

## Study of Prehypertension among the Young Medical Students: A Cross Sectional Study in Tripura

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### Abstract:

**Background:** Many nationwide surveys and literature have documented, the prevalence of prehypertension in a wide range from 18.9% to 80% in young people. However, there is a scarcity of data in this part of India. Hence, the study aimed to estimate the prevalence of prehypertension among medical students and to find an association with family history of hypertension in Tripura.

**Materials and Methods:** A cross-sectional study was conducted in AGMC & GBP Hospital among medical students during 2022-2023 among 171 students. Demographic profile and vitals were recorded in a case record form. Data were analysed using SPSS 21.0. A p-value of <0.05 was considered statistically significant.

**Results:** The mean age of the young students was  $19.78 \pm 1.23$  years (Male: female – 1.5:1). The prevalence of prehypertension was quite high (62%). Among them, Hinduism was more (65.5%). The prevalence of prehypertension was more common among participants whose parents are hypertensive (79.5%) and it is statistically significant (p-value 0.000).

**Conclusion:** Every 3/5<sup>th</sup> of the young medical students is prehypertensive and 4/5<sup>th</sup> of them is having a family history of hypertension either single or both parents.

**Key Word:** Prehypertension; Medical Students; Hypertension; Family history;

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### I. Introduction

Hypertension is an emerging public health concern in India owing to a steady increase in prevalence across a few past decades, especially in urban communities with wide geographic variations.<sup>1</sup> Overall prevalence for hypertension in India is 29.8% (95% confidence interval: 26.7-33.0). Hypertension prevalence between rural and urban parts is 27.6% (23.2-32.0) and 33.8% (29.7-37.8).<sup>2</sup> The proportion of the population suffering from hypertension varied greatly between states with a prevalence of 8.2% in Kerala to 20.3% in Sikkim. Advancing age, obesity, male sex, socio-economic status and consumption of alcohol were found to be the major predictors of hypertension.<sup>3</sup> Hypertension is preceded by Pre-Hypertension. Pre-hypertension is an American classification for cases where a person's blood pressure is elevated above the normal but not to the level considered to be hypertension. According to the eighth report of JNC 8 criteria, normal BP was defined as systolic blood pressure <120 mmHg and diastolic blood pressure <80 mmHg. SBP of 120-139 mmHg and/or DBP of 80-89 mmHg was classified as prehypertension. SBP 140-159 mmHg and DBP of 90-99 mmHg as stage I hypertension and SBP >160 mmHg and DBP >100 mmHg as stage II hypertension.<sup>4</sup> Various studies conducted in India have shown prevalence of pre-hypertension in the age group 20-30 years to be ranging from 24.6% to 65%. A large proportion of pre-hypertensives has at least one cardiovascular risk factor and there is a moderate to high risk of pre-hypertensives progressing to hypertension.<sup>5-9</sup>

Prevalence of pre-hypertension among young adults (20-30 years) in a community-based cross-sectional study in coastal villages of Udupi District in Southern India with 1152 young adults was found to be high (45.2%).<sup>10</sup> The overall prevalence of pre-hypertension with 210 participants was found to be 15.9% (33/207, males: 29.3% and females: 5.2%) among undergraduate medical students of Narayana Medical College, Nellore, Andhra Pradesh, India.<sup>11</sup> Pre-hypertension has recently been observed as a potent cardiovascular risk factor. Exercise in which contraction principally causes a change in the tension of muscle with little change in length is termed as isometric or static exercise. Such static contraction of even a small mass of muscle causes a marked increase in arterial pressure with a relatively small increase in heart rate and cardiac output, thus primarily producing a pressure load on the heart.<sup>12</sup> Sympathovagal imbalance (SVI) was observed to be present in both

normotensive and prehypertensive sibling of hypertensive parents. In normotensive sibling, SVI was mild in the form of proportionate increase in sympathetic and decreased vagal activity. In prehypertensive sibling, SVI was prominent with more of vagal withdrawal.<sup>13</sup>

As there is alarming rise in the prevalence of pre-hypertension and hypertension in India in all age group including younger population, hence, the present study was taken up to estimate the prevalence of prehypertension among the young adult students of Agartala Govt. Medical College, Tripura and to find association between prevalence of prehypertension among young adult medical students with parenteral history of hypertension.

## II. Material And Methods

An observational cross sectional descriptive study was conducted among the 171 medical students of Agartala Government Medical College (AGMC), Agartala in the Department of Physiology from 2022-2023. Ethical approval was taken prior from the institutional ethics committee. Sample size was calculated using the formula,  $n = (Z_{1-\alpha/2})^2 \sigma^2 / d^2$  (where,  $Z_{1-\alpha/2}$  = Standard normal variate at 5% type 1 error ( $p < 0.05$ ), which is 1.96,  $\sigma$  = Standard deviation taken as 2.79<sup>13</sup>,  $d$  = Absolute precision, which is 0.5 with non-response rate 20%). Students taking medication for hypertension were excluded. As study tool, a predesigned and pretested case study form, diamond mercury sphygmomanometer (Item Dimension: 37.01×13 ×5.99 cm, Item weight: 1.08kg), prestige stadiometer (Compatible material – Plastic, Dimensions- 20×20×15 cm, Item weight- 2kg), life line stethoscope (Item dimensions: 36 ×18 ×4 cm, Stainless steel, Aluminum, Item weight: 0.42kg), equinox weight scale (Mechanical EQ-BR-9201, Weight Limit-130kg, Dimension-20L×20W×106H, Item weight - 1450 gm. Before measuring blood pressure, the subjects were allowed to rest for 10 mins in a quiet room to reduce the anxiety. The blood pressure (mmHg) of all the subjects were recorded as per guidelines of the American Heart Association (2019) with the participants in a seated position and at least three BP measurements made with cuff at the level of right atrium, 2 minutes apart and their average value was recorded as the BP of the participants.

**Data analysis:** Descriptive statistics like mean, SD, frequency and percentages were used to express. Statistical analysis was done using students T test, and Chi-square. A p value of less than 0.05 was taken as statistically significant.

## III. Result

A total of 171 medical students participated in the study. The most common age of the participant was 20 years ranges from 18 years to 24 years. Among the young medical students, 55.6% are male and 44.4% are female. The demographic profile was shown in Table 1. General category students were more (38.1%) followed by ST caste students (29.2%) and Hinduism background students were more (65.5%) participated in the study (Table 1).

Baseline anthropometric parameters shows that the mean body weight is  $59.7 \pm 10.9$  Kgs, height is  $1.59 \pm 0.09$ , BMI is in normal range (37.4%) but majority were above normal BMI 57.3%) (Table 2).

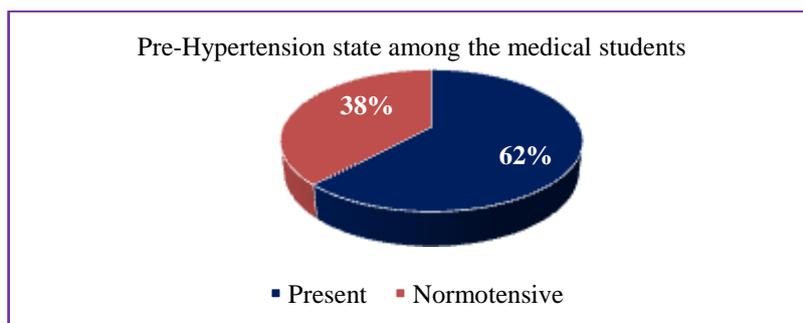
Among the participants, 65 of them (38%) were normotensive having both systolic and diastolic blood pressure measurement were in normal range. The proportion of pre-hypertension is quite high (106 out of 171 participants i.e 62%) (Figure 1).

Among the parents, 51.5% of the participant's parents (either father or mother or both) having hypertension or they are on medication for hypertension (Figure 2).

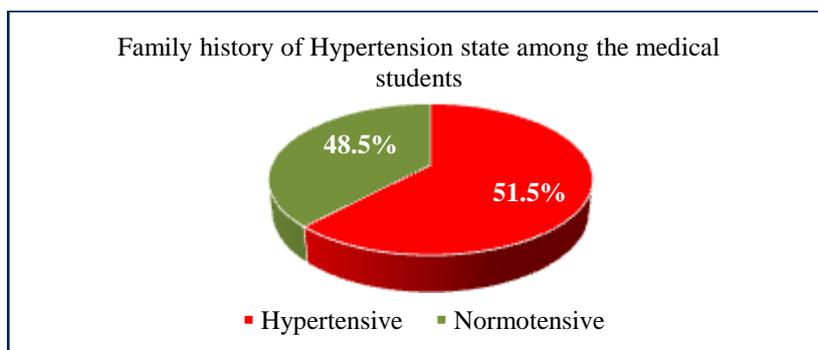
**Table 1:** Demographic profile of the study participants (N=171) **Table 2:** Vital findings of the study participants (N=171)

Variables	Frequency (%) / Mean $\pm$ SD
Age (years)	19.78 $\pm$ 1.23
Sex	
Male	95 (55.6)
Female	76 (44.4)
Caste	
General	65 (38.1)
ST	50 (29.2)
SC	38 (22.2)
OBC	18 (10.6)
Religion	
Hindu	112 (65.5)
Islamic	27 (15.8)
Christian	25 (14.7)
Buddhist	7 (4.1)

Variables	Frequency (%) / Mean $\pm$ SD
Body weight (Kg)	59.7 $\pm$ 10.9
Height (Cm)	1.59 $\pm$ 0.09
Body mass index(Kg/m <sup>2</sup> )	
<18.5 - underweight	9 (5.3)
18.5 - 22.9 – Normal range	64 (37.4)
23.0-24.9 - Overweight	45 (26.3)
25.0 & above - Obese	53 (31.0)
Systolic Blood Pressure (mmHg)	120.21 $\pm$ 12.27
Diastolic Blood Pressure (mmHg)	80.0 $\pm$ 7.99



**Fig 1: Prevalence of Pre-hypertension among the participants (N=171)**



**Fig 2: Family history of Hypertension state among the medical students (N=171)**

**Table 3: Association of prehypertension among the participants with family history of hypertension (N=171)**

Family history of hypertension	Prehypertension among medical students		P value
	Present N (%)	Absent N (%)	
Present	70 (79.5)	18 (20.5)	0.000
Absent	36 (43.4)	47 (56.6)	

The prevalence of prehypertension among the students whose family member(s) are hypertensive is 79.5%. In other way, prehypertension is associated with family history of hypertension (either parent or both) and it is statistically significant with a p value of 0.000 (Table 3).

#### IV. Discussion

The incidence of prehypertension (blood pressure 120-139 and/or 80-89 mm Hg) in young adults worldwide ranges from 37.5% to 77.1%. Identifying high-risk groups of prehypertension in young adults is helpful for early and effective interventions and treatments to reduce the occurrence of future hypertension and organ damage. This review summarized the epidemiological characteristics, disease intervention measures, and disease progression characteristics of prehypertension to provide a basis for the development of targeted intervention measures for young adults with prehypertension.<sup>14-17</sup> The present study revealed similar finding as prehypertension among medical students was 62%. In India as per DHS report by Rahut DB et al<sup>18</sup> prehypertension level is 43.2% which is comparatively similar to the present study finding. A study conducted in South India by Parthaje PM et al<sup>19</sup> shows that overall, 55% are prehypertensive in adults. Family history of hypertension is one the non-modifiable risk factor. The present study also demonstrated that 79.5% of prehypertensive are associated with family history (p value 0.000). It is a precursor of hypertension which later leads many cardiovascular diseases and strokes if it is not controlled timely. Srinivas S, Gupta R et al, Pal GK et al shown strong correlation between family history and development of prehypertensive state among young adults.<sup>6,9,13</sup> A primary risk factor for prehypertension is being overweight. Other risk factors include a family history of hypertension, a sedentary lifestyle, eating high sodium foods, smoking, and excessive alcohol intake. Blood pressure levels appear to be familial, but there is no clear genetic pattern.<sup>21</sup>

There are also a very few limitations found in the study. Only medical students were included which is limited to single centered study. Few information was recalling basis like family history of hypertension.

#### IV. Conclusion

The study concluded that prehypertensive state is very high (3/5<sup>th</sup>) among young adults like medical students which is very alarming, has to be addressed strongly. The prehypertension is strongly associated with family history of hypertension (4/5<sup>th</sup>). However, modifiable risk factors such as overweight, diet habits, physically inactive, stress, inadequate sleep needs to be studied properly to see for any association with prehypertensive state specially among young adults. Health Education and life style modifications in early life stages is suggested among young adults. It is recommended that multicentric or population or community-based study will capture better projection of prehypertension prevalence.

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**Authors Contributions:** All authors equally contributed in the study (Concept, Designing, Data collection, Data analysis, Result drawing, interpretation, manuscript preparation, necessary correction etc).

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