

Prevalence of Hypertension and its Associated Risk Factors Among Military Personnel of Nepali Army in Selected Military Barracks of Nepal

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ABSTRACT

Introduction: Hypertension is an important health issue among Military personnel because of their unique nature of duties and services. Unhealthy diet, low intake of fruits and vegetables, physical inactivity, harmful use of alcohol and tobacco, overweight or obesity, family history of hypertension are the risk factors for hypertension. This study aims to identify the prevalence and risk factors of hypertension among Military personnel of Nepal Army.

Methods: Cross-sectional study was conducted among 416 serving army personnel posted at four selected military barracks; Dhading, Birgunj, Lamjung and Tanahun with the data collection period from January to June 2020. The civilian population working in Army units, retired army personnel and dependents were excluded from the study. Systematic random sampling was used for the selection of participants. Pre-tested questionnaires, weighing machine, stadiometer, measuring tape, stethoscope and BP set were used as a tool for data collection. Data was entered and analyzed using SPSS 20.0.

Results: Participants had a mean age of 34.46 ± 5.25 years. Prevalence of hypertension and pre-hypertension was 13.4% and 37.3% respectively. Among the risk factors studied for hypertension; spouse's education, tobacco chewing, history of hypertension in father and being overweight, were found to be statistically significant with p value of 0.047, 0.000, 0.021, and 0.002 respectively.

Conclusions: Prevalence of hypertension was less in military personnel compared to other occupational groups. Avoidance of tobacco consumption, awareness on risk factors of non-communicable disease and maintenance of body weight by regular physical exercise could help reduce prevalence of hypertension in military personnel.

Key Words: Hypertension; Military personnel; Nepali Army; Prevalence

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INTRODUCTION

Non Communicable Diseases (NCDs) are the leading cause of death with two-third of the deaths being attributed to NCDs in Nepal.¹ Among NCDs, hypertension (HTN) is considered to be the biggest contributor to the global burden of diseases and mortality.² Unhealthy diet, low intake of fruits and vegetables, physical inactivity, harmful use of alcohol and tobacco, overweight or obesity, family history of hypertension are the risks factors for hypertension.³

Among different occupational groups, HTN is an important health issue in army personnel due to the nature of their working environment. Army personnel lead a healthy lifestyle which includes regular physical exercise, balanced nutrition, and an easy access to preventive healthcare. However, military service is inherently associated with long working hours, workplace stress, strong disciplinary mechanisms, stress of separation from the family, which increases the risk of HTN.⁴ This study was conducted to find the prevalence and risk factors of hypertension among Military personnel of Nepal Army.

METHODS

Cross-sectional study was carried out among serving army personnel posted at four selected military barracks; Dhading, Birgunj, Lamjung and Tanahun of Nepal. Data collection was carried out from January to June 2020. The civilian population working in Army units, retired army personnel, and dependents were excluded from the study. Assuming a baseline prevalence of HTN of 41.9%,⁵ 5% margin of error and a 10% non-response rate, the total sample size was 416. Systematic random sampling was used for the selection of the participants. Pre-tested questionnaires, digital weighing machine, stadiometer, measuring tape, stethoscope and sphygmomanometer were used as tools for data collection. Written informed consent was taken from each participant. Training on measuring weight, height, waist and hip circumference was given to data collectors, who took face-to-face interviews to fill up the questionnaire and measured the required physical parameters. Weight was measured with a weighing scale that was placed on a hard, flat surface without slippers and recorded in kilograms (kg). Height was measured by a stadiometer in which a person stands against the board and then adjusts the measuring blade so that it rests on the top of the person's head. Height was then recorded manually where the

blade meets the board in centimeters which was later converted into meters (m). Waist circumference was measured midway between the lowermost margin of the ribs and the top of the iliac crest and recorded in centimeters (cm). Hip circumference was measured by flexible, inelastic measuring tape. Participants were asked to wear one layer of light clothing, removing belts and heavy outer clothing, and asked to stand erect with arms at the sides, feet together with gluteal muscles relaxed. An inelastic tape was placed around the buttocks in a horizontal plane. The measurement was recorded in centimeters (cm).⁶ The blood pressure measurement was taken in both sitting and supine positions on the right arm by a standardized procedure using calibrated aneroid sphygmomanometers with appropriate-sized cuffs. The participants were seated quietly for at least five minutes in a chair, with feet on the floor, and the arm supported at heart level. An appropriate-sized cuff (Cuff bladder encircling at least 80 percent of the arm) was used to ensure accuracy. At least two measurements in a 30 minute interval were taken. Systolic blood pressure was measured at the first appearance of Korotkoff sounds and the diastolic blood pressure at the disappearance of Korotkoff sound.⁶

HTN was defined using JNC 7 criteria of systolic blood pressure (SBP) ≥ 140 mm Hg and / or a diastolic blood pressure (DBP) ≥ 90 mm Hg. Persons with SBP < 120 mm Hg and DBP < 80 mm Hg were labeled as 'Normotensives'.⁷ BMI was calculated using the Quetelets formula by dividing weight in kg by square of height in meters (kg/m^2). BMI cut-offs of ≥ 25 kg/m^2 and ≥ 30 kg/m^2 were used as the criteria for defining overweight and obesity respectively according to WHO standard.⁸ The waist-hip ratio (WHR) was calculated by dividing waist circumference by hip circumference. A cut-off of more than or equal to 0.9 in male and more than or equal to 0.85 in female was used to define presence of central obesity according to WHO.⁹ Smoking data was taken in a dichotomous scale as 'ever' or 'never' smoke, tobacco intake as currently consuming or not, and alcohol consumption as currently consuming or not. For consumption of junk food and fruits, participants were asked to choose one of the four options that described their intake the best; once a day, three days a week, once a week or once a month.

Ethics approval was taken from the Institutional Review Committee of Nepalese Army Institute of Health Sciences. All the collected data was entered

in Microsoft Excel and analyzed using the SPSS 20.0 version. Descriptive statistics like frequency, percentage, mean and standard deviation were calculated. Chi-square test with odds ratio (OR) was applied to determine the presence of an association between the dependent and independent variables. Those variables that reached a significant level with p-value < 0.05 were considered significant.

RESULTS

The mean age of the participants was 31.66 ± 5.97 years and 2.9% participants were females. Out of 416 participants, 91.3% were Non Commissioned Officers (NCOs) and 70.2% of the participants had served the army for more than 10 years. Most of the participants had studied till lower secondary level (37.3%) and the majority of the participants were married (84.6%). (Table 1)

The mean age with standard deviation for pre-hypertension was 31.89 ± 6.04 years and that for HTN 34.46 ± 5.25 years. Prevalence of HTN and pre-hypertension was 13.4% and 37.3% respectively. (Table 2) None of the participants reported being hypertensive or hypertensive on treatment.

The odds of being hypertensive among personnel above 40 years of age was 1.9 times more than those less than 40 years of age. More males (13.9%) were found to be hypertensive than females. The association of HTN with rank was not statistically significant. Odds ratio was found to be less than one with an increased level of education. Prevalence of HTN in participants who served the army for less than 10 years was 16.9% and those who served for more than ten years were 12.0% (OR: 0.66). Prevalence of HTN was more in those whose spouses were uneducated (30.8%) than in those whose spouses were educated (12.1%) (OR: 3.23) and the association was statistically significant (p value: 0.047). Prevalence of HTN was more in the breadwinners of the family (14.2%) than those who were not (10.8%) (OR: 1.37). (Table 3)

Among smokers, 16.9% had HTN. Tobacco chewers had three times more risk for having HTN (24.1%) than those who did not (9.5%) and the association was statistically significant (OR: 3.01, CI: 1.69-5.36). 16.5% of the participants who consumed alcohol had HTN. No statistical significance was seen between fruit consumption, and junk food consumption with the development of HTN. (Table 4)

Table 1. Socio-demographic profile of the respondents

Variables		Frequency (N)	Percent (%)
Age (Years)	20 - 30	148	35.6
	31 - 40	250	60.1
	> 40	18	4.3
Gender	Male	404	97.1
	Female	12	2.9
Rank	Officer	16	3.8
	Junior Commissioned Officer	20	4.8
	Non commissioned Officer	380	91.3
Education	Primary (1 - 8)	154	37.0
	Lower Secondary (9 - 10)	155	37.3
	Higher Secondary (11 - 12)	91	21.9
	Bachelor	12	2.9
	Master and above	4	1.0
Duration of service	< 10 years	124	29.8
	\geq 10 years	292	70.2
Smoker	Yes	83	20.0
	No	333	80.0
Alcohol consumption	Yes	188	45.2
	No	228	54.8
Chewing tobacco	Yes	112	26.9
	No	304	73.1
Marital status	Married	353	84.6
	Unmarried	63	15.4

Those with family history of HTN in fathers had 2.28 times more risk for development of HTN and the association was also statistically significant (OR: 2.28, CI: 1.10-4.47). HTN was 2.38 times more among overweight than normal (OR: 2.38) and this association was statistically significant (P value: 0.002) and more overweight participants (20.0%) had HTN than those who were obese (18.19%). There

Table 2. Prevalence of Hypertension and Pre-hypertension

Categories	Frequency (N)	Mean age	Percentage (%)	Standard Deviation	Median Age
Pre-Hypertension (Diastolic -120 - 139, Systolic- 80 - 89)	155	37.3	31.89	6.04	33.00
Hypertension (Diastolic > 140, Systolic > 90)	56	13.4	34.46	5.25	34.00

was no statistical significance (p value: 0.872) between waist-hip ratio and HTN (OR-0.95, CI-0.53-1.70). (Table 5)

DISCUSSION

NCDs are on rise throughout the world and military personnel are no exception to it. Cardiovascular events like myocardial infarction, stroke and sudden cardiac arrest are frequently observed in recent days in Army personnel. The present study showed the prevalence of HTN to be 13.4%. In the National survey for risk factors of non-communicable diseases (Nepal NCD STEPS Survey 2019), the prevalence of HTN in the general population (15-69 years) was 24.5%.¹⁰ Another study done on military personnel in the Nepali Army reports the prevalence as 9.5%.¹¹ The prevalence of high blood pressure was 44.32% in political cadres and 41.9% in police personnels.^{12,13} Similar results of lower prevalence of hypertension in army population (9.7%) than general population is reported by another study done in Brazilian army.¹⁴ From these studies of different occupational groups, it is seen that the prevalence of HTN is considerably lower in military personnel than the general population. This can be explained in terms of specific occupation-related lifestyle, as military personnel are physically fit due to their engagement in regular physical activities, regular exercise, and health screening at entry. Regular exercise, avoidance of cigarette smoking and alcohol consumption freely inside the barrack premises might have reduced the chances of developing HTN. None of the participants reported being hypertensive or hypertensive on treatment which can also be a cause of the prevalence of HTN being lower. However, the results are in contradiction to another study done in US Army where the cardiovascular health in the Army was less prevalent than in the civilian population with higher prevalence of HTN.¹⁵ The differences in the study population, selection

criteria and age range of participants (20 - 51 vs 17 - 64) could be the reason for the variation. Our study reports a 37.3% prevalence of prehypertension and the age of this prehypertensive group is less as compared to the hypertensives. This prehypertensive population can develop HTN in future which can increase hypertensives in the army as HTN has been observed to be on the rise among general population as well as the armed-forces population.^{10,16}

Age, smoking, alcohol consumption, tobacco use, less fruit consumption, family history of HTN in father and BMI > 24.99 kg / m² were the important risk factors found for hypertension in this study. Among these risk factors, level of education of spouse (OR: 3.23, CI: 0.955 - 10.99), chewing tobacco (OR: 3.01, CI: 1.69-5.36), family history of HTN (Father) (OR: 2.28, CI: 1.10 - 4.47) and overweight (OR: 2.38, CI: 1.33 - 4.26) were found to be significant risk factors. In the study done by Wenzel et al., being an ex-smoker (90% CI: 1.13-2.50), and overweight (90% CI: 1.23 - 2.50), or obesity (90% CI: 1.82 - 4.25) were significant risk factors for hypertension while regular practice of physical activity was a protective factor.¹⁷ Another study done among armed-forces personnel in Kenya showed cigarette smoking, alcohol consumption and certain dietary habits as significant risk factors for HTN.¹⁸ Likewise, in one of the studies done in Saudi Soldiers to examine the relationship between obesity and cardiovascular risk factors, overweight and obesity was positively correlated with the prevalence of cardiovascular risk factors.¹⁹ As military personnel work in a unique environment characterized by high risk conditions, high levels of occupational stress with their heavy responsibilities are more likely to expose a greater risk of developing cardiovascular risks factors.^{20,21}

Table 3. Association between HTN and Socio-demographic Factors

Variable		Hypertension			P-Value
		Yes n (%)	No n (%)	OR (95% CI)	
Age (Yrs)	> 40	4 (22.2%)	14 (77.8%)	1.90 (0.60-5.99)	0.26
	≤ 40	52 (13.1%)	346 (86.9%)		
Gender	Males	56 (13.9%)	348 (86.1%)	-	-
	Females	0 (0.0 %)	12 (100.0%)		
Rank	Officers	2 (12.5%)	14 (87.5%)	0.90 (0.19-4.08)	0.89
	JCO	2 (11.1%)	18 (88.9%)	0.70 (0.15-3.10)	0.63
	NCO (R)	52 (13.7%)	328 (86.3%)	1	
Education	Bachelor and above	10 (9.3%)	97 (90.7%)	0.53 (0.24-1.15)	0.108
	Secondary	21 (13.5%)	134 (86.5%)	0.80 (0.43-1.51)	0.50
	Primary	25 (16.2%)	129 (83.7%)	1	
Duration of serving(Yrs)	≥10	35 (12.0%)	257 (88.0%)	0.66 (0.37-1.20)	0.176
	< 10	21 (16.9%)	103 (83.1%)		
Educational status of Spouse#	Uneducated	4 (30.8%)	9 (69.2%)	3.23 (0.95-10.96)	0.047
	Educated	41 (12.1%)	299 (87.9%)		
Breadwinner of family	Yes	46 (14.2%)	277 (85.8%)	1.37 (0.66-2.85)	0.385
	No	10 (10.8%)	83 (89.2%)		

#Total includes married personnel only

Table 4. Association between HTN and Behavioural Factors

Variables		Hypertension			P-Value
		Yes n (%)	No n (%)	OR (95% CI)	
Smoking	Yes	14 (16.9%)	69 (83.1%)	1.40 (0.72-2.71)	0.310
	No	42(12.6%)	291(87.4%)		
Alcohol consumption	Yes	31 (16.5%)	157 (83.5%)	1.60(0.90-2.82)	0.100
	No	25 (11.0%)	203 (89.0%)		
Chewing tobacco	Yes	27 (24.1%)	85 (75.0%)	3.01 (1.69-5.36)	0.000
	No	29 (9.5 %)	275 (90.5%)		
Consumption of junk food	Once a day	2 (6.7%)	28 (93.3%)	0.35 (0.08-1.53)	0.14
	3 days a week	8 (10.5%)	68 (89.5%)	0.57 (0.25-1.30)	0.18
	Once a week	9 (9.9%)	82 (90.1%)	0.53 (0.24-1.17)	0.11
	Once a month	37 (16.9%)	182 (83.1)	1	
Fruits consumption	3 days a week	17 (13.2%)	111 (86.7%)	1.05 (0.42-2.59)	0.910
	Once a week	18 (13.4%)	117 (86.7%)	1.05 (0.43-2.58)	0.90
	Once a month	13 (14.4%)	77 (85.5%)	1.16 (0.45-2.99)	0.75
	Once a day	8 (12.7%)	55 (87.3%)	1	

Table 5. Association between HTN and Biological Factors

Variables		Hypertension		OR (95% CI)	P-Value
		Yes N (%)	No N (%)		
Family h/o hypertension (Mother)	Yes	7 (15.9%)	37 (84.1%)	1.24 (0.52 - 2.95)	0.615
	No	49 (13.2%)	323 (86.8%)		
Family h/o hypertension (Father)	Yes	13 (23.2%)	43 (76.8%)	2.28 (1.10 - 4.47)	0.021
	No	43 (11.9%)	317 (88.1%)		
Family h/o Hypertension in Mother and Father	Yes	17 (18.7%)	74 (81.3%)	1.68 (0.90 - 3.14)	0.098
	No	39 (12.0%)	286 (88.0)		
BMI	Obese	2 (18.19%)	9 (81.81%)	2.12 (0.43 - 10.38)	0.34
	Overweight	30 (20.0%)	120 (80.0%)	2.38 (1.33 - 4.26)	0.002
	Underweight	0 (0%)	2 (100%)	-	0.64
	Normal	24 (9.49%)	229 (90.5%)	1	
Waist-hip ratio	High risk	35 (13.3 %)	229 (86.7%)	0.95 (0.53 - 1.70)	0.872
	Normal	21 (13.8%)	131 (86.2%)		

The limitations of this study are the possibility of response bias introduced from participants due to fear of being reported in Annual Health Report and Annual Confidential Report which might affect their career. For variables like smoking, tobacco and alcohol intake as data was taken in a dichotomous scale, dose response relationship could not be measured.

CONCLUSIONS

Prevalence of HTN was less in military personnel compared to other occupational groups. Our study findings revealed that spouse's education, chewing tobacco, history of HTN in father and obesity are significant risk factors for HTN among the military personnel. So, it is suggested that changes in the behavioural factors like avoidance of tobacco consumption, awareness on risk factors of non-communicable disease and maintenance of body weight by regular physical exercise be adopted for the prevention of HTN in troops. Other possible risk factors for the development of CVDs and hypertension

among this population like stress, inconsistent dietary habits, long working hours and monitoring of their daily exercises should be explored. Follow up studies on the development of HTN on prehypertensive army personnel should be planned.

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