistically significant. Ethnic differences were observed, with Madhesi participants showing lower odds (COR = 0.58, p = 0.063), but the association was marginal.

BMI was strongly associated with hypertension, as overweight individuals had nearly three times higher odds compared to those with normal BMI (COR = 2.74, p < 0.001). Salt intake also showed a protective effect, with moderate intake (5–9 g/day) associated with significantly lower odds (COR = 0.28, p = 0.041). Family history was important, as participants without a positive family history had reduced odds (COR = 0.46, p = 0.012).

Lifestyle factors revealed mixed associations. Smoking history and current smoking status were not significantly related to hypertension. Sleep quality was strongly associated: participants with poor sleep had over three times higher odds (COR = 3.18, p < 0.001), while those with very poor sleep had nearly six times higher odds (COR = 5.86, p < 0.001). Perceived stress showed a non-significant trend, with moderate stress associated with higher odds (COR = 1.54, p = 0.172).

Table 3: Bivariate logistic regression of hypertension and respondents' characteristics

Variables	Crude Odds Ratio (COR)	p-value	95% Confidence Interval	
			Lower	Upper
Sex (Male as reference)				
Female	0.93	0.773	0.58	1.50
Age categories in years (18 to 30 years as reference)				
31 to 45 years	1.30	0.521	0.59	2.87
46 to 60 years	5.38	0.000*	2.49	11.63
61 and above	15.27	0.000	5.66	41.19
Occupation categories (Mental work as reference)				
Physical work	0.50	0.102	0.22	1.13
Housewife	1.08	0.794	0.63	1.83
Ethnic categories (Brahmin/Chhetri as reference)				
Janajati	0.72	0.352	0.37	1.42
Madhesi	0.58	0.063	0.33	1.02
Others	1.17	0.707	0.53	2.58
BMI categories (Normal as reference)				
Thin	0.60	0.293	0.23	1.55
Overweight	2.74	0.000*	1.64	4.57
Salt intake categories (< 5 gm as reference)				
5-9 gm.	0.28	0.041*	0.08	0.91
>9 gm.	0.66	0.503	0.20	2.22
Positive family history of HTN (Yes as reference)				
No	0.46	0.012*	0.27	0.80
History of smoking (Yes as reference)				
No	0.61	0.063	0.36	1.03
Current smoker (Yes as reference)				
No	1.07	0.842	0.56	2.03
Sleep quality categories (Good sleep as reference)				
Bad sleep	3.18	0.000*	1.90	5.33
Very bad sleep	5.86	0.000	2.28	15.06
Perceived stress score (low stress as reference)				
Moderate stress	1.54	0.172	0.83	2.87

** p-value significant at <0.05*

Multivariate analysis of hypertension and characteristics of respondents'

Multivariate logistic regression analysis was done to explore the association of hypertension with the background characteristics of the respondent. In the multivariate logistics analysis variables were retained if they had statistically significant relation in the bivariate analysis or were recommended by the existing literature (table 4). Age was the strongest determinant, with participants aged 46–60 years having over three times higher odds of hypertension (AOR = 3.106, p = 0.015), and those aged 61 and above showing a markedly elevated risk (AOR = 26.809, p < 0.001) compared to the 18–30 age group.

Body mass index (BMI) also showed a significant association. Overweight individuals had increased odds of hypertension (AOR = 2.722, p = 0.088), while obesity was a strong predictor (AOR = 7.661, p = 0.001). Salt intake between 5–9 grams per day was associated with significantly lower odds of hypertension (AOR = 0.168, p = 0.020) compared to intake below 5 grams, suggesting a protective effect within moderate consumption levels.

Family history of hypertension was another important factor. Participants who were unaware of their family history had reduced odds (AOR = 0.373, p = 0.005), while those with a negative history showed no significant difference. Sleep quality emerged as a strong behavioral correlation: poor sleep was associated with more than threefold increased odds (AOR = 3.406, p < 0.001), and very poor sleep also showed a significant association (AOR = 3.199, p = 0.044).

Table 4: Multivariate logistic regression analysis of hypertension and respondents' characteristics

Variables	Adjusted Odds Ratio (AOR)	P- value	95% Confidence Interval	
			Lower	Upper
Age (in years)				
18-30		0.000*		
31-45	1.017	0.971	0.417	2.481
46-60	3.106	0.015*	1.243	7.762
61 and above	26.809	0.000*	7.932	90.609
BMI categories				
Thin		0.000*		
Normal	2.722	0.088	0.86	8.614
Obese	7.661	0.001*	2.315	25.348
Salt intake categories				
<5grams per day		0.001*		
5-9 grams per day	0.168	0.020*	0.038	0.751
> 9grams per day	0.512	0.384	0.114	2.309
Family history of HTN				
Positive Family History		0.017*		
Don't Know	0.373	0.005*	0.189	0.738
Negative Family History	0.673	0.366	0.285	1.588
Sleep quality				
Good sleep quality		0.000*		
Bad sleep quality	3.406	0.000*	1.816	6.387
Very bad sleep quality	3.199	0.044*	1.03	9.929

DISCUSSION

This study revealed a hypertension prevalence of 36%, aligning closely with previous national estimates such as the STEPS survey (36.8%) and other semi-urban studies in Nepal. [31-33] The self-reported awareness level (24%) was notably lower than the actual prevalence, reinforcing concerns about underdiagnosis and the silent nature of hypertension. [9] Although awareness among hypertensive individuals was relatively high (66.6%), treatment (59%) and control (46%) rates remain suboptimal, echoing findings from other South Asian contexts. [19, 26] The low treatment and control rates may be attributed to limited access to health-care services and prevailing perceptions that antihypertensive medication, once initiated, must be taken lifelong, which may discourage treatment initiation and adherence.[34] The proportion of newly identified cases 34.25% further highlights the hidden burden of hypertension, consistent with studies from India and Ethiopia reporting 46% and 63% newly screened cases respectively. [19, 35]

Age emerged as the strongest predictor of hypertension, with individuals aged 61 and above having significantly higher odds (AOR = 26.809, p < 0.001), corroborating global and regional evidence on age-related vascular changes and cumulative exposure to risk factors. [5, 28, 36] This association is well documented and reflects age-related vascular changes, cumulative exposure to risk factors and higher prevalence of comorbidities.[37] Menopausal status also showed a strong association, with post-menopausal women exhibiting higher prevalence, likely due to hormonal changes and metabolic shifts. [8]

BMI was another significant factor, with obesity showing a strong association (AOR = 7.661, p = 0.001), consistent with findings from both national and international studies. [6, 33] It may be explained by the link between excess body weight and elevated blood pressure through metabolic and inflammatory pathways.[38] Salt intake between 5–9 grams per day was associated with lower odds of hypertension (AOR = 0.168, p = 0.020), suggesting a protective threshold, although excessive intake (>9 g/day) did not show significant association. While high salt consumption is a well-established risk factor for hypertension, this finding may reflect reporting bias, reverse causation, or dietary modification among individuals already diagnosed with hypertension.[39] This supports WHO recommendations for moderate salt consumption and aligns with regional dietary patterns. [27, 40]

Family history of hypertension was a relevant predictor, with participants unaware of their family history showing reduced odds (AOR = 0.373, p = 0.005), possibly reflecting underreporting or lack of health literacy. Sleep quality was strongly associated with hypertension, with poor and very poor sleep linked to significantly higher odds (AOR = 3.406 and 3.199 respectively), echoing findings from China, Peru, and Italy that demonstrate the impact of sleep disturbance on cardiovascular health. [41-43]

Behavioral factors such as smoking and alcohol consumption showed mixed associations. Past smoking was nearly significant (p = 0.064), while current smoking did not show a clear link, contrasting with studies from Kathmandu and India that reported higher hypertension prevalence among smokers. [44, 45] Alcohol consumption, however, was significantly associated with hypertension, with drinkers showing higher prevalence (44.8%) compared to non-drinkers (32.4%), consistent with previous findings. [31, 40, 46]

Perceived stress showed a non-significant trend, though the direction of association was consistent with global literature linking psychological stress to elevated blood pressure. [47, 48] Variability in stress measurement tools, subjective measurement and cultural perceptions may explain inconsistencies across studies. [31]

This study has notable strengths, including its community-based design with probability cluster sampling, which enhances representativeness of adults in a semi-urban setting of Nepal. The use of standardized and validated tools—such as the WHO STEPS questionnaire, the Pittsburgh Sleep Quality Index, and the Perceived Stress Scale—with validated Nepali versions ensured methodological rigor, while repeated blood pressure measurements minimized measurement error. Additionally, the study contributes to the evidence by examining sleep quality and perceived stress. However, the cross-sectional design limits causal interpretation of observed associations. Reliance on self-reported data for awareness, treatment, lifestyle behaviors, and psychosocial factors may have introduced recall and social desirability bias, and the subjective assessment of sleep and stress may have affected precision. Conducting the study in a single semi-urban municipality restricts generalizability, and the absence of biochemical measures and long-term adherence assessment may underestimate the complexity of hypertension management.

Overall, this study reinforces the multifactorial nature of hypertension and the urgent need for targeted interventions focusing on early detection, lifestyle modification, and improved treatment adherence. The findings support global calls for integrated NCD strategies, especially in low- and middle-income countries where awareness and control remain limited despite rising prevalence. [24]

CONCLUSION

This study demonstrated that hypertension remains a significant public health concern, with a high prevalence and a substantial proportion of newly identified cases. Awareness, treatment, and control rates were inadequate, underscoring persistent gaps in prevention and management. Age, obesity, family history, salt intake, and poor sleep quality emerged as key determinants, while smoking and stress showed mixed associations. The findings highlight the multifactorial nature of hypertension and the urgent need for integrated strategies focusing on early detection, lifestyle modification, and improved treatment adherence. Strengthening awareness programs, promoting healthier behaviors, and enhancing access to care are essential to reduce the burden of hypertension and its complications in Nepal and similar low- and middle-income settings.

CONFLICT OF INTEREST: None

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