Association between body mass index and blood pressure among adults

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ABSTRACT

Introduction: Increase in body mass index increases risk of developing high blood pressure. Controversies have been found regarding the association of body mass index with high blood pressure. So, this study was conducted to find association between body mass index and blood pressure. **Methods:** A cross-sectional study was conducted among 245 adults of Pokhara, Lekhnath Metropolitan Ward No. 27 using convenient sampling method. The questionnaire was adopted from the step 2 (physical measurements) section of the WHO STEPS instrument. **Results:** Among 245 subjects, almost half (48.5%) of the subjects had normal body mass index. One-fourth (25%) of the subjects were overweight. About 60 percent of the respondents had normal systolic blood pressure. There were no significant positive correlations of body mass index with both systolic BP, diastolic BP and age. However, significant positive correlation was found between age and systolic BP. **Conclusions:** The study finding concluded that there are no significant positive correlations of body mass index with both systolic BP, diastolic BP and age. However, age and systolic BP has significant positive correlation. Therefore, with increase in age, regular monitoring of BP is required.

Keywords: Blood pressure, BMI.

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Submitted: February 15, 2022
Accepted: May 24, 2022

To cite: Thapa B, KC D, Shrestha K, Gurung S. Association between body mass index and blood pressure among adults. JGMC Nepal. 2022;15(1):59-62.
DOI: 10.3126/jgmcn.v15i1.43157

INTRODUCTION

Hypertension is one of the most common cardiovascular disorders. It is increasing in developing countries which places burden on health systems of the countries.[1] In South East Asia region, prevalence of hypertension is reported about 35% among adults.[2] In Nepal, 17% of women and 23% of men are hypertensive. A large proportion of both women (24%) and men (31%) are pre-hypertensive. Among those with normal blood pressure (BP), 2% are taking medication to lower their BP.[3]

There are various modifiable and "non-modifiable" risk factors which cause hypertension such as overweight and obesity. Body mass index (BMI) is used to measure overweight and obesity which is calculated by dividing the weight in kilograms by the square of height in meters (kg/m^2).[4] BMI is a marker of factors associated with high BP and cardiovascular disease. So, increase in BMI increases risk of developing high blood pressure. Weight loss significantly reduces blood pressure.[5] Hypertension is a silent killer disease. Most people are usually unaware about their disease condition, thus many seeks medical advises after development of complications and even sudden death occurs.[7] As it causes high mortality and morbidity of productive age group, it has negative impact in economic condition of family, community and whole country.[8]

Study conducted in Gujarat state of India showed that there is significant correlation between BMI and diastolic BP (DBP) or

systolic BP (SBP) among government employees of Gujarat state.[9] While the study conducted in Jama' in Bauchi state, Nigeria showed that there was no statistically significant association between age, BMI and BP, except for BMI and DBP.[10] Some studies have reported that there is increased risk of mortality related to cardiovascular disease among the very lean and very overweight.[1] While other studies have reported no significant relationship between BMI and blood pressure.[11] So, this study was conducted to find association between BMI and blood pressure.

METHODS

This is a cross-sectional study conducted at Pokhara, Lekhnath Metropolitan Ward No. 27. The study population were the adult population of Pokhara, Lekhnath Metropolitan Ward No. 27. The total area coverage of Pokhara Lekhnath-27 is 1225.02 hectares and the total population is 9538. Considering the feasibility of the researcher in terms of time and cost, the study setting was selected.

Subjects for the study was selected from the accessible adults with age 21 years and above of the ward. Sampling technique was nonprobability convenient sampling technique. Considering the valuable time of the research subjects, data was collected during the day time to ensure that respondents will have enough time to answer the questionnaire. Sample size was calculated from the accessible population using Cochran's formula taking the prevalence of hypertension in Nepal as 19.9% among individuals aged 18 years and above (NDHS, 2016). The precise sample size was 245.

Data was collected using the WHO STEPS Instrument for Non-Communicable Disease Risk Factor Surveillance. The STEPS Instrument covers three different levels or "STEPS" of risk factor assessment: Step 1 (questionnaire), Step 2 (physical measurements) and Step 3 (biochemical measurements). The questionnaire for the study was adopted using the step 2 (physical measurements) section of the WHO step instrument.

Anthropometric measurement and BMI classification: Height and weight of the participants was measured by researchers using standardized instruments and procedures. Portable weighing scale was used to take weight and inch tape was used to take height. The participants weight and height were taken without shoes and wearing light clothing. Sphygmomanometer with appropriate cuff size was used to measure blood pressure. The subjects were asked to sit relaxed with arm supported comfortably and the blood pressure was taken. The measurement was repeated twice with five-minute interval. BMI was calculated by dividing body weight (k.g.) by squared height (m^2). Participants was classified based into four groups according to the conventional World Health Organization (WHO) classification system: underweight (<18.5 kg/m^2), normal weight (18.5 to 24.9 kg/m^2), overweight (25.0 to 29.9 kg/m^2), and obese (≥30.0 kg/m^2). Pretesting of the tool was done in 10% (15) of total sample size in Ranipauwa 11, Pokhara.

After obtaining the ethical clearance from Institutional review committee of Gandaki Medical College (GMC-IRC) with reference number (96/77/78), the data was collected for six weeks from 2078/5/13 to 2078/6/16. Verbal consent was taken from participants. Confidentiality was maintained by not disclosing information about the research participant and ensuring that the information will be used entirely for research purpose only.

The collected data was edited, coded, and entered in statistical package for the social sciences (SPSS) version 16.0 and analysed according to research objectives by using descriptive statistics (frequency, percentage) and inferential statistics (Chi square).

RESULTS

Table 1 reveals the BMI of the subjects where almost half (48.5%) of the subjects had normal BMI and one fourth of the subjects were overweight.

Table 1: Distribution of subjects by BMI (N=245)

BMI	Number (N)	Percent (%)
Underweight	35	14.4
Normal	119	48.5
Overweight	61	25
Obese	30	12.1

Table 2 reveals the whether the subjects were hypertensive or not. About 145 (59%) of the respondents had normal systolic blood pressure.

Table 2: Distribution of subjects by systolic blood pressure (N=245)

SBP	Number (N)	Percent (%)
Normal	145	59.1
Hypertensive	100	40.9

Table 3 reveals the whether the subjects were hypertensive

or not. About 189 (77.3%) of the respondents had normal diastolic blood pressure.

Table 3: Distribution of subjects by diastolic blood pressure (N=245)

DBP	Number (N)	Percent (%)
Normal	189	77.3
Hypertensive	56	22.7

Table 4 displays correlation between BMI, BP and age. There were no significant positive correlations of BMI with both systolic BP, diastolic BP and age. However, there were significant positive correlation between age and SBP.

Table 4: Correlation matrix between BMI, BP and age

Variables	BMI	SBP	DBP	Age
BMI	1.0	0.099	0.128	0.056
SBP	0.099	1	0.548**	0.293**
DBP	0.128	0.548	1	0.147
Age	0.056	0.293	0.147	1

** Correlation is significant at the 0.01 level (2-tailed)

DISCUSSION

In this study, almost half (48.5%) of the subjects had normal BMI followed by over weight (25%), underweight (14.4%) and obesity (12.1%). It shows that out of 245 respondents, most of them have normal BMI and this finding is consistent with the finding of the study done among Fulani ethnic population of Jama'are, Nigeria which showed normal BMI range of the populations was 47.8%. Both study revealed that there were no significant positive correlations of BMI with both systolic BP, diastolic BP and age.[10] Similarly another study conducted in rural health training centre area of Rajendra Institute of Medical Sciences (RIMS), Ranchi, revealed that out of 500 study subjects more than half (51.6%) of the study subjects were having normal BMI and around one-third (34.2%) of the subjects were overweight.[2] Likewise the finding of this study is also supported by the another study done in Ghana which showed the prevalence of overweight and obesity was found to be 20.0% and 7.5%, respectively.[13]

About 40.9% of participants were hypertensive (SBP) which is similar to the finding of the study performed among adults' population in Ghana.[13]

Other study finding showed that there is significant positive correlation between BMI and DBP or SBP among government employees of Gujarat state in western part of India but this study finding shows there were no significant positive correlations of BMI with both systolic BP, diastolic BP and age.[9] This finding is in contrast with the finding of another study which reported that BMI had a significant weak negative correlation with both systolic blood pressure level and diastolic blood pressure level in males; however, no significant correlation was found in females.[12]

CONCLUSIONS

Based on findings of study, it is concluded that there is no significant positive correlations of BMI with both systolic BP, diastolic BP and age. However, significant positive correlation exist between age and SBP. The research findings highlights the need of regular monitoring of blood pressure and adoption of healthy lifestyle with increase in age.

ACKNOWLEDGEMENT:

We are grateful to all the participants for their valuable time and information.

CONFLICT OF INTEREST: None declared

SOURCE OF FUNDING: None

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