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ORIGINAL ARTICLE

ASSOCIATION OF HYPERTENSION WITH BODY MASS INDEX IN NORTHERN DISTRICTS OF BANGLADESH

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Abstract:

Background: *Body Mass Index is one of the significant determinant associated with many disease process particularly hypertension. There is positive association between Body Mass Index (BMI) and blood pressure (BP). Lowering BMI with weight reduction significantly reduces blood pressure (BP). The main purpose of this study was to find out the association of BMI with hypertension. The aim of the study is to find out any association between BMI and hypertension in a particular area of Bangladesh.* ***Methods:*** *This is a retrospective study which involves review of written medical records for adults diagnosed with hypertension aged 18 years and above. This study was conducted at hypertension and research centre, Rangpur. A total of 14137 hypertensive patients were included in this study. Hypertension was defined by the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7). BMI was calculated by a person's weight in kilograms divided by his height in meters squared.* ***Results:*** *Majority (42.1%) of hypertensive patients were within 41 to 50 years of age. Among 14137 participants 4.6% were underweight, 46.5% were healthy weight, 38.7% were overweight and 10.2& were obese. The mean values of systolic and diastolic blood pressure were144.9, 145.2, 148.3, 152.7 and 89.8, 90.4, 91.2, 92.8 respectively with increasing BMI.* ***Conclusion:*** *Increasing BMI increases the risk of HTN.*

Key words: *Retrospective study, obesity, overweight, BMI, blood pressure, hypertension*

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Introduction:

Hypertension is common in day to day practice. Many patients with hypertension are obese. Many studies were done to see correlation between obesity and hypertension. Few were done in patients residing in northern districts of Bangladesh. There was a positive correlation between Body mass index (BMI) and blood pressure (BP); this association has critical implications. In countries like China, where high blood pressure and obesity is increasing[1].Blood pressure can be reduced significantly with control of obesity[2]. Obesity is not only a factor associated with high BP but also a cause[3]. Hypertension has prevented to be a recognized cause of morbidity and deaths worldwide[4]. In developing countries like Bangladesh hypertension is an emerging major publichealth problem[5].One quarter of world adult population is already hypertensive and most of them are in developing countries[6]. According to an extensive survey on non-communicable disease conducted in 2010; prevalence of hypertension is 17.9%[7]. Exact prevalence of HTN in Bangladesh was not known. One meta-analysis and a population-based survey found the prevalence 11.3% and 18.6% respectively[8]-[9]. In another survey the prevalence was 20.1%[10]. 'Prevention is better' this is particularly true for hypertension. We tried to see if there was association between BMI and hypertension. So finding the association between BMI and HTN might help prevent HTN and its many complications. Though Bangladesh is a small country it has nearly 200 million populations. Out of them many suffers from hypertension and its complications. Bangladesh is a developing country with overwhelming impact on healthcare system. Once hypertension developed it requires long term medication with increased cumulative cost. Northern districts of Bangladesh are relatively poor compared to other parts. Many are not able to continue the treatment of hypertension due to financial constraints. Many study found clear association between increased BMI and hypertension. Very few studies done in this particular area. Hypertension and research centre covers wide areas of northern districts of Bangladesh including Rangpur, Kurigram, Gaibandha, Lalmonirhat, Nilphamari, Dinajpur, Thakurgaon and Panchagarh. This centre has a rich, huge data of patients from these districts. Our rationale for this study is to find any association between BMI and hypertension among people living in this area.

Methods:

This retrospective study was conducted at hypertension and research centre, Rangpur. Data collected from 2008 till December 2021 was enrolled for study. A total of 28000 participants were considered initially, out of them 14143 were finally selected. Rest was excluded due to missing information or lack of complete data. Participants were included by purposive sampling method.

According to The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7) HTN is diagnosed when systolic and diastolic blood pressure equals to or more than 140 and 90 respectively[11].Blood pressure was recorded through pre-checked and reliable aneroid sphygmomanometer. Patients were seated on comfortable chairs calm and quiet for at least 5 minutes prior to measurement. Three consecutive readings of BP were recorded at 3 minutes interval in between measurements and mean were calculated.

Weight and height were measured without shoes and wearing light clothes. Height was measured with patients stood upright with head in[1]Frankfort plane done by stadiometer. Height was recorded to the nearest 0.5 cm. Weight was measured by asking the patient standing straight in a digital weighing scale. Weight was recorded to the nearest 100 grams. Body mass index is calculated using a person's height and weight. The formula is BMI = kg/m^2 where kg is a person's weight in kilograms and m^2 is their height in meters' squared.

BMI interpretation[12]. BMI less than 18.5: Underweight, BMI between 18.5 and 24.9, Healthy weight, BMI between 25 and 29.9: Overweight, BMI of 30 or higher: Obese

Patients with HTN were allocated to different groups on the basis of age, sex, educational qualification, occupation, residence, family history of HTN etc. Alldata were recorded systematically in Semi-structured questionnaire.

Patients with HTN attending the 'hypertension and research centre Rangpur' were registered by registered doctor. Then registered patient was referred to the investigator. Written consent was taken from the patient. Detailed history was taken and clinical examination was done systematically. A pre-set data form was filled up for every patient. Patients with serious co-morbidities and patients who refuse to give consent were excluded from the study. Information on certain socio-demographic variables was obtained from the patients and/or their caregivers.

Results:

The study was intended to find any association between BMI and hypertension. The findings were presented below which were derived from this study.Among 14143 participants 7366 (52.1%) were males and 6771 (47.9%) were females (Fig 1). Socio-demographic data demonstrated that majority (52.1%) of the study subjects were female. Most of them resided in rural areas (70.1%), 42.3% were housewife and 32.9% were service holders. Of our study subjects 11.1% had no institutional qualification, 23.8% & 37.9% completed primary and secondary education respectively, and 26.7% completed bachelor/post O graduation (Table-1). BMI distribution revealed underweight, healthy weight, overweight & obese 4.6%, 46.5%, 38.7% & 10.2% respectively (figure 2). From the bar chart it was obvious that a significant proportion (49%) of study population were either overweight or obese. Mean value of SBP (144.91, 145.23, 148.39, 152.71) & DBP (89.83, 90.48, 91.21, 92.84) were found to be increasing as the BMI increased (Table-II). The association of BMI with SBP & DBP revealed significant positive correlation with $p<0.005$ and $r=0.689$ (SBP) and $p<0.005$ and $r=0.705$ (Table III).

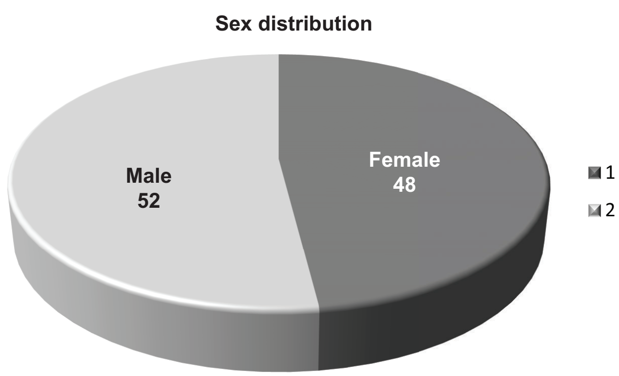

Fig.-1: *Distribution of male and female participants*

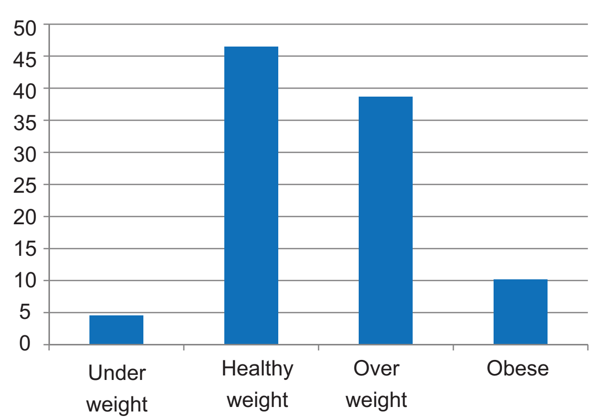

Fig.-2: *BMI distribution*

Table-II

Socio-demographic characteristics of the study subjects (n=14137)

Variables		Frequency	Percent
Sex	Male	6771	47.9
	Female	7366	52.1
Residence	Rural	9910	70.1
	Urban	4147	29.3
	Suburban	80	0.6
Occupation	Housewife	5986	42.3
	Service holder	4644	32.9
	Businessman	1934	13.7
	Farmer	1573	11.1
Qualification	Primary	3366	23.8
	Secondary	5350	37.9
	Bachelor/ postgraduate	3776	26.7
	Illiterate	1645	11.6

Table II

Mean BP in each BMI category

BMI	Mean SBP	Mean DBP
Underweight (<18.5)	144.91±9.28	89.83±7.52
Healthy weight(18.5-24.9)	145.23±10.34	90.48±7.88
Overweight(25-29.9)	148.39±9.82	91.21±6.78
Obese (≥30)	152.71±11.52	92.84±9.27

Table III

Pearson correlation between BMI & BP

	SBP		DBP	
	P value	r value	P value	r value
BMI	0.000	0.689	0.000	0.705

Correlation was significant at 0.01 level

Discussion:

Our study provided an idea of association between BMI and BP in general population residing in a particular area of Bangladesh. To date there are no published studies to see if this is true for the population living in greater Rangpur area of Bangladesh. Our study revealed strong association between BMI and SBP or DBP among participants. Both SBP and DBP increased significantly as the BMI increased.

Overweight or obese subjects were more likely to have higher SBP or DBP compared to healthy weight subjects. Underweight subjects were less likely to have high BP than healthy subjects with normal BMI. Our findings were similar to a study done by Esha Shrestha et al. where BMI was a strong predictor of hypertension[13]. Humayun et al. found BMI is more associated HTN compared to age[14]. Another study done by Kumanyika et al found BMI was more strongly associated with HTN compared to race[15]. One study conducted in adolescent population found strong relation between BMI and both SBP & DBP[16].

The Frahingham study demonstrated SBP increased 4 mmHg for every 4.5 kg of increased weight[17]. In our study higher BMI participants had 7 mmHg mean high SBP and 3 mmHg mean high DBP compared to normal BMI participants.

Overweight/obesity among the participants might be due to less physical activity, high fat intake, sweetened beverages, familial obesity, less fruits and vegetables intake. Various studies revealed diet, physical activity and self-discipline are major factors influencing obesity and HTN. The prevalence of HTN and obesity are significant public health problem and the trend is increasing globally. It is important that there is a need for nationwide campaign for control of weight and obesity. There is specification that measurement of blood pressure and BMI and timely diagnosis and control are essential for all particularly overweight/ obese people.

Conclusion:

There was a positive correlation between HTN and increased BMI. So, we recommended measures to reduce overweight or obesity to prevent HTN and its negative consequences. The limitation of our study was that data were collected from a single centre. Further multi-centrestudy was recommended for validation of present study.

Limitations:

This is a study; only patients at hypertension and research centre, Rangpur were taken for the study. So, this will not reflect the overall picture of the country. A large scale, preferably, nationwide survey should be conducted to reach to a definitive conclusion. Sample were taken by purposive method in which question of personal biasness might arise.

Conflict of Interest:

The authors stated there is no conflict of interest in this study.

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