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ORIGINAL RESEARCH ARTICLE

PREVALENCE OF PREHYPERTENSION AND ITS ASSOCIATION WITH BODY MASS INDEX AMONG THE MEDICAL STUDENTS

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ABSTRACT

Background: Prehypertension in adolescents is an important risk for developing hypertension in later years of life. Hypertension is one of the major cardiovascular problems in urban and suburban areas of Nepal and is increasing among the young population. There are not many studies reported in Nepal which estimates the prevalence of hypertension among medical students. Hence, this study aimed to assess the prevalence of prehypertension and its association with body mass index so that it would assist in developing strategies for control of hypertension and cardiovascular diseases in later years of life

Methods: This cross-sectional study included 250 medical students. Anthropometric variables of the subjects were recorded. Height and weight were measured on calibrated scales and body mass index was calculated. Waist and hip measurements were obtained and waist-hip ratio was calculated. Blood pressure was measured with a mercury sphygmomanometer. The data obtained was divided into different groups according to blood pressure and BMI. Descriptive statistics, chi-square test was used for presenting data and testing the significance and $P<0.05$ was considered as statistically significant.

Results: The prevalence of normotensive, prehypertensive and hypertensive students was found to be 75.2%, 20.8% and 4% respectively. Mean BMI was found to be 21.59±3.39. In general, 75.2% of the students had ideal waist hip ratio, 15.2% were underweight, 70 % had normal weight, 12 % were overweight, and 2.8% were found to be obese. Moreover, 51.4% of prehypertensives had BMI more than 25. Prehypertension was significantly higher among males ($\chi2=16.385$, $p<0.001$) and among the obese medical students ($\chi2=16.416$,$p<0.001$).

Conclusions: Prehypertension is prevalent in about a third of medical students and BMI is found to be significantly associated with pre-hypertension.

INTRODUCTION

According to the Seventh Report of the Joint National Committee (JNC-7) individuals with a systolic BP of 120 to 139 mm Hg or a diastolic BP of 80 to 89 mm Hg are considered as "prehypertensive". This classification aimed to increase awareness of the risk of hypertension in later years of life so that such "prehypertensives" would initiate health-promoting lifestyle modifications to prevent cardiovascular diseases. Adolescents with prehypertension are in increasing risk for developing hypertension in later years of life. Prehypertension increase the risk of cardiovascular morbidity, independently of other risk factors.[1] Hypertension is one of the major cardiovascular problems in urban and suburban areas of Nepal and is increasing among the young population.[2]

Studies done in different parts of the world have revealed that overweight and obesity are the main risk factors for prehypertension.[3-6] Major consequences of being overweight or obese include higher prevalence of hypertension and also increases the risk of cardiorenal and metabolic disorders. Studies in diverse populations throughout the world have shown that the relationship between BMI and systolic and diastolic blood pressure (BP) is nearly linear.[7,8]

The study of young adults in search of factors associated with pre-hypertension allows early detection and would provide an estimate of the future magnitude of the problem and assist in developing strategies for control of hypertension and cardiovascular diseases in later years of life**.** So, this study aimed to find the prevalence of prehypertension and its association with body mass index in medical students of KIST Medical College.

METHODS

The present cross-sectional study was carried out from June 2018 to October 2019 at Department of Physiology, KIST Medical College and Teaching Hospital, Imadol, Lalitpur, Nepal. The research proposal was approved by Institutional Review Board of KIST Medical College and Teaching Hospital (IRC no. 2074/75/34). This cross sectional study was performed on medical students of 1st and 2nd year MBBS and BDS. The sample size was calculated considering the prevalence of pre-hypertension among medical students in India by Debbarma et al.[18] of 45% and relative precision at 15% at 95% confidence interval using the formula $n=4pq/L2$. Adding 15% non-response rate, the total sample size was calculated to be 250. Convenience sampling was the method adopted for subject

selection. Adult MBBS and BDS student between the age of 17-25 years were included in the study and subjects with established hypertension using antihypertensive medications were excluded from the study. The enrolled students were explained about the procedure and informed consent was taken.

Anthropometric variables were recorded. Height in centimeters (cm) was measured with a height scale. Weight in kilograms (kg) was taken using a weighing machine where the subjects were without shoes and wearing minimum and light clothes. Waist measurement was done by measuring halfway between lowest rib and the top of hipbone, roughly in line with belly button. Hip measurement was done by wrapping the tape around the fullest part of hips and buttock. Waist-hip ratio (WHR) of ≤1 was considered as normal and WHR >1 was considered as high. [9] BP was measured with a mercury sphygmomanometer, as per JNC 7 guidelines.[10] Two measurements were obtained, and the average was taken as BP. Body Mass Index was calculated with a formula, [11] BMI= weight in kg/ height (m^2). Depending on BMI, students were grouped into four groups: underweight (BMI<18.5), normal weight (18.5-24.9), overweight (25-29.9) and obese (BMI≥30).

Data entry and analysis were performed using Statistical Package for Social Sciences (SPSS) 17.0 version. Descriptive statistics, chi-square test was used for presenting data and testing the significance and P<0.05 was considered as statistically significant.

RESULTS

A total of 250 students were included in this study. Prevalence of pre-hypertension, hypertension and optimum BP among the medical student of KIST Medical College was found to be 20.8%, 4% and 75.2% respectively.

Among the participants, 15.2% were underweight, 70% had normal weight, 12% overweight, and 2.8% were found to be obese. Ideal WHR was observed among 75.2% of the students.

When the students in both groups (normotensive and prehypertensive/hypertensive were categorized based on their BMI, 51.4% obese students were prehypertensive/hypertensive which was statistically significant with p-value<0.05 (Table 2).

The mean BMI of the prehypertensive/hypertensive group (23.36±4.241) was significantly higher than of the normotensive group (21.00±2.853). The mean waist circumference too was higher among the prehypertensives / hypertensives (82.63±10.822) than in the normotensives (76.12±9.427). The mean hip circumference too was higher among the prehypertensives/hypertensives (96.76±8.258) than in the normotensives (93.22±6.683) (Table 3).

Table 1: Prevalence of pre-hypertension by age and sex

Variables	Categories	Prehypertensive/hypertensive Number (%)	Normotensive Number (%)	p-value
Age in years	17-19	22 (21%)	83 (79%)	0.231
	20 and above	40 (27.6%)	105 (72.4%)	
Sex	Male	41 (37.3%)	69 (62.7)	0.001
	Female	21 (15%)	119 (85%)	

It shows that pre-hypertension was significantly more prevalent in males ($\chi 2$=16.385, P=0.000)

Table 2: Prevalence of pre-hypertension according to body mass index and waist-hip ratio

Variables	Categories	Prehypertensive/hypertensive Number (%)	Normotensive Number (%)	p-value
BMI in (kg/m^2)	≤25	43 (20.2%)	170 (79.8%)	0.001
	>25	19 (51.4%)	18 (48.6%)	
WHR	≤1	43 (22.9%)	145 (77.1%)	0.219
	>1	19 (30.6%)	43 (69.4%)	

It shows that prevalence of pre-hypertension was significantly higher among the obese medical students with BMI >25 ($\chi 2$=16.416, p<0.001)

Table 3: Mean BMI, Waist-hip circumference values among normotensives and prehypertensive/hypertensives

Variables	n	Mean	SD	SEM
BMI				
Normotensive	188	21.00	2.853	0.208
Prehtn/htn	62	23.36	4.241	0.538
Waist circumference (cm)				
Normotensive	188	76.12	9.427	0.688
Prehtn/htn	62	82.63	10.822	1.374
Hip circumference (cm)				
Normotensive	188	93.22	6.683	0.487
Prehtn/htn	62	96.76	8.258	1.049

BMI: Body mass index, SD: Standard deviation, SEM: Standard error of mean

DISCUSSION

The prevalence of hypertension is increasing in much of the South Asian region, including Nepal. There are very few studies to identify the prevalence of hypertension and prehypertension in Nepal and still fewer done in young adults.

In the current study we observed that the overall prevalence of prehypertension and hypertension in the entire group was 20.8% and 4% respectively. The prevalence of prehypertension in the present study is similar to the 30% prevalence reported from a study done among young adults in a shopping mall of Kathmandu, Nepal.[12] In a cross sectional study done in adults of 18 years and above living in Central Development region of Nepal, hypertensive subjects were found to be 22.4% and prehypertensive subjects were more than double the hypertensives (48%).[13]A systematic review and meta-analysis done in a large population of urban, suburban, and rural areas of Nepal found the prevalence of prehypertension to be 35.4%.[14]

Similar studies done in a medical college in Puducherry India found the prevalence of prehypertension to be 21.7%.[15] Several other studies done in medical colleges in India found the prevalence of prehypertension to be 37.45%, 68.38% and 45%.[16,17,18] Lower prevalence in our study may be attributable to ecological and racial differences among the studies and also because most of our students are involved in regular physical activities such as playing football, basketball, cricket etc.

There was a significant association between BMI and prehypertension in our study, similar to findings in other studies.[16,18,19] A study from Israel concluded that BMI was the strongest predictor of prehypertension among males and females.[20] A study done in Jamaica also found a relation to overweight/obesity and waist circumference among younger prehypertensives.[21] WHR was found to be within normal range among 75.2% of the study subjects which was similar with other findings.[18]

A slight predominance of prehypertension was observed in males (41 out of 62) in our study similar to other studies.[17,21] This was in contrast to a study by Kande V et al who found females to be more affected than males.[19]

The present study has few limitations. This includes convenience sampling and small sample size as we enrolled only one institute, hence we cannot generalize the result. Also, in the present study we did not include factors like dietary intake, physical activity and lifestyle which may influence body mass index.

CONCLUSION

This study concluded that the prevalence of prehypertension among medical students was found to be significantly associated with body mass index. This calls for adoption of healthy lifestyle measures from the student period itself.

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CONFLICT OF INTEREST: None

FINANCIAL DISCLOSURE: None

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