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Cross Sectional Study of Body Mass Index, Blood Pressure and Age among Medical and Paramedical Students of Medical College in Delhi

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ABSTRACT
Objective: *To correlates changes in body mass index (BMI) and obesity with blood pressure, age and waist-to-hip ratio in adults as well as to identify possible risk groups with undesirable trends in obesity by assessing associations of BMI and obesity with demographic, socioeconomic and behavioral factors.*
Methods: *110 medical and paramedical students of age group of 17- 26 years were selected for this study out of which 54 were males and 56 were females. The methods used for this study were- for BMI by calculation of 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), Waist Hip ratio by measuring Waist circumference and Hip circumference with the help of measuring tape and Blood pressure using mercury sphygmomanometer.*
Results: *Significant correlation for male students (r 0.814) and for female students (r 0.559) was found between SBP and BMI. Also significant correlation for male students (r 0.622) and for female students (r 0.390) was found between DBP and BMI. No significant correlation for age and W/H ratio was found with BMI for male and female students. Statistical significant difference found among male subject mean SBP was maximum among obese 2 group (126.4 ±5.64) as compare to normal & underweight subjects with SBP 118.5±3.72 & 110 ±4.0 respectively and mean DBP was maximum among obese 1 group (83.42 ±2.22) as compare to underweight whose DBP was minimum (76 ±0.0). Statistical significant difference found among female subject mean SBP was maximum among obese 2 group (116 ±3.46) as compare to normal& underweight subjects with SBP 112.63± 4.20& 111 ±1.41 respectively and mean DBP was maximum among obese 2 group (76.0 ±3.46) as compare to underweight whose DBP was minimum (70 ±0.0).*
Conclusion: *The findings of the present study done among young adult medical students reveals, substantial proportions of young adult medical students are overweight and obese, the rate being higher for female participants. Participants who were overweight or obese had high blood pressure levels and there was significant relationship between the BMI category and BP levels and with increased BMI there was risk of high blood pressure. The obesity index which correlates very well with both systolic and diastolic blood pressure is BMI. As the BMI increases there is progressive increase in both systolic and diastolic blood pressure in both male and female subjects. Thus, our results highlight the necessity to institute effective prevention and health promotion programs targeting younger age groups.*
Keywords: *BMI, SBP, DBP, WHpR.*

Introduction

Body mass index is considered as measure for assessing obesity. Obesity is characterized by excess adipose tissue. Body mass index is positively and independently associated with morbidity and mortality from hypertension, cardiovascular disease, Type 2 diabetes mellitus and other chronic diseases.

Overweight and obesity increase the risk of high B.P and coronary heart disease worldwide about 58% of diabetes mellitus and 21% of ischemic heart disease are attributed to BMI above $21 kg/m^2$ by the world health organization (Reducing the risk promoting the healthy life Switzerland 2002).

The relationship between BMI and B.P has long been the subject of epidemiological research. Positive association between BMI and B.P has also been reported in Asian population. Several studies indicate that high B.P. is associated with age and also because of process of modernization with changing life style factor has an increasing trend of hypertension especially among the urban population.

Life style changes such as lack of exercise, habits of taking junk food and late night study may causes derangements of BMI particularly medical and dental students. So, medical and dental students are of the particular interest as the target group as they fall in young adult age group and also future physician.

Therefore knowledge awareness regarding health consequences of life style changes are generally expected to be high among these students. This in turn could influence the prevalence of life style disease such as hypertension and diabetes among them.

Materials and Methods

Subjects: 110 medical and dental students of age group of 17- 26 years were selected for this study. Out of which 54 were males and 56 were females. Subjects suffering from any disease were excluded from the study. Sample size is depending upon the availability of students during the period of study.

An informed consent was taken from the participants before the study was started and study was approved by the institute ethical committee. Subjects were divided into two major groups:-

Group	Number of subjects
Male	54
Female	56

Males and females were further divided into two following groups on the basis of BMI of Western Pacific Region of WHO:-

Characteristics	BMI (kg/m^2)
Normal weight	<18.5
Under weight	18.5 -22.9
Over weight	23 -24.9
Obese 1	25 -29.9
Obese 2	>30

Classification of Hypertension

Classification	Systolic	Diastolic
Normal	< 120 mmHg	<80 mmHg
Pre- hypertensive	120-139 mmHg	80-89 mmHg
Stage-1 hypertensive	140-159 mmHg	90-99 mmHg
Stage-2 hypertensive	>160 mmHg	>100 mmHg

The cutoff point of Waist to hip ratio for central obesity was defined as:

≥ 0.9 for male participants

≥ 0.8 for female participants.

Statistical analysis

Mean $\pm$ SD were calculated for the parameters analyzed and were compared by Student's 'T' test and Pearson Correlation coefficient was used to correlate parameters.

P-values considered significant were as follows:-

P <0.05– As significant

P <0.001 – As highly significant

Result

Age and BMI Correlation

Male: No significant correlation (r- 0.110) was found between age and BMI of male students.

Female: No significant correlation (r- 0.067) was found between age and BMI of female students

WHpR ratio and BMI Correlation

Male: No significant correlation (r- 0.196) was found between W/H ratio and BMI of male students.

Female: No significant correlation (r- 0.162) was found between W/H ratio and BMI of female students.

Correlation of BMI with SBP

Male: significant correlation (r 0.814) was found between SBP and BMI of male students.

Female: No significant correlation (r 0.559) was found between SBP and BMI of male students.

Correlation of BMI with DBP

Male: significant correlation (r 0.622) was found between DBP and BMI of male students.

Female: No significant correlation (r 0.390) was found between DBP and BMI of male students.

Table-1: Correlation of BMI with age, WHpR, SBP and BDP in male

		Age	WHpR	SBP	DBP
BMI	Pearson Correlation	-0.110	0.196	0.814**	0.622**
	Sig. (2-tailed)	0.428	0.156	0.000	0.000
	N	54	54	54	54

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

Table-2: Correlation of BMI with age, WHpR, SBP and BDP in female

		Age	WHpR	SBP	DBP
BMI	Pearson Correlation	-0.067	0.162	0.559**	0.390**
	Sig. (2-tailed)	0.624	0.234	0.000	0.003
	N	56	56	56	56

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

Table-3: Comparison of BMI category with SBP and DBP among male

Characteristics	Number of students	SBP (Mean ± SD)	DBP (Mean ± SD)
Normal weight	20	118.5 ± 3.72	78.40 ± 4.52
Under weight	3	110.0 ± 4.00	76.00 ± 0.00
Over weight	14	119.40 ± 4.467	78.86 ± 3.82
Obese 1	7	124.2 ± 2.69	83.43 ± 2.23
Obese 2	10	126.4 ± 5.64	83.20 ± 3.155

Among male subject mean SBP was maximum among obese 2 group (126.4 ±5.64) as compare to normal & underweight subjects With SBP 118.5±3.72 & 110 ±4.0 respectively. On statistical analysis mean SBP was significantly different among different BMI category $P < 0.05$. Among male subject mean DBP was maximum among obese 1 group (83.42 ±2.22) as compare to underweight whose DBP was minimum (76 ±0.0).on statistical analysis mean DBP was significantly different among different BMI category $P < 0.05$

Table-4: Comparison of BMI category with SBP and DBP among female

| Characteristics	Number of students	SBP (Mean ± SD)	DBP (Mean ± SD)
Normal weight	41	112.63 ± 4.21	73.14 ± 2.27
Under weight	3	111.00 ± 1.41	70.00 ± 0.00
Over weight	3	112.67 ± 1.15	75.33 ± 3.06
Obese	7	110.29 ± 3.90	75.17 ± 3.43
Obese 1	2	116.00 ± 3.46	76.00 ± 3.46

Among female subject mean SBP was maximum among obese 2 group (116 ±3.46) as compare to normal& underweight subjects with SBP 112.63± 4.20& 111 ±1.41 respectively. On statistical

analysis mean SBP was significantly different among different BMI category   p > 0.05

Among female subject mean DBP was maximum among obese 2 group(76.0 ±3.46) as compare to underweight whose DBP was minimum (70 ±0.0).on statistical analysis mean DBP was significantly different among different BMI category   p > 0.05

Figure-1: Correlation between BMI and SBP & DBP in male and female students
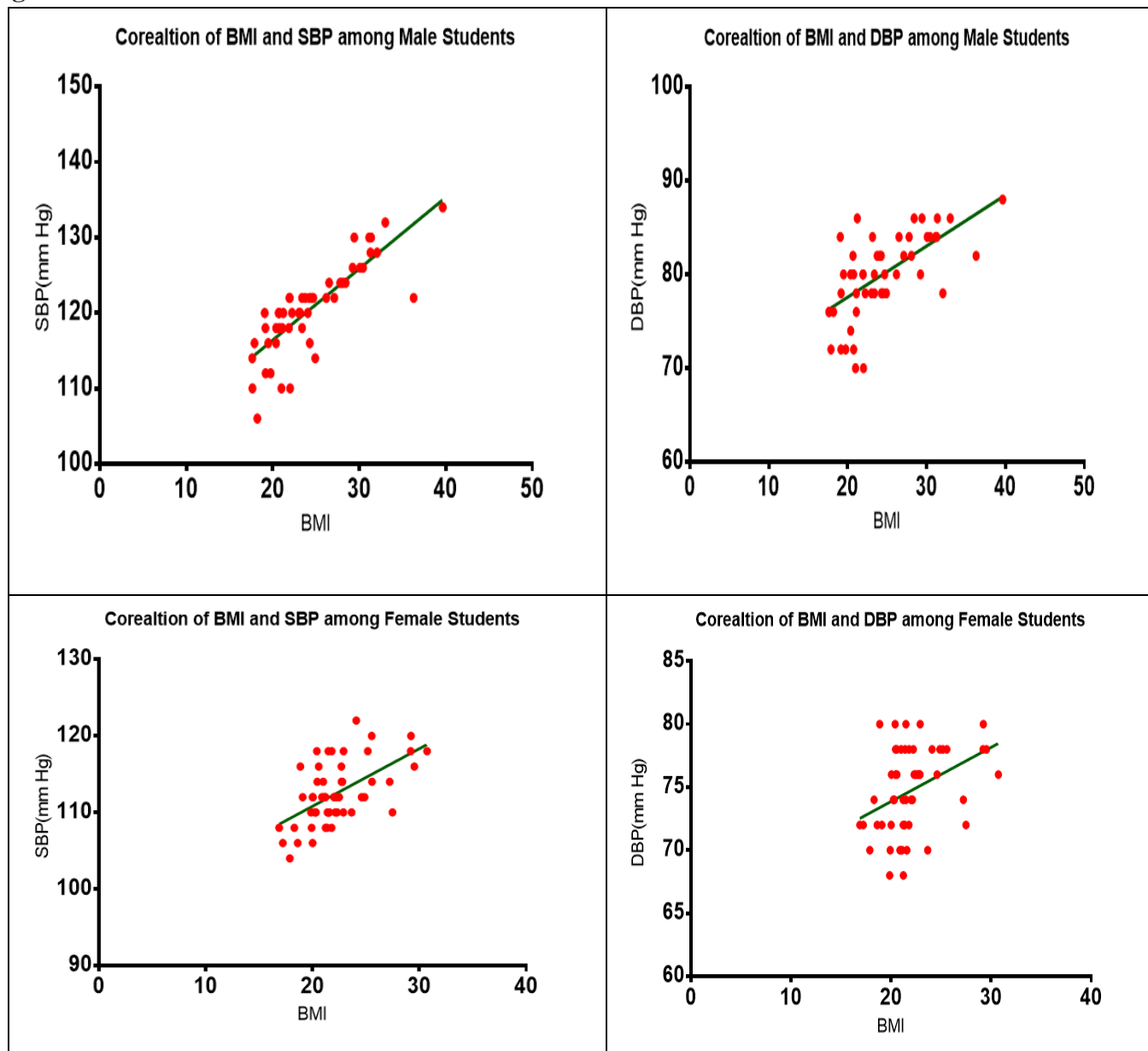
Table-5: Risk Group among male for SBP and BPB

Characteristics	Number	SPB (Mean ± SD)	SPB (Std. Error of Mean)	DPB (Mean ± SD)	DPB (Std. Error of Mean
No Risk	45	119.73 ± 5.470	0.8155	79.33 ± 4.31	0.641
Risk	9	124.22 ± 6.036	2.012	82.89 ± 3.33	1.111

Mean SBP among no risk group of male students was 119.73±5.47 while it was 124.22±6.03 among in high risk group which showed statistical different was significant while Mean DBP among no risk group of male students was 79.33±4.30 while it was 82.89 ±3.33 among in high risk group which showed statistical different was significant.

Table-6: Risk Group among female for SBP and BPB

Characteristics	Number	SPB (Mean ± SD)	SPB (Std. Error of Mean	DPB (Mean ± SD)	DPB (Std. Error of Mean)
No risk	42	112.33 ± 3.99	0.6169	74.62 ± 3.29	0.507
Risk	14	112.82 ± 4.35	1.161	75.29 ± 3.65	0.974

Mean SBP among no risk group of female students was 112.33 ± 3.99 while it was 112.82±4.34 among in high risk group which showed statistical different was significant while mean DBP among no risk group of female students was 74.61±3.29 while it was 75.28±3.64 among in high risk group which showed statistical different was significant.

Discussion

The present study was conducted among medical and paramedical students in the academic years 2016 under Department of Physiology, Dr BSA Medical College and hospital, Delhi from October 2016 to February 2017.

Association of BMI and Blood pressure

In present study it was found that there is a progressive increase in Systolic & diastolic blood pressure with increase in BMI in both male and female students and the results were statistically significant (P<.05) . It was also found that obese students were prone to develop hypertension in their adult life as the systolic & diastolic BP with in this group of subject fall under pre hypertension category. In a Turkish cohort study done by Erem C et al [1] studied similar results were obtained, they found that both age and body mass index were predictors for hypertension.

Association of BMI and cardiovascular risk factors

BMI and systolic and diastolic blood pressure correlated significantly with each other. This correlation was also statistically significant within each categories of BMI. With regard to blood pressure our findings are in agreement with several studies performed on young adults. Studies done among medical students in Pakistan, Crete, US and South Africa also reported the similar association between BMI and blood pressure. Zafar S et al [2] studied relationship of

body mass index and waist to hip ratio measurement to hypertension in young adult medical students and reported that increasing BMI directly affect the cardiovascular risk which supported our finding .

Association of Waist Circumference and cardiovascular risk factors

Comparing the association between WC and blood pressure, there was statistically significant correlation between both in male participants while the correlation was not statistically significant in female participants. Though WC is a better indicator of central obesity, the results of the present study shows variation in association between WC and cardiovascular risk factors.

WC is an important component of the most recent and frequently applied diagnostic criteria for the metabolic syndrome. However, measuring WC doesn't reliably distinguish between large waists due to increases in subcutaneous adipose tissue versus visceral fat. This type of varied results is also found in other studies. Our results are similar with those of the Bogalusa Heart Study done by Gustat J et al [3] where WC measurements didn't predict the blood pressure levels of young adults in multivariate models.

Association of WHpR and cardiovascular risk factors

Considering the correlation between WHpR and blood pressure, statistical significance(P<.05) was achieved only for systolic blood pressure and WHpR in female participants, while there was no statistical significance(P> .05)between WHpR and diastolic blood pressure both males and females. The reason for such variation could be that regional fat distribution has an impairment effect on metabolic and hemodynamic measures, only when the overall body fat is larger than a certain quantity.

Gustat J et al [3] & Raison JM et al[4] surveys showed a significant association between WHpR and blood pressure. Bertsias G et al [5] showed that there was a positive and independent correlation of WHpR with systolic arterial pressure both in males and females.

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. The findings of the present study done among young adult medical students reveals:

- Substantial proportions of young adult medical students are overweight and obese, the rate being higher for female participants.
- Participants who were overweight or obese had high blood pressure levels.
- There was significant relationship between the BMI category and BP levels and with increased BMI there was risk of high blood pressure.
- The obesity index which correlates very well with both systolic and diastolic blood pressure is BMI.
- As the BMI increases there is progressive increase in both systolic and diastolic blood pressure in both male and female subjects.

Thus, our results highlight the necessity to institute effective prevention and health promotion.

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