

# To evaluate the Pre-hypertension among MBBS students and its associated factors

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## ABSTRACT

**Aim:** To evaluate the Pre-hypertension among MBBS students and its associated factors.

**Methods:** 200 students of MBBS were included in this study. Out of these 200 participants, 60% were males and 40% were females. The mean age of the students was  $22.55 \pm 7.66$ . As per JNC 7 guidelines BP was measured, with a mercury sphygmomanometer. Anthropometric measurements and basic laboratory parameters for blood glucose and lipid profile estimation were measured in the study.

**Results:** 35% students had Pre-hypertension, 60% were normal and 5% effected with Hypertension. The male and female were almost similarly affected with pre-hypertension and hypertension. There was no significant relation on the basis of gender and age.  $62.55 \pm 10.85$  kg was the mean weight of pre-hypertensive students and  $58.52 \pm 10.74$  kg was the mean weight of the normotensive group ( $P=0.0006$ ).  $23.12 \pm 4.03$  was the mean body mass index (BMI) of the pre-hypertensive students which was high as compared to the normotensive students ( $p=0.003$ ).  $81.22 \pm 10.08$  cm was the mean waist circumference of the pre-hypertensives and  $78.25 \pm 6.55$  cm in the normotensives ( $P = 0.007$ ). On the basis of BMI

when the students were studied, they were similar in the pre-hypertensives as well as in the normotensives. There was no significant difference on the basis of BMI.

**Conclusion:** This study concluded that the prevalence of pre-hypertension among medical students was significantly associated with body mass index. It is the need of time to adopt healthy lifestyle measures from the student life itself.

**Keywords:** Normotensive, Pre-hypertension, Hypertension, BMI

### **Introduction**

Adolescence is defined as the “period between the beginning of puberty until maturity” in human development, and it extends mainly over the teen years and terminates legally when the age of majority is reached.<sup>1</sup> The word is from the Latin root *adolescere*, which means to grow up or to grow into maturity.<sup>2</sup> It is a time of rapid change in the life of an individual, and it is the time between childhood and adulthood. While children are not just little adults and adults are not just large children, adolescents are also unique and constantly changing, and during this time there are some medical problems that may surface. Elevated BP may be detected at this age, and it is important to recognize the definitions of hypertension (HTN) as well as pre-hypertension (pre-HTN) to appropriately counsel patients and their families about this condition.<sup>3</sup> As pre-hypertension is an early pointer to hypertension, our focus remained the same to establish an association of pre-hypertension with stress and anxiety, the major contributors to clinical hypertension. Stress is one of the contributors to hypertension by recurrent blood pressure (BP) fluctuations as well as by stimulation of the sympathetic nervous system to produce large amounts of hormones causing vasoconstriction. Factors influencing BP through stress include white coat hypertension, nature of job, race, environmental factors, and emotional status. In addition when one factor is coupled with other factors contributing to stress, the consequence is that BP is multiplied.<sup>4</sup> The second important factor that influences hypertension is anxiety and is under study for several years. Anxiety causes activation of the autonomic nervous system through hypothalamo-pituitary axis thereby increasing circulating catecholamines. This is associated with an amplified risk of hypertension and a pro-inflammatory state leading to coronary heart disease. The prevalence of hypertension is maximum in developing countries as compared to developed countries because of public health interventions. The general public is on alert to this risk and is encouraged to prevent and intercede early from pre-hypertension and hypertension.<sup>5</sup> Hypertension is one of the most common cardiovascular diseases with the global prevalence of around 22% in adults  $\geq 18$  years.<sup>6</sup> According to the report of a study conducted by Indian

Council of Medical Research in 2007–2008, the prevalence of hypertension was between 17% and 21% in the states included in the survey.<sup>7</sup>

### Material and methods

This study was done in collaboration with the departments of Physiology and Pharmacology. 200 students of MBBS were included in this study, out of 200 participants, 60% were males and 40% were females with the mean age of the students being  $22.55 \pm 7.66$ . As per JNC 7 guidelines BP was measured, with a mercury sphygmomanometer.<sup>8</sup>

3 measurements were obtained and the average was taken as BP.

- **Normotensive:** Systolic Blood Pressure (SBP) <120 mmHg and Diastolic Blood Pressure (DBP) <80 mmHg.
- **Hypertensive:** SBP >140 mmHg or DBP >90mmHg.
- **Pre-hypertensive:** SBP 120-139mmHg or DBP 80-89mmHg.

Weight and Height were measured with the standard instruments and the waist circumference was measured at the level of umbilicus.<sup>9</sup>

For estimating Lipid profile and Glucose tolerance 50 normotensives and 50 pre-hypertensives were selected. After 24hrs of fasting, venous blood sample was collected for evaluation of plasma glucose and lipids. Then they were given 75 grams of glucose mixed in 300 ml of water and plasma glucose was studied 2 hrs later. Glycemic status was classified as:

- Normal fasting glucose (FG) if plasma glucose <100 mg% (5.6 mmol/l).
- Impaired fasting glucose if plasma glucose 100-125 mg% (5.6-6.9).
- Impaired glucose tolerance if 2 h glucose 140- 199 mg% (7.8-11.1).
- Diabetes if FG > 126 mg% (7 mmol/l) or 2 h glucose >200 mg% (11.1).<sup>10</sup>

### Results

35% students had pre-hypertension, 60% were normal and 5% effected with hypertension. The males and females were almost similarly affected with pre-hypertension and hypertension. There was no significant relation on the basis of gender and age.

**Table-1 Gender distribution**

	Normotensive	Pre-hypertensive	Hypertensive	Total
Males	76	40	4	120

Females	44	30	6	80
Total	120	70	10	200

62.55 ± 10.85 kg mean weight of the prehypertensive students and 58.52 ± 10.74 kg of the normotensive group ( $P = 0.0006$ ). 23.12 ± 4.03 the mean body mass index of the prehypertensive students which was high as compared to the normotensive students ( $p=0.003$ )

81.22 ± 10.08 cm mean waist circumference of the prehypertensives and 78.25 ± 6.55 cm in the normotensives. ( $P = 0.007$ ).

**Table-2 Weight distribution**

	Normotensives=120	Pre-hypertensives=70
Mean weight in kg	58.52 ± 10.74 kg	62.55 ± 10.85 kg

On the basis of BMI when students were studied, they were similar in the pre-hypertensives as well as in the normotensives; there was no significant difference on the basis of BMI.

12 students of normotensives and 8 students of pre-hypertensives were overweight with a BMI between 25 and 29.9, while 3 and 2 students in the 2 groups, respectively, were obese ( $BMI \geq 30$ ). Most of the students were in the normal BMI category.

**Table-3 BMI distribution**

BMI	Normotensives=120	Pre-hypertensives=70	P-value
<18.5 (Underweight)	40	10	NS
18.5-24.9 (Normal)	75	50	
25-29.9 (Overweight)	12	8	
≥30 (Obese)	3	2	

NS: Not Significant

50 students from the Normotensive category and 50 from the Pre-hypertensive category were selected and tested for their fasting blood sugar, 2 h post-glucose blood sugar and fasting lipid profile.

The mean (78.02 ± 5.03 mg% vs. 78.25 ± 10.88 mg% and 91.25 ± 8.55 mg% vs. 96.51 ± 15.63 mg%) of fasting glucose and 2 h blood glucose levels were similar in both the

category. There was no statistically remarkable difference in the mean levels of lipids (Total Cholesterol, LDL, HDL, VLDL and Triglyceride) between both the categories.

**Table -4. Lipid profile**

	<b>Normotensives=120</b>	<b>Pre-hypertensives=70</b>	<b>P-value</b>
Total Cholesterol	153.02±16.52	163.58±24.58	
Triglyceride	77.85±21.68	84.29±21.59	NS
HDL Cholesterol	42.69±7.69	44.59±10.22	
LDL Cholesterol	87.59±14.61	93.47±15.66	
VLDL Cholesterol	20.98±4.85	21.88±6.66	

NS: Not Significant

### **Discussion**

35% students had pre-hypertension, 60% were normal and 5% effected with hypertension. The males and females were almost similarly affected with pre-hypertension and hypertension. There was no significant relation on the basis of gender and age. In our study, we observed that the prevalence of pre-hypertension is more than 35% which is higher than prevalence reported from a previous study done in a medical college at Puducherry<sup>11</sup>. A similar study of 100 medical students in Davangere showed a prevalence of pre-hypertension in 64%<sup>12</sup> while another two studies of 100 boys & girls and 150 girls in a medical college in Wardha showed a prevalence of pre-hypertension in 52% and 58% respectively.<sup>13,14</sup> Similarly a previous study revealed an overall prevalence of pre-hypertension of 58.75% at a medical college, Dehradun.<sup>15</sup>

A previous study done at Mangalore on 500 medical students showed a point prevalence of 55.4%.<sup>16</sup> Lower prevalence of pre-hypertension in our study could be possible due to lower prevalence of overweight among the students. A previous study done at Mangalore had a higher prevalence of overweight of 31.8% as compared to the present study which showed a prevalence of 12.1% of overweight and obesity in the entire group. There is a positive correlation has been shown between pre-hypertension and BMI in these studies among boys<sup>16</sup> and girls<sup>14</sup> and in both genders in a study.<sup>12</sup> On the basis of BMI, students were similar in the pre-hypertensives as well as in the normotensives as there was no significant difference on the basis of BMI. 12 students of normotensives and 8 students of pre-hypertensives were overweight with a BMI between 25 and 29.9, while 3 and 2 students in the 2 groups, respectively, were obese (BMI ≥ 30). Most of the students were in the normal BMI category.

There was a significant association between overweight and pre-hypertension in our study, which is similar to findings of previous studies.<sup>13,14,17</sup> A previous study revealed that BMI was the strongest predictor of pre-hypertension among males and females.<sup>18</sup> Few previous studies also revealed a significant correlation between pre-hypertension and BMI in boys<sup>16,18</sup> while a study in Jamaica found a relation to overweight/obesity and waist circumference among younger pre-hypertensives.<sup>19</sup> A Chinese study concluded that BMI was a major determinant of pre-hypertension even after controlling for gender, lipid profile, uric acid, insulin resistance, smoking and drinking.<sup>20</sup> In the present study,  $62.55 \pm 10.85$  kg mean weight of the pre-hypertensive students and  $58.52 \pm 10.74$  kg of the normotensive group ( $P = 0.0006$ ).

$23.12 \pm 4.03$  the mean body mass index of the pre-hypertensive students which was high as compare to Normotensive students ( $p=0.003$ ).  $81.22 \pm 10.08$  cm mean waist circumference of the pre-hypertensives and  $78.25 \pm 6.55$  cm in the normotensives. ( $P = 0.007$ ).

Some previous studies also have found an association of dyslipidemia, overweight and glucose intolerance with prehypertension.<sup>21,22</sup> A Chinese study revealed that total cholesterol and triglycerides were significantly higher in pre-hypertensives compared to normotensives but LDL and HDL were similar;<sup>20</sup> BMI and waist circumference were of course higher among the pre-hypertensives. A previous study also reported similar relation to the lipid profile.<sup>11</sup>

A previous study has also reported an association between pre-hypertension and glucose intolerance from multiple logistic regression analysis that impaired glucose tolerance, along with age, BMI and obesity were independent risk factors for Hypertension and pre-hypertension.<sup>14</sup> Similarly a study was done on 83 pre-hypertensives and revealed a higher response to oral glucose tolerance test suggesting insulin resistance but the fasting glucose levels were similar to normotensives.<sup>23</sup>

50 students from the normotensive category and 50 from the pre-hypertensive category were selected and tested for their fasting blood sugar, 2 h post-glucose blood sugar and fasting lipid profile. The mean ( $78.02 \pm 5.03$  mg% vs.  $78.25 \pm 10.88$  mg% and  $91.25 \pm 8.55$  mg% vs.  $96.51 \pm 15.63$  mg%), of fasting glucose and 2 h blood glucose levels were similar in both the category. There was no statistically remarkable difference in the mean levels of lipids (Total Cholesterol, LDL, HDL, VLDL and Triglyceride) between both the categories.

A previous study done among 892 adults (>30 years) showed that overweight/obesity was the strongest predictor for pre-hypertension with an odds ratio(OR) of over 2.5 followed by male gender (OR = 1.89), while diabetes, cholesterol, triglyceride, HDL and LDL were not significantly associated.<sup>24</sup>

## Conclusion

This study concluded that the prevalence of pre-hypertension among medical students was significantly associated with body mass index. It is the need of time to adopt healthy lifestyle measures from the student life itself.

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