ORIGINAL ARTICLE

A RELATIONSHIP BETWEEN BMI AND BLOOD PRESSURE AMONG FIRST YEAR MBBS STUDENTS OF MYSORE MEDICAL COLLEGE AND RESEARCH INSTITUTE

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HOW TO CITE THIS ARTICLE:
Lohith Rao Jadav, K. S. Tejaswini, Revathi Devi M. L. "A Relationship between BMI and Blood Pressure among First Year MBBS Students of Mysore Medical College and Research Institute". Journal of Evidence based Medicine and Healthcare; Volume 2, Issue 10, March 09, 2015; Page: 1478-1484.

ABSTRACT: AIMS & OBJECTIVE: To evaluate relationship between BMI and Blood Pressure among 1ST Year M.B.B.S. students of Mysore medical college. **METHODOLOGY:** A total of 126 students, 79 males and 47 females participated in the study conducted between June and July 2014 at Mysore Medical College. All students were divided into underweight, normal, over weight according to Western Pacific Regional Organization 2000 (WPRO) BMI classification. Hypertension was determined from the measurement of Blood pressure (BP). Comparison of blood pressure among different groups was made by ANOVA. **RESULTS:** Their mean age was calculated to be 18.6 years. Among students 23.8% were overweight and 22.2% were underweight while rest had normal BMI.A consistent increase was seen in the prevalence of hypertension in Underweight, Normal, Overweight Mean values of systolic BP (110.9, 114.3, 124.0 mmHg) and diastolic BP (76.2, 74.0, 78.4 mmhg) also increased with increasing BMI. **CONCLUSION:** The present study tested the hypothesis that there is a significant correlation between BMI with SBP, MBP & RRP.
KEYWORDS: Blood Pressure, BMI.

INTRODUCTION: Hypertension is a medical condition in which the blood pressure is chronically elevated.(1) It is usually found incidentally by health care professionals measuring blood pressure during routine checkup. In isolation, it usually produces no symptoms although some people do report symptoms during onset or before HTN is diagnosed.(2) Although no specific medical cause can be determined in essential HTN, it often has several contributing factors which include obesity, salt sensitivity, renin homeostasis, insulin resistance, genetics and age. It is also strongly correlated with BMI.(3)

As per the World Health Organization report 2013 on Hypertension. The largest proportion of Non communicable disease deaths is caused by cardiovascular disease. In terms of attributable deaths, raised blood pressure is one of the leading behavioural and physiological risk factor. Hypertension is reported to be the fourth contributor to premature death in developed countries.(4) The increasing prevalence of hypertension Is attributed to population growth, ageing and behavioural risk factors, such as unhealthy diet, harmful use of alcohol, lack of physical activity, excess weight and exposure to persistent stress.

Body Mass Index (BMI) is a simple index of weight-for-height that is commonly used to classify underweight, overweight and obesity in adults. It is defined as the weight in kilograms divided by the square of the height in metres (kg/m^2).(1) BMI values are age-independent and the same for both sexes. However, BMI may not correspond to the same degree of fatness in different populations due, in part, to different body proportions. The health risks associated with

increasing BMI are continuous and the interpretation of BMI gradings in relation to risk may differ for different populations.[5]

Obesity has been shown to be an independent risk factor for cardiovascular mortality and an indirect risk factor because of its effect on hypertension, diabetes, and dyslipidaemia.[6, 7]

The knowledge of the effect of obesity on hypertension is very important as it is a modifiable risk factor. Associations between body mass index (BMI) and blood pressure (BP) have been consistently observed, but remain poorly understood.[8]

Despite the consistency with which this correlation is observed, mechanistic explanations for the phenomenon are still being debated, and no biological model of the process has been established.[9]

The recognition of obesity (As assessed by BMI) in the present study as important factors associated with increased risk of developing elevated BP among subjects may help target prevention towards high-risk individuals in this age group. In the present study, we tested the Hypothesis that there is a correlation between BMI and BP indices viz Systolic pressure (SBP), Diastolic pressure (DBP), Mean pressure (MBP), Heart rate (HR), Rate pressure product (RPP) in apparently healthy adolescents.[10]

MATERIALS AND METHODS: The study sample consists of 126 subjects in the age group of 18-19 yrs. from first year MBBS. MMC & RI. Informed consent was taken. Ethical committee approval was also taken. The measurements of height and Weight were taken. BMI calculated by Weight (Kg)/ {Height (m)}^{1} Blood pressure readings were taken at sitting position at left arm using digital sphygmomanometer.

Based on BMI subjects were classified as underweight, Normal weight and Overweight.

None of the subjects were taking any medication and none had a significant medical history. All of them had a normal Physical examination. Subjects with History and or clinical evidence of acute medical illnesses were excluded.[2]

Descriptive Statistics, Product Moment Correlation, 1Way Annova, 2 Way ANOVAs were used as statistical analysis.

RESULTS: The study population consisted of 126 1st year M.B.B.S students of Mysore medical college and Research Institute. We Included 79 males and 47 females. The mean age of the subjects were 18.6yrs. Among them 28 were Under Weight, 68 were Normal Weight and 30 were Over Weight as per the Western Pacific Regional Organization (WPRO) BMI classification.

Comparison of parameters between males and females, showed that MBP, SBP, RPP, were significantly higher in Males. Mean values of systolic (110.9, 114.3, 124.0mmHg) and diastolic BP (76.2, 74.01, 78.4 mmHg) were found to be higher as the BMI increased In Underweight, Normal weight and Overweight respectively.

When bivariate correlation analysis was done systolic BP, Mean BP, RRP had positive correlation with BMI. No significant association of DBP with BMI was seen.

Correlation Coefficient of MNBP (0.240), SBP (0.360), RRP (0.207) p (<0.05)

These variables also showed a positive correlation among themselves also.

GROUP	MEAN BMI	No. OF PATIENTS	MALE	FEMALE
I UNDER WEIGHT	18.5	28	23	5
II NORMAL WEIGHT	18.5-22.9	68	36	32
III OVER WEIGHT	>23	30	20	10

TABLE 1: DEMOGRAPHIC PROFILE OF STUDY SUBJECTS

	MALES		FEMALES	
	MEAN	SD	MEAN	SD
UNDERWEIGHT	111.3043	14.172	109.2	11.099
NORMALWEIGHT	119.0278	8.1853	109.156	10.6
OVERWEIGHT	129.05	13.547	114.1	9.02404

TABLE 2: SYSTOLIC BLOOD PRESSURE

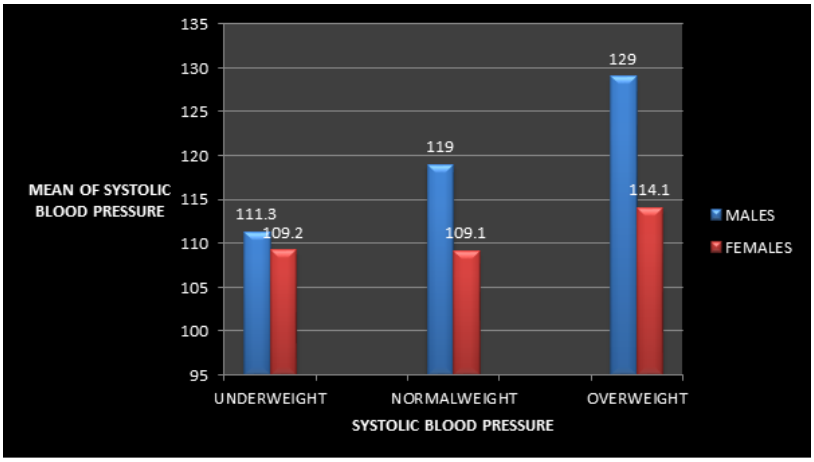

Fig. 1: MEAN OF SBP AT DIFFERENT BMI

	MALES		FEMALES	
	MEAN	SD	MEAN	SD
UNDERWEIGHT	76.21	10.15	76.6	7.53
NORMALWEIGHT	75.19	7.35	72.68	8.18
OVERWEIGHT	80.6	12	74	10.19

TABLE 3:DIASTOLIC BLOOD PRESSURE

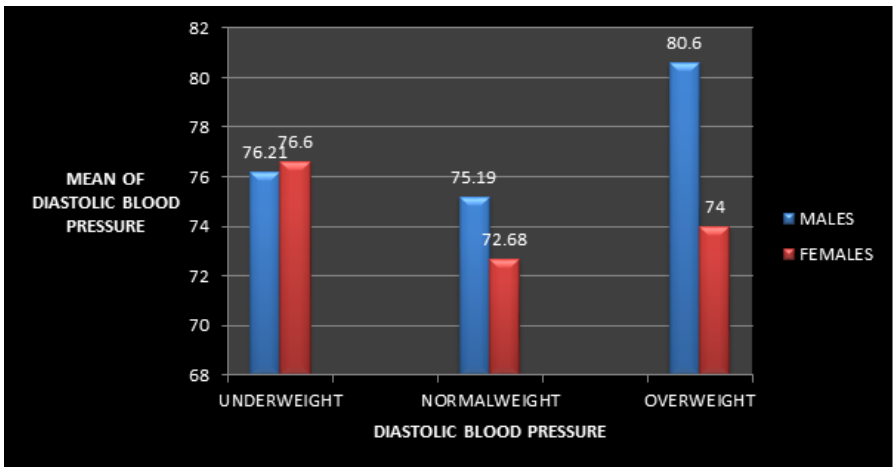

Fig. 2: MEAN OF DBP AT DIFFERENT BMI

	MALES		FEMALES	
	MEAN	SD	MEAN	SD
UNDERWEIGHT	86.26	12.359	87.8	8.78
NORMALWEIGHT	90.08	6.69	84.31	8.197
OVERWEIGHT	95.5	11.803	87.3	8.084

TABLE 4: MEAN BLOOD PRESSURE

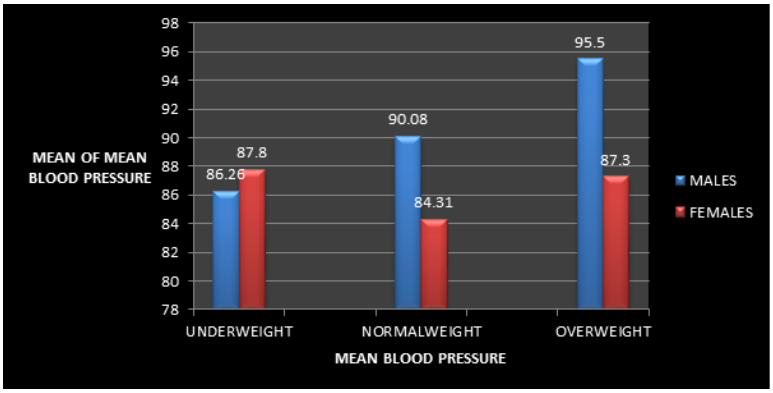

Fig. 3: MEAN OF MBP AT DIFFERENT BMI

	MALES		FEMALES	
	MEAN	SD	MEAN	SD
UNDERWEIGHT	10051.09	2320.153	10617.6	2262.099
NORMALWEIGHT	10435.31	1426.949	10249.72	2047.703
OVERWEIGHT	11403.55	2604.926	10414.5	2777.927

TABLE 5: RATE PRESSURE PRODUCT

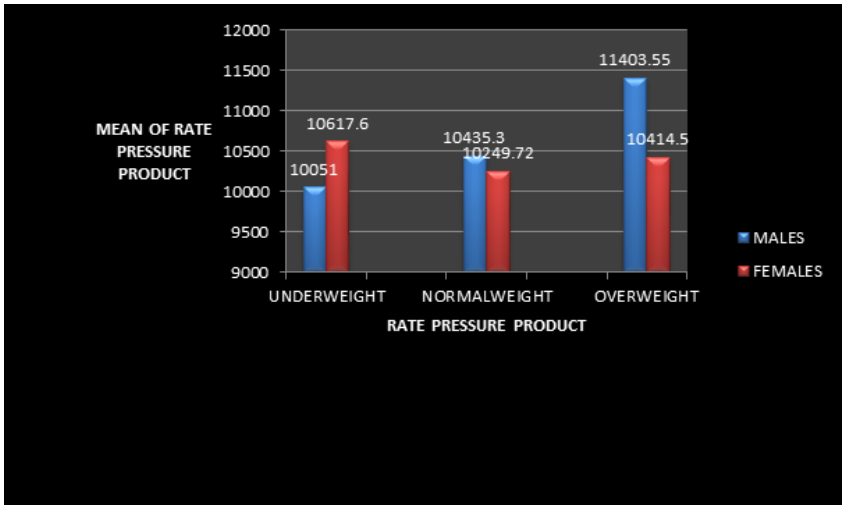

Fig. 4: MEAN OF RPP AT DIFFERENT BMI

DISCUSSION: In this study, we examined the relationship between BMI and BP among the first year MBBS students of Mysore Medical College and Research Institute. There was a Significant Positive co-relation of BMI with SBP,[11] MBP,RPP.[12] Even though there was a slight increase in values of DBP but it didn't show significant co-relation. In both males and females, we found that SBP and DBP were highest in overweight Subjects, intermediate in normal weight subjects and least in underweight subjects.[10] This is possibly due to differences in sympathetic tone between underweight and overweight subjects [13] and also due to factors like Socio Economic Factors, Cultural Factors, Genetic factors, Physical activity, Salt Consumption, Alcohol consumption and Smoking.[14] Obesity is associated with Insulin resistance and Hyper Insulinemia is associated with excessive sympathetic activity [15]. The observed differences between the males and females of Under Weight, Normal Weight, and Over Weight possibly may be due to differences in Cardiovascular Autonomic control and Energy Metabolism.[10] Our results support that the higher BP in over weight subjects is due to heightened sympathetic vascular tone.[10]

Interpreting the blood pressure–BMI relationship is further complicated by the suggestion from some studies of a threshold effect below which there appears to be no correlation between the variables.(16)

Some of these studies have relatively small samples and therefore limited power to detect a true relationship.(17)

In addition to greater fat stores and its associated direct metabolic consequences, persons with higher BMI values consume more sodium[18, 19] and engage in less physical activity.[20]

Assuming that arterial compliance was not different between the groups, this suggests that stroke volume is also similar. Also, HR was similar. Thus, we have indirect evidence that cardiac output is not significantly different between the three groups. Thus, differences in BP could be largely due to differences in total peripheral resistance, which in turn is greatly influenced by tonic sympathetic control of resistance vessels. Our results indirectly suggest that the higher BP in overweight subjects is due to heightened sympathetic vascular tone.(8)

REFERENCES:

1. Montgomery B. Evidence Based Case Report: Does paracetamol cause Hypertension? Br Med J. 2008; 336(7654):1190.
2. Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL, et al. Seventh report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure. Hypertension. 2003; 42(6):1206-52.
3. Humayun A, Shah AS, Sultana R. Relation of hypertension with body mass index and age in male and female population of Peshwar, Pakistan. J Ayub Med Coll Abbottabad. 2009; 21(3):63-5.
4. WHO report on Hypertension year 2013.
5. WHO BMI DATABASE.
6. Bots ML, Grobbee DE, Hofman A. High blood pressure in the elderly. Epidemiol Rev 1991; 13: 294-314.
7. Hubert HB, Feinleib M, McNamara PM, Castelli WP. Obesity as an independent risk factor for cardiovascular disease: a 26-year follow-up of participants in the Framingham Heart Study. Circulation 1983; 67: 968-9.
8. Kaufman JS, Asuzu MC, Mufunda J, Forrester T, Wilks R, Luke A, Long AE and Cooper RD: Relationship between blood pressure and body mass index in lean populations. Hypertension 1997, 30:1511-6.
9. Jones DW, Kim JS, Andrew ME, Kim SJ, Hong YP. Body mass index and blood pressure in Korean Men and Women: The Korean national Blood Pressure Survey. J Hypertension 1994;12:1433-1437.
10. Dr. Ravishankar P, Dr. Madan Mohan, Dr. Kaviraja udupa, Dr. Sankaranarayanan Correlation between body mass index and blood pressure indices, handgrip Strength and Handgrip Endurance in Underweight, Normal Weight and Overweight adolescents. Indian journal Physiol Pharmacol 2005 ;49(4):455-461.
11. Relationship between BMI, Waist circumference and BP among 5246 residents in Chongging area. Zhonghug Xin Xue Guan Bing Za Zhi 2007:35(7)655-8.

12. Anil Kumar T, Sudhir U, Gita Srinivasan, Punith K. Association of Body Mass Index with Blood Pressure in the Elderly. JIACM 2008; 9(4): 2746.
13. Kanavi Roopa Shekharappa , Smilee Johncy S , Mallikarjuna P T , Vedavathi K J , Mary Prem Jayarajan. Correlation between body mass index and cardiovascular parameters in obese and non-obese in different age groups. Int J Biol Med Res. 2011; 2(2): 551-555.
14. A. Collin Bell, Linda S Adair, Barry m Popkin. American Journal of Epidemiology, Vol. 155 issue 4.
15. N. L. Nanaware, A. M. Gavkare, A. D. Surdi. Study of Correlation of Body Mass Index (BMI) With Blood Pressure in School Going Children and Adolescents. International Journal of Recent Trends in Science and Technology, E-ISSN 2249-8109, Volume 1, Issue 1, 2011 pp 20-26.
16. Bunker VH, Ukoli FA, Matthews KA, Kriska AM, Huston SL, Kuller LH. Weight threshold and blood pressure in a lean black population. Hypertension. 1995; 26: 616-623.
17. Kaufman JS, Owoaje EE, James SA, Rotimi C, Cooper RS. The determinants of Hypertension in west Africa: Contribution of anthropometric and dietary factors to urban rural and socio-economic gradients. Am J Epidemiol 1996;143:1203-1218
18. Sanchez-Castello CP, Warrender S, Whitehead TP, James WPT. An assessment of the sources of dietary salt in a british population. Clin Sci 1987; 72: 95-102.
19. Stamler J. The INTERSALT Study: background, methods, findings and implications. Am J Clin Nutr 1997:65 (suppl): 626S—642S
20. Nelson L, Jennings GL, Esler MD, Korner PI. Effect of changing levels of physical activity on blood pressure and hemodynamics in essential hypertension. Lancet. 1986: 2: 473-47.

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Date of Submission: 12/02/2015.
Date of Peer Review: 13/02/2015.
Date of Acceptance: 28/02/2015.
Date of Publishing: 05/03/2015.