

Original Research Article

Blood pressure measurement in overweight, underweight and normal BMI undergraduate students of a private medical college: correlation of BMI with blood pressure

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ABSTRACT

Background: It is estimated that by 2025 around 46.5% of India's population will be suffering from hypertension and associated complications. Thus, early detection of hypertension can prevent complications in later life. Higher BMI is associated with increased risk of elevated blood pressure. Weight related problems are on rise in college/University students. The medical students are at greater risk owing to various stressors. Thus, the present study was undertaken to measure blood pressure and BMI of undergraduate MBBS students and to find correlation with them.

Methods: 253 students were enrolled in the study. BMI (Kg/m²) and blood pressure (mmHg) were measured. The data was analysed using appropriate statistical tests.

Results: BMI was 22.54±2.85 and 20.75±2.99 Kg/m² respectively in males and females (p<0.001). 21.34% and 12.65% were found to be underweight and overweight respectively. SBP and DBP in males and females was found to be 120.54±9.48/79.71±4.77 and 110.80±0.98/74.40±5.45 mmHg respectively (p<0.001). 67.98%, 28.07% and 3.95% students were found to be normo, pre-and hypertensive respectively. Significant positive correlation of BMI with SBP and DBP was found both in males and females.

Conclusions: There is weight related concerns and associated complications like elevated blood pressure in medical students.

Keywords: Blood pressure, MBBS Students, Malnutrition, Stress, Weight

INTRODUCTION

As per Global Burden of Disease, the mortality due to chronic diseases will rise by the year 2020.¹ Prevalence of hypertension is on rise in recent years in India. As per data, rates for HTN in percentage are projected to go up to 22.9 and 23.6 for Indian men and women, respectively by 2025.² Thus 46.5% of population will be suffering from hypertension and associated complications overall it is estimated that 20-80% population suffers from prehypertension.³ Hypertension is a risk factor for many cardiovascular diseases. Thus, Early detection of

Hypertension and associated risk factors can prevent cardiovascular complications in later life.⁴ Various researches have shown that the risk of hypertension is five times more in obese than in non-obese.⁵

The higher BMI is associated with increase in adipose tissue. Further there is increase in numerous factors like leptin and angiotensinogen which in turn act as risk factors for cardiovascular disease including hypertension.⁶ Though body fat cannot be measured directly by BMI but it correlates to direct measures of body fat. BMI measures excess weight and is a valuable

tool for screening and thus predicting future morbidity.⁷ Students living away from home often indulge in unhealthy eating habits.

Other factors like stress, skipping breakfast and peer pressure may also contribute to weight changes in students. 16.7% male and 9.5% females were found to be overweight and underweight respectively in a study done by Atanasova V et al, in foreign medical students.⁸ On the other hand, Salve SB et al, in their study found that 29.52% males and 31.73% females had less than normal BMI. Similarly, more than normal BMI was found in 18.07% males and 14.42% females respectively.⁹ Thus, keeping in view the rising rates of weight related issues in university students, the present study was conducted to measure the blood pressure in various categories of BMI and correlate it with blood pressure. The study was also undertaken keeping in view that hypertension is tip of iceberg phenomenon and the students who fall in pre-hypertensive group can be educated about the life style modification and precautions.

METHODS

The present study was a cross sectional study conducted in the Department of Physiology, IIMS and R, Integral University, Lucknow, Uttar Pradesh, India. Data of 253 undergraduate medical students was analysed in the present study. The following parameters were measured: height (m), weight (Kg), BMI (Kg/m²) (underweight as BMI<18.5 kg/m², overweight as BMI ≥ 23.0 kg/m² but <25 kg/m²).¹⁰ Blood pressure (Systolic and Diastolic

mmHg) was measured using mercury sphygmomanometer (following standard protocol and precautions) and on basis of readings the subjects were classified as normotensive (120/80 mmHg), pre-hypertensive (120-139/80-89 mmHg) and hypertensive (>140/>90 mmHg).¹¹

Statistical analysis

The data was expressed as mean±SD and was analysed using SPSS (21.0). The non-parametric data was analysed using chi square test. Unpaired T test and ANOVA was used to compare the systolic and diastolic blood pressure in BMI groups (normal, underweight and overweight groups). Correlation of BMI with SBP and DBP was done in overweight and underweight subjects using Pearson’s correlation. P value <0.05 was taken as statistically significant.

RESULTS

BMI was 22.54±2.85 and 20.75±2.99 Kg/m² respectively in males and females (p<0.001) (Table 1). 21.34% and 12.65 % were found to be underweight and overweight respectively (Table 2). SBP and DBP in males and females was found to be 120.54±9.48/79.71±4.77 and 110.80±0.98/74. 40±5.45 mmHg respectively (p<0.001) (Table 3). 67.98%, 28.07% and 3.95% students were found to be normal, pre-and hypertensive respectively (Table 4). Significant positive correlation of BMI with SBP and DBP was found both in males and females (Table 5).

Table 1: BMI status of males (n=140) and females (n=113).

BMI	Males		Females	
	*Number (%)	BMI (Kg/m ²)	*Number (%)	BMI (Kg/m ²)
Normal	105 (75)	22.29±2.03	62 (54.87)	21.50±1.97
Underweight	14 (10)	18.09±0.26	40 (35.40)	17.96±0.43
Overweight	21 (15)	26.78±1.50	11 (9.73)	26.65±1.76

Overall in males and females BMI was 22.54±2.85 and 20.75±2.99 Kg/m² respectively. Significant difference at p<0.001; *Chi Square is significant at p<0.001(value=24.109 and df=2).

Table 2: Data of 253 students combined.

BMI	Number	%
Normal	167	66.01
Underweight	54	21.34
Overweight	32	12.65

DISCUSSION

The assessment of BMI gives a count of body thinness and thickness. Though simple tool, it gives information about underweight and overweight status. Both underweight and overweight are risk factors for multiple diseases. Impaired immunity, delayed puberty,

osteoporosis, anaemia, psychological disturbances are more commonly associated with underweight.¹² On the other hand overweight is risk factor for diabetes, cardiovascular diseases, respiratory, chronic kidney, musculoskeletal problems, GIT and hepatic disorders and psychological and low functioning problems.¹³ In the present study out of 253 students, 21.34% and 12.65 % were found to be underweight and overweight respectively. In a sample of 149 medical students Afzal M et al, found that 28.9% were underweight and 9.4% were overweight.¹⁴ Similarly prevalence of underweight and overweight was found to be 16.5% and 15.2% respectively in a study done by Sarkar P et al.¹⁵ The results can be explained on the basis that the sample size

was more in the present study and the higher percentage of underweight can be attributed to higher percentage of underweight females i.e. 35.40% (40/113) in the present

study. Higher percentage of underweight has been reported in females.¹⁶

Table 3: SBP and DBP in various categories of BMI in both males and females.

	Males		Females	
	SBP(mmHg)	DBP(mmHg)	SBP(mmHg)	DBP(mmHg)
Normal	120.13±7.53	79.71±4.17	112.80±5.76	75.54±5.34
Underweight	106.00±3.84	74.57±3.63	101.35±4.40	70.80±3.03
Overweight	132.28±5.15	83.14±5.31	125.64±2.80	81.09±3.72

Overall SBP and DBP in males and females was 120.54± 9.48/79.71±4.77 and 110.80 ±0.98/74.40±5.45 mmhg respectively. SBP and DBP difference is significant at p<0.001.

Table 4: Number and percentage of normo, pre-and hypertensive in males and females (significant difference found).

Category	Males		Females	
	Number	%	Number	%
Normotensive	90	64.29	82	72.56
Pre-hypertensive	44	31.42	27	23.90
Hypertensive	06	04.29	04	03.54

Overall 172(67.98%), 71 (28.07%) and 10(3.95%) were found to be normo, pre and hypertensives; Chi Square show p=0.371(value=1.984 and df=2).

Table 5: Correlation of BMI with SBP and DBP in males and females.

Parameter	Male		Female	
	r	p	r	p
SBP	0.405	0.01	0.702	0.01
DBP	0.375	0.01	0.597	0.01

Significant positive correlation of BMI with SBP and DBP in both males and females.

In the present study, higher percentage of males (15%) were found to be obese than females (9.73%). Sheikh NH et al, also have reported low prevalence of obesity in females.¹⁷ Twice the females were found to be overweight than males in a study done by Hamid S et al.¹⁸ The results of present study contrast with the above-mentioned study. The differences in the result may be explained by number of factors namely, larger sample size in the study, greater awareness of health in females as compared to males. Another interesting observation which is worth mentioning is that, in the vicinity of hostel more males indulge in outing (since the outing rules for females are often stricter than those of males) from hostel and thus get exposed to fast and junk food. Positive association between junk food and BMI have been reported.¹⁹ Study done by Manojan KK et al, found high prevalence of obesity among students who were adopting unhealthy life styles and indulging in fast food and fried items.²⁰ The present study is also in contrast with the studies which have reported no gender differences in

weight or have reported high prevalence of obesity amongst female students.²¹

Interestingly the variations in weight, height and BMI can be explained based on genetics especially in boys. On the other hand, in girl's environmental factors play a significant role. Socio economic status, parenting styles; parent modelling of eating behaviours and life styles; eating environments at home, school and community as well as the neighbourhood characteristics play an important role. Thus, the interaction of environmental factors and genetics influence the BMI.²²

Apart from genetics, the problem of weight being faced by medical undergraduates may also be attributed to the ever-increasing challenges owing to tough competition. The result is that the students are under continuous stress. The academic burden also plays an important role. There seems to be the problem in time management. The students devote majority of the time to academic. They are often found indulging in unhealthy eating habits and adopting unhealthy life styles. Moreover, they have little time left to indulge in physical activities. All these factors play a role in weight related issues.

In the present study 172 (67.98%), 71 (28.07%) and 10 (3.95%) were found to be normo, pre-and hypertensives. Systolic and diastolic blood pressure was more in overweight males and females. The results are almost similar to the study done by Chitrapu RV et al Slight variations in results may be due to higher sample size in the study. The results of our study are similar to studies done earlier in which more males were found to be hypertensive and BMI correlated positively with blood pressure.^{23,24} In the present study SBP and DBP was more in overweight BMI category. Both SBP and DBP tend to elevate with high BMI.²⁵ In the present study BMI correlated positively with SBP and DBP in both males and females. Blood pressure was more in overweight students. The study is similar to studies done earlier which have reported similar correlation between BMI and blood pressure.^{26,27} The results may be explained on the basis that with increase in BMI there is increase in

sympathetic nervous system activity, endothelial dysfunction and increase in cytokines.²⁸

Limitation of this study analysis of dietary habits, physical activities and stress faced by the students will yield better results.

CONCLUSION

On the basis of study, it is concluded that there are weight related concerns in medical undergraduate students. The BMI correlates positively with both systolic and diastolic blood pressure. The study needs to be carried out on larger scale with inclusion of various parameters which influence the blood pressure and weight. There is need for awareness among medical undergraduates right from the day of entry in medical school about the weight related health complications. This will improve not only their health but also serve as boon to the society as they will be better equipped to spread the message among the masses. Healthy doctors will lay the foundation of healthier and resilient India.

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