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Research Article

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Prevalence of prehypertension and its associated risk factors among students of a nursing campus in Nepal

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ABSTRACT

Introduction: Prehypertension is an early indicator of hypertension and subsequently the increased risk factor for cardiovascular diseases in later years of life. Prevalence of prehypertension and hypertension was found to be higher among adults in Nepal. However it is not much explored among the young population focusing on gender, hence requiring more studies to control it efficiently. Thus, this study aims to determine the prevalence of prehypertension and its associated risk factors among nursing students.

Materials and methods: A cross-sectional study was conducted among the nursing students of Nepalgunj Nursing Campus, Banke, Nepal. Blood pressure measurement and anthropometric measurement was done for data collection. Descriptive analysis, Pearson correlation and chi square test was done using SPSS v20.

Results: Total 189 female nursing students participated whose mean age was 22.06±3.42 years. Only 21 participants (11.1%) had prehypertension. Out of total, 36 (19%) were overweight and 11 (5.8%) were obese; 56 (29.6%) had a high waist hip ratio and 75 (39.7%) of the participants had family history of hypertension. There was no significant association of prehypertension with body mass index, waist hip ratio and family history of hypertension. However, the systolic blood pressure was moderately and positively correlated with waist circumference ($r=0.215$, $p=0.003$), hip circumference ($r=0.222$, $p=0.002$) and body mass index ($r=0.237$, $p=0.001$) but not with waist-hip ratio. Similarly, the diastolic blood pressure was also moderately and positively correlated with waist circumference ($r=0.309$, $p<0.001$), hip circumference ($r=0.269$, $p<0.001$), body mass index ($r=0.269$, $p<0.001$) and waist hip ratio ($r=0.178$, $p=0.014$).

Conclusions: Although the prevalence of prehypertension among nursing students is low and there are no significantly associated risk factors, blood pressure is still correlated with the anthropometric measurements.

Keywords: Prehypertension, prevalence, nursing students

OPEN ACCESS

INTRODUCTION

Hypertension (HTN) is a global health challenge with an estimation of one fourth of adults suffering worldwide and is predicted to increase by about 60% in 2025.[1] Nearly half of the people are suffering from HTN in Nepal.[2] It even develops faster among individuals with prehypertension (PreHTN).[3] According to the Seventh Report of Joint National Committee (JNC-7) guidelines, a systolic blood pressure (SBP) of 120 to 139 mmHg and/or diastolic blood pressure (DBP) of 80 to 89 mmHg is considered as pre-HTN.[4] It is an early indicator of HTN and subsequently doubles the risk of Cardiovascular diseases (CVDs) in later years of life.[5,6] The Trial of Preventing Hypertension Study (TROPHY) showed that the rate of conversion to hypertension was 37% in 4 years for patients with higher than normal BP.[7] However, due to its silent nature, its prevalence is often underreported. [8]

Studies have revealed that the prevalence of PreHTN varies from country to country ranging from 21.9% to 52%.[6] Meanwhile, in Nepal, PreHTN was found to be 35.4%, which is higher than the prevalence of hypertension, affecting 40% population of rural areas of Nepal.[9] Similarly, another systematic review and meta-analysis showed 27.4% of the people in Nepal have a pre-hypertensive range of elevated blood pressure.[10]

Prehypertension has been associated with many factors such as age, sex, waist circumference, socioeconomic status, obesity, lesser physical activity etc. [11–13] According to the Teheran Lipid and Glucose Study (TLGS), the incidence of pre-HTN was higher in older age groups and in those who has higher body mass index (BMI), higher blood pressure, higher total cholesterol, and higher fasting blood glucose.[13]

Prehypertension is not only a warning sign to develop HTN, but also a major health risk on its own as it is subjected to approximately double the risk of CVDs independent of progression to HTN and irrespective of presence of other cardiovascular risk factors. [14,15]

All of these evidences suggest that even though preHTN is not yet considered as a disease, its early detection can prevent the risk of development of HTN and CVDs.[16] Moreover, if prehypertensive persons could maintain a normal pressure level by early diagnosis and lifestyle modification, progression to HTN may be delayed.[3] However, preHTN and its associated risk factors among nursing students, who are the future healthcare worker and who can become the role model for their patients regarding maintaining a healthy lifestyle is less studied in Nepal. Thus, this study aims to determine the prevalence of preHTN and its associated risk factors among the nursing students of Nepal.

MATERIALS AND METHODS

A cross-sectional observational study was conducted among the nursing students of Nepalgunj Nursing Campus. A non-probability, purposive sampling technique was used to select the participants. All the nursing students enrolled in the proficiency certificate level and bachelor level with age ≥18 years, willing to participate and without any medical or surgical conditions were enrolled in the study. Those who were <18 years and with hypertension or taking any medicines and male nursing students were excluded from the study.

Ethical clearance was taken from the Institutional Review Committee (IRC) of the Tribhuwan University, Institute of Medicine, Kathmandu prior to starting the study and then permission from the study site was taken. The participants were explained about the study purpose and their rights in the participation. Verbal and written informed consent was obtained from each of them. Data collection was done using a pretested, semi-structured questionnaire, which was developed from a rigorous literature review and consultation with the subject experts.

Measurement of Blood Pressure: Before taking the BP, the participants were allowed to rest for 5 minutes with the legs uncrossed in the sitting position as the legs in crossed position increases blood pressure due to higher cardiac output.[17] The level of the sphygmomanometer was kept at the level of the heart and hands were supported during BP measurement. BP was measured twice in right arm with at least 3 minutes rest between each reading with aneroid sphygmomanometer and the values were averaged.[18] The calculated BP measurements were then categorized as per JNC-7 guidelines.[4]

Measurement of weight: The weight was measured by digital weighing scale. The scale was kept on a flat

surface and the participant was requested to stand in the center of the scale facing front with bare foot and minimal clothing without any support.

Measurement of height: The height was taken using a non-elastic measuring tape, bare foot upon firm even surfaced floor.

Measurement of waist circumference: The waist circumference (WC) was measured at the level of umbilicus, halfway between the iliac crest and costal margin during expiration in standing position directly over the skin using an in-elastic measuring tape.[19,20]

Measurement of hip circumference: The hip circumference (HC) was measured at the point of greatest circumference around hips and buttocks with an in-elastic measuring tape without indenting the soft tissue.[21]

Using the height and weight, BMI was calculated and computed. BMI cutoff levels were adopted as per Asia Pacific guidelines.[22] Similarly, Waist hip ratio (WHR) was also calculated using WC and HC.

All the collected data was compiled, organized, coded and then analyzed using a statistical package for social sciences (SPSS) v.20. Descriptive statistics was used to calculate frequency, percentage, mean and standard deviation. Inferential statistics – Pearson correlation and chi square test was done to determine the correlation and association between prehypertension and the BMI, WHR and family history of hypertension.

RESULTS

Total of 189 nursing students participated in the study with the mean age of 22.06±3.42 years. The general characteristics of the participants are shown in (Table 1). Among them, 75 (39.7%) had a family history of hypertension. The majority of the participants had normal BMI. Meanwhile only few were found to be overweight and obese (Table 2). The majority of the participants had normal WHR while high WHR was found in nearly 30% of participants. Result showed that only few 21 (11.1%) of the participants had prehypertension. Even though some had prehypertension, the overall mean SBP and DBP were within the normal range. Grouping the participants into different categories based on different factors, prehydration was found to be more prevalent among the overweight participants compared to participants with normal BMI and obesity and also among the participants with normal WHR compared to high WHR (Table 3).

Table 1: General Characteristics of the Participants

General Characteristics	Mean
Age (yrs)	22.06±3.42
Height (cm)	154.08±5.93
Weight (kg)	51.05±8.61
Waist circumference (cm)	73.18±9.35
Hip circumference (cm)	88.94±8.19

Table 2: Distribution of body mass index and waist-hip ratio among the Participants

	Frequency (n)	Percentage (%)
BMI Categories (kg/m^2)		
Normal (18.50-22.9)	142	75.
Overweight (23.0-27.4)	36	19.0
Obese (≥27.5)	11	5.8
Mean BMI	21.69±3.185	
WHR Categories		
Normal WHR (≤0.85)	133	70.4
High WHR (>0.85)	56	29.6
Mean WHR	0.8225±0.70	
Blood Pressure Categories		
Normal	168	88.89
Pre-hypertensive	21	11.1
Mean SBP (mmHg)	103.98±9.31	
Mean DBP (mmHg)	67.037±6.95	

Table 3: Distribution of Prehypertension according to BMI, WHR and Family history of HTN

Variables	Prehypertension		
	Present n (%)	Absent n (%)	Total (n)
Normal BMI	13 (9.15)	129 (90.85)	142
Overweight	7 (19.44)	29 (80.56)	36
Obese	1 (9.09)	10 (90.90)	11
Normal WHR	18 (13.53)	115 (86.47)	133
High WHR	3 (5.36)	53 (94.64)	56
Family history of HTN			
Present	10 (13.33)	65 (86.67)	75
Absent	11 (9.65)	103 (90.35)	114

Table 4: Correlation of SBP and DBP with WC, HC, BMI and WHR

Variables	WC		HC		BMI		WHR	
	Pearson correlation (r)	p value	Pearson correlation (r)	p value	Pearson correlation (r)	p value	Pearson correlation (r)	p value
SBP	0.215	0.003*	0.222	0.002*	0.237	0.001*	0.078	0.285
DBP	0.309	0.000**	0.269	0.000**	0.269	0.000**	0.178	0.014*

The result also revealed that there was a significant correlation of SBP with WC (r=0.215, p=0.003), HC (r=0.222, p=0.002) and BMI (r=0.237, p=0.001) only. Whereas, DBP had significant correlation with WC (r=0.309, p<0.001), HC (r=0.269, p<0.001), BMI (r=0.269, p<0.001) and WHR (r=0.178, p=0.014) (Table 4). Meanwhile, there was no significant association of prehypertension with BMI, WHR and family history of hypertension (Table 5).

DISCUSSION

The prevalence of prehypertension among the nursing students and its association with body built and family history was studied in this study It revealed that only 21(11.1%) of the participants had prehypertension. However, the low prevalence of prehypertension in the study can be due to the influence of age and gender as it is reported that the risk of prehypertension increases with age and females are less likely to have HTN or PreHTN due to role of estrogen as a protective factor against HTN until menopause.[23,24] Similarly, the prevalence of the generally recognized risk factors such as BMI, WHR and family history of HTN were also found to be low among the participants in this study.

The study also found that the proportion of prehypertension was higher among the overweight participants, which is supported by studies showing that the prevalence of prehypertension is slightly higher among overweight and obese population as well as the odds of prehypertension increases with the increase in overweight and obesity. [23–25] Although the overall proportion of obese and overweight participants was low in this study, early intervention of modifying dietary habits and lifestyles is essential to reduce the burden of obesity and prevent HTN and other diseases that occur as complications of HTN or obesity.[23]

Table 5: Association of Prehypertension with WC, BMI, WHR and family history of HTN

Variables	Prehypertension		χ^2	p value
	Yes (n)	No (n)		
Waist Circumference				
<80 cm	12	128	3.527	0.06
≥80 cm	9	40		
Body Mass Index				
Normal (BMI=18.50-22.9)	13	129	2.754	0.25
Overweight (BMI=23.0-27.4)	7	29		
Obese (BMI≥27.5)	1	10		
Waist Hip Ratio				
Normal WHR (≤0.85)	18	115	2.667	0.25
High WHR (>0.85)	3	53		
Family History of Hypertension				
Yes	10	11	0.622	0.48
No	65	103		

Although the overall prevalence of prehypertension was low, the proportion of prehypertension was higher among the participants with the family history of hypertension compared to no family history of hypertension which is supported by the study conducted in India showing that 33% of the patient with prehypertension had at least a parent or grandparent who had prehypertension or hypertension.[25]

The study identified that there was statistically significant moderately positive correlation of SBP with WC, HC and BMI but not with the WHR. Similarly, DBP had a statistically significant moderately positive correlation with all these parameters of the participants. This finding is supported by Nkeh-Chungag et al suggesting that maintaining a normal BMI, WC, HC and WHR will help to maintain a normal SBP and DBP.[26]

High WC is linked to potential development of non-communicable diseases and considered as one of the risk factors for prehypertension.[27,28] Although many studies have shown prehypertension to have moderate and significant correlation with WC in both females and males, this study did not show any association of WC with prehypertension.[26] This suggests that WC is not a risk factor of prehypertension among young females. Stevens et al have reported the WC to be larger in males compared to females and larger in older adults compared to younger adults.[29] Similarly, this study also did not show any association between WHR with prehypertension which is similar with a study by Prabhavati et al in India.[30]

Regarding BMI also, there was no significant association with prehypertension in this study, which is similar with the finding presented in the study by Prabhavati et al.[30] Also, another study in India have revealed that prehypertension is less correlated with BMI even though participants with prehypertension had higher BMI compared to normotensive participants.[26]

There was no significant association of prehypertension with family history of hypertension in this study, which is supported by the findings of

the study by Felix et al in Indonesia.[31] By contrast, the finding of a study conducted in India among medical students showed that prehypertension is associated with family history of hypertension which conisdered all categories of adults unlike our study.[28,32] Similarly, the WHR was also not associated with prehypertension in this study which is relevant with the findings with different studies. [30,32] Despite of these finding, the study still has some limitations. Since this study is conducted in a single campus, the findings cannot be generalized to the whole females aged ≥18 yrs. We still need large sample size for the generalization.

CONCLUSION

Prevalence of prehypertension among nursing students is low and the risk factors of hypertension such as WHR, BMI, and family history of HTN has not been significantly associated with prehypertension. Nevertheless, there is significant moderately positive correlation between both systolic and diastolic blood pressure with WC, HC and BMI.

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CONFLICT OF INTEREST

None.

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