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Cross Sectional Study of Body Mass Index, Waist Hip Ratio and Blood Pressure among Medical and Dental Students

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Abstract

Objective: To study body mass index**,** waist hip ratio and blood pressure as well as to correlates the changes in body mass index and waist-hip ratio with systolic and diastolic blood pressure among medical and dental students. **Methods:** 500 medical and dental students of age group of 17- 26 years were selected for this study out of which 255 were males and 245 were females. Body mass index was calculated by measuring body weight in kilograms (kg) by Digital scale divided by square of the body height which is measured by commercial stadiometer in meter square (m^2). The Waist Hip ratio was measured by measuring Waist circumference and Hip circumference with the help of measuring tape and Blood pressure using mercury sphygmomanometer.

Result: Significant correlation of body mass index and waist-hip ratio with systolic and diastolic blood pressures has been found. Similarly, there were significant comparisons systolic and diastolic blood pressures among the different classes of body mass index. The blood pressure is highest in obese II subjects.

Conclusion: there should be regular health checkup for obese person for prevention of hypertension and cardiovascular diseases complications. Prevention of obesity is must for better health.

Keywords: BMI, WHR, SBP, DBP, Obese.

Introduction

Obesity is a major risk factor for many diseases like diabetes, CVD, hypertension etc [1, 2]. According to Indian council of medical research (ICMR), the epidemiology of general obesity assessed by body mass index (BMI) and abdominal obesity assessed by (waist-hip ratio) WHR were 135, 153 million [3]. Various research studies suggested that there is very close relationship between excess body weights and increased blood pressure which leads to various CVD complications [4-7]. One of the major factors of obesity is the change in the life style of modern societies with lack of physical activity [8].

The prevalence of obesity in young adults of developing countries like India ranges from 2.3 - 12% [9]. Therefore, it is necessary to identify the risk factors which may leads to obesity and related complication. That's why this study is intended to study body mass index, waist hip ratio and blood pressure among medical and dental students and to correlate changes in BMI and WHR with systolic and diastolic blood pressure among medical and dental students.

Materials and Methods

Study Design and Size: The cross sectional study was conducted among medical and dental students of the NIMS medical and dental college and in the Department of Physiology, NIMS UNIVERSITY JAIPUR. 500 medical and dental students of age group of 17- 26 years were selected for this study. Out of which 255 were males and 245 were female subjects. Subjects suffering from any disease, pregnant women and subjects taking weight gaining drugs were excluded from the study. An informed consent was taken from the participants before the study was started and the Ethical committee clearance was obtained from the Institute's Research Council and Ethics Committee.

Measurements of anthropometric parameters and blood pressure

BMI was calculated by measuring body weight in kilograms (kg) by Digital scale nearest to 0.1 kg divided by square of the body height which is measured by commercial stadiometer to the nearest 0.1cm in meter square (m^2). The Waist Hip ratio was measured by measuring Waist circumference with the help of measuring tape midway between lower border of rib cage and the iliac creast and Hip circumference was measured by measuring tape around the point with the maximum circumference over the buttocks. Blood pressure was measured on left arm using mercury sphygmomanometer. Full comfortable rest of 5-10 minutes was given to each subject before taking blood pressure. Two readings were taken and mean of two reading was used.

Statistical Analysis: The data was entered in Microsoft Office Excel 2016 and sorting and filtering was done in same. Mean and standard deviation was calculated in the Microsoft Office Excel 2016 The data was analyzed for correlation and one way anova by using the Statistical Package for the Social Sciences, version 24.0 (SPSS software). The graphs were drawn from Graph Pad Prism Version 7.00. P-values considered significant were as follows:-

- P <0.05– As significant
- P <0.001 – As highly significant

Result

The mean ± SD of anthropometric parameters and blood pressure of medical and dental students are shown in table1. There was significant correlation of BMI and WHR with SBP and DBP shown is table 2. The graphical representation of correlation of BMI with SBP and DBP is shown figure 1 and 2 respectively. Similarly, the graphical representation of correlation of WHR with SBP and DBP is shown figure 3 and 4 respectively. There were significant comparisons SBP and DPB among the different classes of BMI as shown table 3 and 4 respectively. The blood pressure is highest in obese II subjects. The graphical representation of comparisons SBP and DPB among the different classes of BMI is shown in box plot in figure 5 and 6 respectively

Table1: Showing the anthropometric parameters and blood pressure of medical and dental students

Parameters	Mean	± SD
Age	18.87	1.57
Gender (in number)	Female=245	Male= 255
Height (cm)	164.45	9.94

Weight(kg)	63.25	13.89
BMI	23.31	4.36
Waist	29.22	4.66
Hip	36.34	3.89
Waist hip ratio	0.8	0.1
Systolic blood pressure	116.77	6.64
Diastolic blood pressure	77.51	4.66

Table 2: Showing the Correlation of BMI and WHR with SBP and DBP.

Correlations of BMI with blood pressure		
	SBP	**DBP**
BMI	r = 0.746**	r = 0.581**
WHR	r = 0.382**	r = 0.387**
**. Correlation is highly significant at the 0.01 level.		

Table 3: Showing the one way-anova between BMI and SBP in medical and dental students

Characteristics	**Number of students**	**SBP (Mean ± SD)**	**Anova**	
			F	**Significance**
Underweight	35	108.86 ± 4.18	137.77	0.000**
Normal weight	335	114.96 ± 4.74		
Over weight	90	120.38 ± 5.04		
Obese 1	40	128.05 ± 2.45		
Obese 2	10	131.5 ± 3.03		
** Highly Significant at 0.001 (p<0.001) * Significant at 0.05 (p<0.05) NSNon Significant				

Table 4: Showing the one way-anova between BMI and DBP in medical and dental students

Characteristics	**Number of students**	**SBP (Mean ± SD)**	**Anova**	
			F	**Significance**
Underweight	35	108.86 ± 4.18	137.77	0.000**
Normal weight	335	114.96 ± 4.74		
Over weight	90	120.38 ± 5.04		
Obese 1	40	128.05 ± 2.45		
Obese 2	10	131.5 ± 3.03		
** Highly Significant at 0.001 (p<0.001) * Significant at 0.05 (p<0.05) NSNon Significant				

Figure 1: Showing the Correlation of BMI and SBP among medical and dental Students

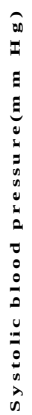


Figure 2: Showing the Correlation of BMI and DBP among medical and dental Students

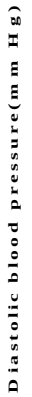


Figure 3: Showing the Correlation of waist-hip ratio and SBP among medical and dental Students.

Figure 4: Showing the Correlation of waist-hip ratio and DBP among medical and dental Students

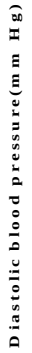


Figure 5: Showing the Box plot between systolic blood pressure and classifications of body mass index.

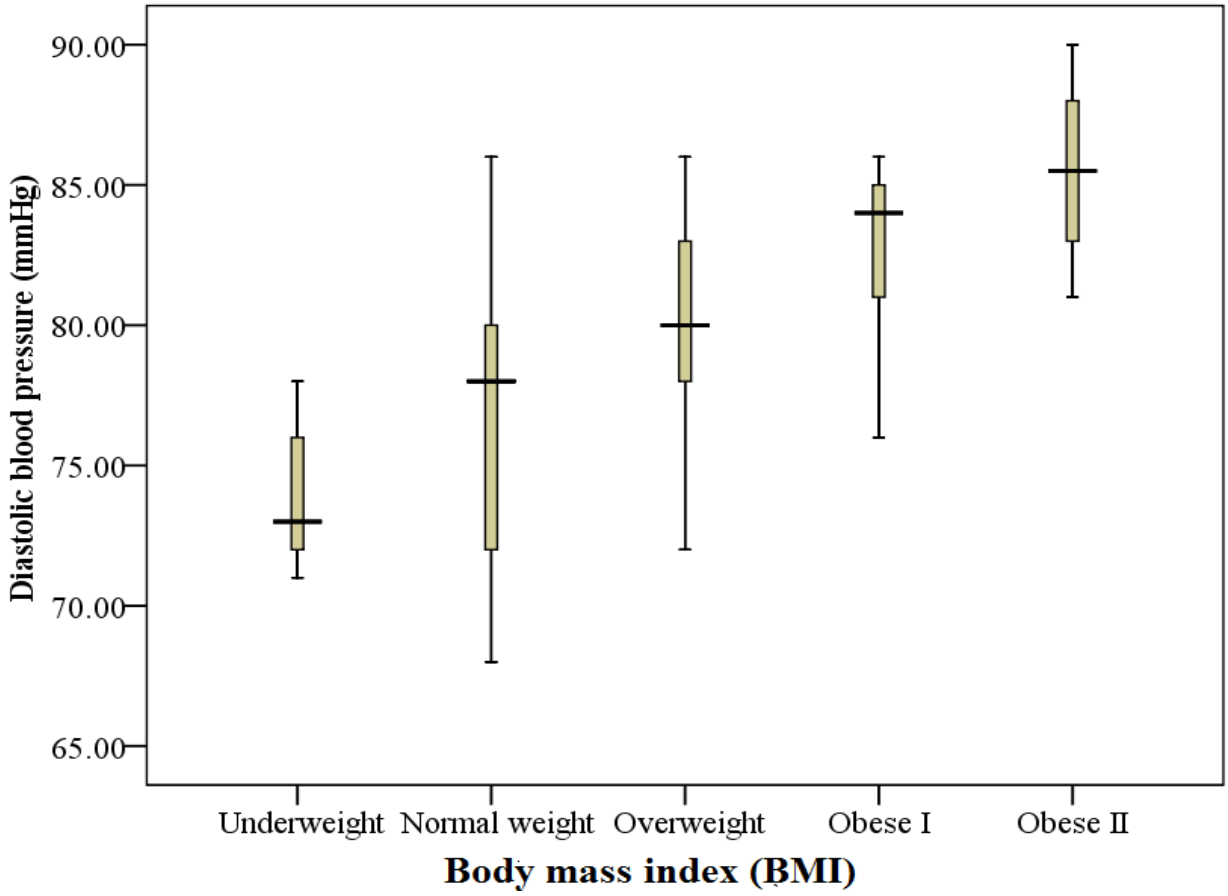
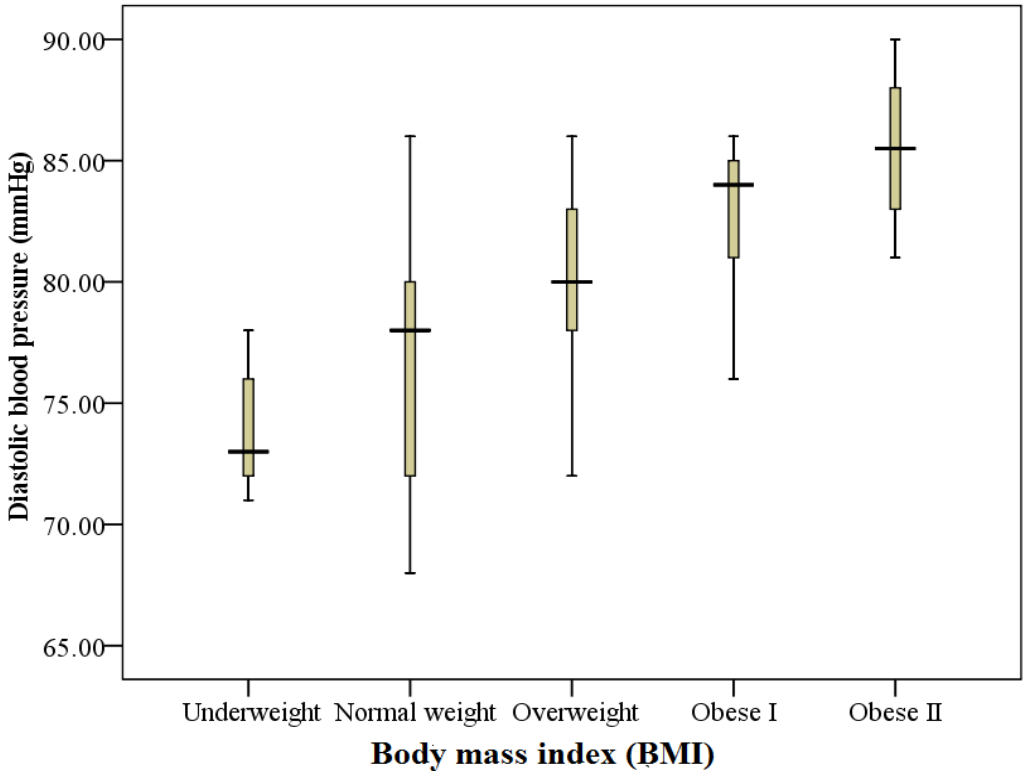


Figure 6: Showing the Box plot between diastolic blood pressure and classifications of body mass index.



Discussion

In this study, we found that there was significant positive correlation between BMI and WHR with blood pressure. Increased BMI and WHR may be one of the reasons for increased blood pressure. Our results are consistent with the finding of many other researchers finding [10-13]. It was also found that obese students were prone to develop hypertension in their adult life as the SBP & DBP with in this group of subject fall under pre hypertension category. BMI and SBP and DBP correlated significantly with each other. This correlation was also statistically significant within each categories of BMI. Zafar S et al studied relationship of BMI and WHR measurement to hypertension in young adult medical students also reported that increasing BMI directly affect the cardiovascular risk [14] which supported our finding. Obesity is the prime risk factor for CVD. Obesity is also linked with hypertension [15]. According to Indian Association of Pediatrics (IAP) 2015, the prevalence of overweight and obesity were 19.1% and 14% in adolescent [16]. Prevention of obesity is important to prevent the complications of CVD. Life style changes viz. change in dietary pattern, morning or evening exercise and try to doing less work with electronic gadgets like mobile phones [17, 18] will reduce the risk of hypertension and obesity. The blood pressure is a physiological parameter which is influenced by so many factors which include BMI, physical inactivity [19]. Sasi RSK reported that BMI and WHR were important risk predictors of hypertension [20]. There are many factors which contributes obesity includes socioeconomic status, modern life style, lack of physical activity and psychological factors such as depression, low esteem level, anxiety[21, 22] . The reason for obesity is more intake of energy as compared to less energy expenditure [23]. One of the possible reasons for increased blood pressure in obese subjects is that the large amount of carbohydrates and alcohol causes increased formation of triglycerides in blood which is one of the risk factor for high blood pressure and atherosclerosis. Various other factors like sedentary life style, smoking habits, stress in young adults [24] causes increased carotid intima- media thickness which causes increased blood pressure [25]. These data showed the early course of increased blood pressure and atherosclerosis in obese subjects. Other reason for increased blood pressure may be the high caloric intake causes increased norepinephrine turnover in peripheral tissues; results increased resting plasma norepinephrine concentration [26]. Thus, high dietary content in fat and carbohydrate had been suggested to acutely stimulate peripheral α1 and β-adrenergic receptors thereby leading to the elevation of sympathetic activity and hypertension [27, 28]. Similarly, upregulated hypothalamic tyrosine hydroxylase and hypothalamic adrenoceptor gene expression of the α2B receptor have been identified, in obese hypertensive rat [29]. In human also, blockade of both α and β adrenergic significantly reduced blood pressure in obese subjects [30].

Conclusion

Overweight and obesity are a major health hazard all over the world and are becoming a major health threat among both the sexes and all age groups. Prevention of obesity in adolescent and young adults is important to reduce CVD and its complications. Regular health checkup is very important to prevent cardiac problems and hypertension in obese subjects.

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