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Hypertension and Risk Factors in Nepalese Police in Far Western Region

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ABSTRACT

Background: Hypertension is an emerging public health problem in Nepal due to epidemiological and nutritional transition in the last two decades. In this study, we aimed to characterize the distribution of risk factors for hypertension in Nepalese police officer of far western province of Nepal.

Methods: This cross-sectional study was conducted in police stations in three districts of the far western Province of Nepal. Physical examination including blood pressure, height, weight, waist circumference, and random blood sugar and urine reaction were recorded during the annual medical check after obtaining verbal approval to research the findings. Hypertension, defined as systolic BP (SBP) ≥ 140 mmHg and/or diastolic BP (DBP) ≥ 90 mmHg (classified as 1) was the outcome variable of interest. Covariates of hypertension were elicited through the multivariable logistic regression. These covariates were age, gender, body mass index (BMI), residence location, diabetes status and waist circumference.

Results: Among the 1055 police personnel, 14% (146) were hypertensive, 4.8% (51) were diabetic, and 33% (339) were pre-obese (BMI 25.0-29.0). In the multivariable logistic regression, age groups 25-29 (adjusted odds ratio [AOR] = 2.03, 95% CI 1.11, 3.75), 35-39 (AOR = 2.36, 95% CI 1.22, 4.62), and 40-44 years (AOR = 2.50, 95% CI 1.20, 5.16) were twice at odds of being hypertension compared to 19-24 year. At the same time, those with pre-obese were 78% (AOR = 1.78, 95% CI 1.21, 2.62) more likely to report hypertension compared to normal BMI. A unit increase in waist circumference was likely to be associated with a 6% (AOR = 1.06, 95% CI 1.01, 1.11) increase in hypertension.

Conclusions: The prevalence of hypertension in the Nepalese police personnel in the western region of Nepal was lower than in the general population. The risk factors for hypertension were age, being overweight, and increased waist circumference.

Keywords: Hypertension; logistic; Nepal; regression; risk factors.

INTRODUCTION

In 2008, around 1.28 billion adults over 25 years were diagnosed with hypertension, of which two-thirds were living in low and middle-income countries.[1] Hypertension is defined as systolic and/or diastolic blood pressure equal to or above 140/90 mmHg.[2,3] Hypertension is responsible for at least 45% of deaths due to heart disease and 51% of deaths due to stroke.[4] There are multiple interrelated risk factors for hypertension including hyperlipidaemia,[5] physical inactivity,[6] kidney disease,[7] high salt consumption,[8] alcohol consumption,[9-11] and smoking.[12] Age is an independent predictor of future hypertension and is directly correlated with rising blood pressure[13] from a gradual increase in peripheral vascular resistance with ageing.[14] The other risk factors of hypertension are diabetes mellitus, obesity and females.[11,15]

According to the World Health Organization (WHO), around 20% of Nepalese adults suffer from hypertension.[16] However, another study reported hypertension prevalence of 36% among 15-49 study population[17] and the prevalence of hypertension in semi-urban villages of Nepal has tripled in 25 years.[18] This is a result of the epidemiological transition from communicable diseases to non-communicable diseases (NCD) including hypertension.[19] The hypertension in Nepal, as in other countries is driven by a number of lifestyle related factors including alcohol use, sedentary

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life, use of tobacco, and other metabolic diseases such as diabetes.[18,20] Globally and in Nepal, the increased prevalence of NCD including hypertension are partly driven by sociodemographic changed like globalization, rapid urbanization, and nutritional transition.[21]

Hypertension is prevalent in every second person in police personnel of age more than forty years of age, it may be due to overburden of responsibility in the office as well as in their family.[22] Most of the police personnel engage in factors associated with hypertension including consumption of alcohol, smoking cigarettes and chewing tobacco. While others maintain unhealthy body weight leading to high BMI.

Therefore, the primary aim of this paper was to determine the prevalence of hypertension among Nepalese Police and explore the associated risk factors. Exploration of this risk factor is anticipated to provide a better understanding of the risk factors of hypertension in this population for initiating preventive measures.

METHODS

A cross-sectional study was conducted in different police stations in three districts of the far western Province of Nepal, i.e. Doti, Kailali, and Kanchanpur located 600 to 800 kms from capital city Kathamandu during the special regular medical checkup. Inform consent was taken from each individual before the data collection and ethical clearance was taken from the institute review committee of Nepal police Hospital. A single casual blood pressure (BP), using a mercury manometer was recorded after recording age and sex. A study participant was considered hypertensive if systolic BP (SBP) ≥ 140 mmHg and/or diastolic BP (DBP) ≥ 90 mmHg.[23] Additionally, weight (in kgs), height (in feet), and waist circumference (cms) were recorded. Body weight and height were used to calculate body mass index (BMI). BMI was calculated as body weight in kg divided by height in meters square. BMI was classified under (<18.5), normal (18.5-24.9), pre-obesity (25.0-29.9), obesity (>29.9).[24] Urine was tested for pH and alkaline was considered as abnormal (coded as 1).

We conducted a multivariable logistic regression analysis using a stepwise method (*p* value=0.10) to select variables, with the presence of hypertension considered as the dependent variable. The independent variables were those that were significantly associated with hypertension in the univariate analysis. The analysis was performed using the statistical package RStudio 4. Categorical variables were analysed in relation to the study objective using x^2 test, with difference at 5% accepted as statistically significant. Odds ratios (OR), their 95% confidence intervals (CI) and *p* values were calculated as appropriate and <0.05 considered significant (2-sided).

RESULTS

The study consists of 1,055 participants, with representation from Doti (44%, 464), Kailali (28%, 296), and Kanchanpur (28%, 295). Most of the participants were in the age group of 19-24 years (38%, 403), followed by 25-29 years (19%, 195), and 30-34 years (16.0%, 166). More than two-thirds (79%, 835) were males. Hypertension was observed in 14% (146) of the participants, and 4.8% (51) had diabetes. In terms of BMI, 56% (588) were in the normal range (BMI 18.5-24.9) while 32% (337) and 6.8% (72) were in pre-obese (BMI 25.0-29.9) and obese (BMI >29.9). The median waist circumference is 35.00 cm (interquartile range (IQR 34-36). Urine analysis shows that 92% (972) of participants had acidic urine (**Table 1**).

Table 1. Descriptive characteristics.

Characteristic	N = 1,055[1]
Address	
Budar doti	127 (12%)
Dipayal	337 (32%)
Kailali	296 (28%)
Kanchanpur	295 (28%)
Age group	
19-24	403 (38%)
25-29	195 (19%)
30-34	166 (16%)
35-39	137 (13%)
40-44	88 (8.4%)
45+	59 (5.6%)
Unknown	7
Sex	
F	217 (21%)
M	835 (79%)
Unknown	3
Hypetensive	146 (14%)

Table 1. Descriptive characteristics.	
Characteristic	**N = 1,055[1]**
Unknown	1
Diabetic	51 (4.8%)
Unknown	1
BMI	
Under	57 (5.4%)
Normal	588 (56%)
Preobese	337 (32%)
Obese	72 (6.8%)
Unknown	1
Waist Circumference	35.00 (34.00, 36.00)
Unknown	1
Urine reaction	
Acidic	972 (92%)
Alkaline	82 (7.8%)
Unknown	1

[1]n (%); Median (Q1, Q3) BMI- body mass index

Among the 146 hypertensive participants, nearly half (43%, 63) were from Kanchanpur and the smallest from Budar Doti (7.5%, 11). Participants are fairly distributed across age groups, with the highest percentage in the 25-29 age range (24%, 35) and the lowest in the 45+ group (6.8%, 10). The majority of participants were male (86%, 125). Diabetes was present in 6.8% (10) of the participants. In terms of BMI, 43% (63) are pre-obese, and 4.1% (6) were obese. Waist circumference has a median of 35.00 cm (IQR 34.00-36.00). The urine analysis indicates that 93% (136) of participants had acidic urine (**Table 2**).

Table 2. Description of Hypertensive recruits. (N=146)	
Characteristic	**N = 146[1]**
Address	
Budar doti	11 (7.5%)
Dipayal	27 (18%)
Kailali	45 (31%)
Kanchanpur	63 (43%)
Age group	
19-24	30 (21%)
25-29	35 (24%)
30-34	23 (16%)
35-39	30 (21%)
40-44	18 (12%)
45+	10 (6.8%)
Sex	
F	21 (14%)
M	125 (86%)
Diabetic	10 (6.8%)
BMI	
Under	10 (6.8%)
Normal	67 (46%)
Preobese	63 (43%)
Obese	6 (4.1%)
Waist Circumference	35.00 (34.00, 36.00)
Urine_reaction	
Acidic	136 (93%)
Alkaline	10 (6.8%)

[1]n (%); Median (Q1, Q3)

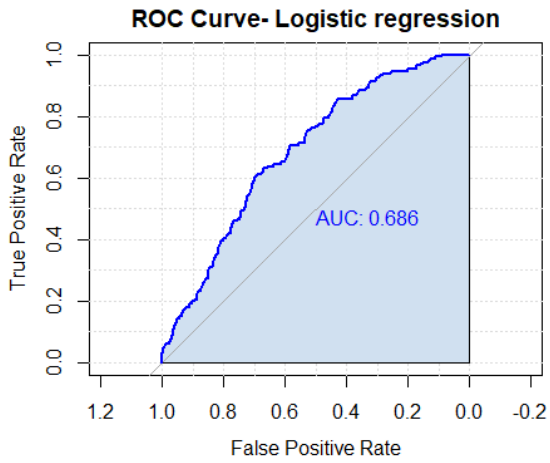
In the multivariable logistic regression, age groups 25-29 (adjusted odds ratio (AOR) = 2.03, 95% CI 1.11, 3.75), 35-39 (AOR = 2.36, 95% CI 1.22, 4.62), and 40-44 years (AOR = 2.50, 95% CI 1.20, 5.16) were twice at odds of being hypertension compared to 19-24 year. At the same time, those with pre-obese BMI were 78% (AOR = 1.78, 95% CI 1.21, 2.62) more likely to report hypertension compared to normal BMI. A unit increase in waist circumference was likely to be associated with a 6% (AOR = 1.06, 95% CI 1.01, 1.11) increase in hypertension (**Table 3**).

Table 3. Linear Regression for hypertension.

Characteristic	OR[1]	95% CI[1]	p-value
Sex			
F	—	—	
M	1.09	0.64, 1.93	0.8
Age group			
19-24	—	—	
25-29	2.03	1.11, 3.75	0.022
30-34	1.33	0.67, 2.65	0.4
35-39	2.36	1.22, 4.62	0.011
40-44	2.50	1.20, 5.16	0.013
45+	1.83	0.74, 4.24	0.2
Address			
Budar doti	—	—	
Dipayal	0.87	0.41, 1.95	0.7
Kailali	1.27	0.58, 2.91	0.6
Kanchanpur	1.90	0.90, 4.31	0.11
BMI			
Normal	—	—	
Under	1.79	0.81, 3.67	0.13
Preobese	1.78	1.21, 2.62	0.003
Obese	0.66	0.24, 1.50	0.4
Diabetic	1.31	0.59, 2.65	0.5
Urine reaction			
Acidic	—	—	
Alkaline	0.75	0.35, 1.46	0.4
Waist Circumference	1.06	1.01, 1.11	0.022

[1]OR = Odds Ratio, CI = Confidence Interval BMI- body mass index.

When using logistic regression to predict hypertension, the ROC (Receiver Operating Characteristic) curve and the AUC (Area Under the Curve) help evaluate the model's performance. An AUC of 0.686 in this context means that the logistic regression model is moderately good at predicting hypertension, with a 68.6% chance of correctly distinguishing between a hypertensive and a non-hypertensive individual.



Caption

DISCUSSION

This study is the first study to estimate and identify correlates of hypertension in police personnel in the far western province of Nepal. The prevalence of hypertension among personnel was 14%, which is lower than the national prevalence. The risk factors of hypertension in this study were age, pre-obese, and waist circumference.

The prevalence of hypertension in this study was lower than the national prevalence of 27.3%.[25] It has been postulated that the primary driver of hypertension in developing countries including Nepal may be rapid urbanization, changes in dietary habits, social stress and behavioral factors like smoking and harmful drinking, high illiteracy rates, poor access to health facilities, bad dietary habits, poverty, and high costs of drugs contribute to poor blood pressure control.[26] The lower prevalence of hypertension in this study could be young participants, with more than 60% under 40 years. However, hypertension is common among Nepal police, due to their responsibility, stressful and extra duty hour.

Age is one of the non-modifiable risk factors of hypertension.[13] Ageing is associated with a gradual increase in peripheral vascular resistance leading to hypertension.[14] Hypertension is a known major risk factor for developing sudden cardiac death, a dissecting aortic aneurysm, angina pectoris, left ventricular hypertrophy, thoracic and abdominal aortic aneurysms, chronic kidney disease, atrial fibrillation, diabetes mellitus, the metabolic syndrome, vascular dementia, Alzheimer's disease, and ophthalmologic disease.[27] Therefore, it is important to screen for pre-hypertension

and hypertension in Nepalese police for the prevention of these complications.

BMI and waist circumference are associated with the hypertension, which is the same finding in the study done in China.[28] Metabolic co-morbidity including pre-obesity was associated with an increased risk of hypertension in this study. Being overweight is a known risk factor for hypertension.[29] Obesity-related hypertension occurs through the activation of the sympathetic nervous system, the amount of intra-abdominal and intra-vascular fat, sodium retention leading to an increase in renal reabsorption, and the renin-angiotensin system.[30] Obesity plays a common risk factor for hypertension and diabetes, with these comorbidities[31] are closely associated. Nepal has been undergoing a nutritional transition with the prevalence of low fruit and vegetable consumption.[32] This has resulted in increased disposable income, a transition from traditional high-carbohydrate, low-fat diets to those that are lower in carbohydrates and higher in saturated fat, sugar, and salt, along with reduced levels of physical activity.[33]

Waist circumference was positively associated with the risk of hypertension. Similar reports have been published[34]. Waist circumference is an important measure in assessing health risks, particularly hypertension[35]. It serves as an indicator of abdominal fat, which is linked to increased blood pressure and cardiovascular diseases[36]. A larger waist circumference can signify higher visceral fat levels, leading to insulin resistance and other metabolic issues that contribute to hypertension. Monitoring waist circumference, alongside other factors like BMI and overall lifestyle, can help identify individuals at risk for high blood pressure and guide interventions for better health outcomes.

Limitations of this study need to be considered when interpreting the findings of this study. First, because this was a cross-sectional study, causality between nutritional status and its determinants, particularly lifestyle factors cannot be established. Second, this study was conducted on police personnel from the western region of Nepal. So, findings may not be generalized to all the Nepalese police personnel. Third, the variables on dietary habits, alcohol consumption, or physical activity, were not significant risk factors of hypertension, possibly due to a homogenous study population.

In conclusion, the prevalence of hypertension among Nepalese police personnel in the western region of Nepal was found to be lower than that in the general population. This observation suggests that specific occupational factors or lifestyle choices may play a role in this lower prevalence. However, despite this relatively lower rate, several key risk factors were identified that could contribute to the development of hypertension among these personnel. These include age, being overweight, and increased waist circumference, all of which are significant indicators of cardiovascular risk.

Given these findings, it is crucial to implement regular physical examinations for Nepalese police personnel. Such routine assessments would facilitate the early identification of individuals at risk of developing hypertension or those already experiencing elevated blood pressure levels. Additionally, these examinations could serve as an opportunity to initiate appropriate management strategies, including lifestyle modifications, dietary recommendations, and, if necessary, pharmacological interventions. By prioritizing the health and well-being of police personnel through regular monitoring and management of hypertension, we can enhance their overall quality of life and operational effectiveness. Furthermore, ongoing education about the importance of maintaining a healthy weight and waist circumference can empower these individuals to adopt healthier habits, ultimately reducing their risk of hypertension and its associated complications.

CONCLUSIONS

Overall, the study highlights the significant impact of age, BMI, and waist circumference on the outcome, while sex, location, diabetes, and urine reaction were not found to be significant predictors. The logistic regression model shows moderate effectiveness in predicting the outcome, suggesting that further refinement of the model or additional data may be necessary to improve predictive accuracy.

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