

**A CROSS-SECTIONAL STUDY ON PREVALENCE AND DETERMINANTS OF PRE-HYPERTENSION AMONG UNDERGRADUATE MEDICAL STUDENTS IN A PRIVATE MEDICAL COLLEGE, KANCHIPURAM, INDIA**

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**Abstract**

**Background:** Hypertension is one of the major non-communicable disease posing a public health challenge. Prehypertension among younger age is a major risk factor for developing hypertension in later life. Hence, tracking of blood pressure helps to identify individuals at risk of developing hypertension.

**Objectives:** To estimate the prevalence of pre-hypertension among medical college students and to determine the factors associated with it.

**Methods:** This cross-sectional study was conducted among under graduate students in a medical college,

Kanchipuram district. The study participants were the students of 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> year Medical undergraduates. The sample size calculated was 207 and study subjects were selected by simple random sampling technique. A semi- structured questionnaire was administered for collecting data. Data was analyzed using SPSS version 20.0. Chi-square test was used for statistical analysis. Ethical clearance was obtained from institutional ethical committee. Informed consent was taken prior to the start of the study.

**Results:** The prevalence of pre-hypertension was 46.86%. Prevalence of pre-hypertension was found higher among males (53.9%) compared to females (46.1%). The prevalence of prehypertension is higher among people with obesity (57.8%) and overweight (27.5%) compared to people with normal weight.

**Conclusions:** Higher prevalence of pre-hypertension was seen in non-modifiable factors like male gender and modifiable factors like body mass index. Hence a healthy lifestyle must be adopted to combat these risk factors to avoid developing hypertension in future.

**Keywords:** Hypertension, Obesity, Physical inactivity, cardiovascular disease.

**Introduction**

The concept of prehypertension (PHTN) was introduced in 1939 by Robinson and Brucer who were first to draw attention to the range of blood pressure (BP) between 120-139 mmHg (systolic) and 80-89 mmHg (diastolic) as being of value in determining clinically overt hypertension (HTN).<sup>(1)</sup> According to JNC-7, Pre-hypertensives are the persons with systolic BP 120-139 or diastolic BP of 80-89mm Hg.<sup>(2)</sup>

Nearly 63% of total deaths in India are due to non-communicable diseases, of which 27% are attributed to cardiovascular disease which affects 45% people in the 40-69 age group. Raised blood pressure is among the most important risk factors for CVDs. Moreover, it remains poorly controlled due to low awareness about hypertension, lack of appropriate care through primary care and poor follow up. India has set a target of 25% relative reduction in the prevalence of hypertension (raised blood pressure) by 2025. <sup>(3)</sup>

Hypertension is prevalent among older adults and ubiquitous among younger ages too. <sup>(4)</sup>A meta-analysis reported that even low-range prehypertension increased the risk of composited CVD compared with optimal BP and the risk was higher with high-range prehypertension. Risk factor assessment is necessary at an earlier age to prevent them developing hypertension and cardiovascular disease at later life. <sup>(5)</sup>

Pre-hypertension is rising alarmingly among young adults <sup>(6)</sup>, but the NPCDS programme has been planned for opportunistic screening of population of more than 30 years of age only. <sup>(7)</sup> Hence this study was conducted to estimate the prevalence of pre-hypertension among medical college students and to determine the factors associated with it.

## **MATERIALS AND METHODS :**

**Study design and Setting:** This cross-sectional study was conducted among under graduate students in a medical college, Kanchipuram district for a period of 3 months from June 2018 to August 2018. The study participants were the students of 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> year Medical undergraduates.

**Sample size and sample design:** The sample size was calculated by using the formula ( $n = Z^2pq/d^2$ ),  $p = 67%$  [5],  $q = 33%$  and  $d=10$ . The sample size calculated was 207 and study subjects were selected by simple random sampling technique.

**Inclusion Criteria:** Students in the young adult age group between 18-25 years of both sexes, who were willing to give consent were chosen.

**Exclusion Criteria:** Students in the age group between 18-25 years of both sexes, who were not willing to give consent and who were absent on the day of data collection. Known case of hypertensive students were excluded.

### **Study questionnaire:**

A semi- structured questionnaire was administrated to obtain data. All the participants were examined on a single meeting. The participants were examined for various anthropometric parameters.

The anthropometric parameters measured in the study were height in cm, Weight in kg, body mass index, and waist circumference in cm, skin fold thickness in mm and blood pressure in mmHg.

- **Body Weight** - Body weight was measured using manual weighing scale with subject standing erect and looking straight.
- **Height** - It was measured with the subject standing in an erect position against a vertical scale.
- **BMI** - The body mass index is calculated by using the formula, weight in kilograms divided by the square of the height in meters.
- **Waist Circumference** - It was measured between the lower margin of lowest rib and the highest point of iliac crest using non-stretchable inch tape

- Skin fold thickness – it's the sum of values taken at four sites (triceps, biceps, subscapular and supra iliac) using Harpenden calliper.
- Blood pressure- Blood pressure was measured twice by using standardized mercury sphygmomanometer in left upper arm in sitting position after ensuring that the subject has relaxed at least for 5 minutes. Two readings were taken at a gap of 10 minutes apart.

**Data collection procedure:** Approval for conducting the study was obtained from the institutional ethical committee. The study participants were explained about the purpose and objectives of the study. Informed consent was taken from the study participants.

**Statistical Analysis:** Data was analyzed using SPSS version 20.0. Chi-square test was used for statistical analysis.

### RESULTS:

A total of 207 medical undergraduate students participated in the study. Majority of the respondents belong to female population (54.6%). It was observed in the present study that the Persons with smoking and alcohol history accounted for 5.3% and 5.0% respectively. In this study, majority of the participants consume non-vegetarian diet (86%) and about 47.8% had salty food consumption. The study participants had about 49% of family history of hypertension (Table 1).

Among all the factors, gender and BMI were found to be significantly associated. [Table.2]. Out of 207 study participants, 102 (49.27%) of them had elevated blood pressure as per JNC7. Thus the prevalence of pre hypertension in the study population was 97(46.86%) and prevalence of hypertension was 5 (2.41%) respectively (Fig: 1).

**Table 1: Frequency distribution of risk factors of Prehypertension**

VARIABLE	FREQUENCY
<b>GENDER</b>	
MALE	94(45.4% )
FEMALE	113(54.6%)
<b>CIGARETTE SMOKERS</b>	
SMOKERS	11(5.3%)
NON-SMOKERS	196(94.7%)
<b>ALCOHOL CONSUMPTION</b>	
PRESENT	10(5.0%)
ABSENT	197(95.0%)
<b>TYPE OF DIET</b>	
VEGETARIAN	29(14%)
NON- VEGETARIAN	178(86% )
<b>SALTY FOOD CONSUMPTION</b>	
YES	99(47.8%)
NO	108(52.2 %)
<b>PHYSICAL EXERCISE</b>	
YES	155(74.8%)

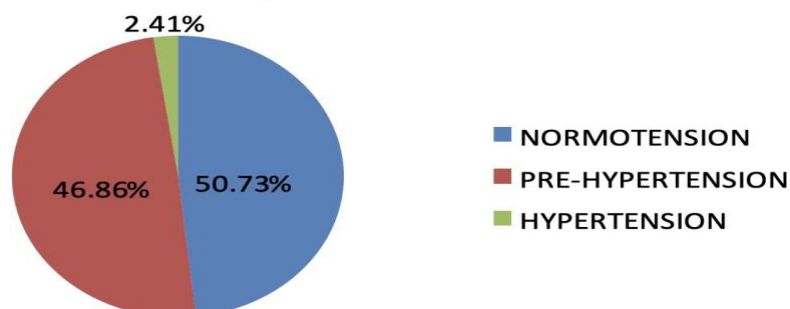
NO	52(25.2%)
<b>FAMILY HISTORY (HYPERTENSION)</b>	
PRESENT	101(49%)
ABSENT	106(51%)

**Table 2: Association between risk factors and pre-hypertension**

Variable		Pre hypertension & Hypertension	Normotensive	Chi-square test	P-value
GENDER	MALE	55(53.9%)	39(37.1%)	5.875	0.015
	FEMALE	47(46.1%)	66(62.9%)		
BMI	<18.5	7(6.8%)	8(7.6%)	11.7913	0.008
	18.5 to 24.9	8(7.9%)	7(6.7%)		
	25 to 29.9	28(27.5%)	10(9.6%)		
	≥30	59(57.8%)	80(76.1%)		
CIGARETTE SMOKING	SMOKER	8(7.8%)	3(2.9%)	4.161	0.125
	NON-SMOKER	94(92.2%)	102(97.1%)		
ALCOHOL CONSUMPTION	PRESENT	7(6.8%)	3(2.9%)	1.944	0.378
	ABSENT	95(93.2%)	102(97.1%)		
DIET	VEG	16(15.7%)	13(12.3%)	0.469	0.493
	NON-VEG	86(84.3%)	92(87.7%)		
PHYSICAL EXERCISE	YES	81(79.4%)	76(72.3%)	2.136	0.344
	NO	21(20.6%)	29(27.7%)		
SALTY FOOD CONSUMPTION	YES	54(52.9%)	45(42.8%)	2.108	0.146
	NO	48(47.1%)	60(57.2%)		
FAMILY H/O HYPERTENSION	PRESENT	48(47.1%)	54(51.4%)	0.3953	0.530
	ABSENT	54(52.9%)	51(48.6%)		

[\* p < 0.05 is considered as statistically significant]

**Figure-1: Distribution of study participants as per JNC 7**



### **Discussion:**

Among 207 undergraduate medical students, 102 (49.27%) of them were found to have elevated blood pressure.

Thus the prevalence of pre hypertension in the study population was 97(46.86%) and prevalence of hypertension was 5 (2.41%) respectively, which is similar to the study conducted by Chadha V et al where the prevalence of prehypertension was 46.8% and hypertension was 7.2%.<sup>(8)</sup> Another study done by Sidenur B<sup>(9)</sup> et al is par with the present study findings.

In the present study, higher prevalence of pre-hypertension was observed in male gender (53.9%) and it is found statistically significant ( $p < 0.015$ ). Bhavani PL et al reported higher prevalence of pre-hypertension among male gender (29.3%) and it is significantly associated<sup>(10)</sup> which is comparable with this study. Similar findings were also noted in Thilip Kumar et al<sup>(11)</sup> where higher prevalence of pre-hypertension was found in male gender and it is statistically significant. Another study done on young adults showed a slightly higher trend of hypertension in female subjects,<sup>(12)</sup> which is contrast to this study.

Concerning the relationship between BMI and pre-hypertension, it was found that the rate of pre-hypertension among obese(57.8%) and overweight(27.5%) participants were much higher compared to participants with normal weight (7.9%) and underweight (6.8%) with the association being statistically significant ( $P < 0.05$ ). Similar findings were observed in a study done by Bhavani PL et al<sup>(10)</sup> where BMI were found to be significantly associated with preHTN. Balami AD et al reported that increasing trend in prehypertension with increasing BMI status and it was significantly associated with prehypertension.<sup>(13)</sup> Another study done by Maria C et al found that the Body mass index was associated with hypertension.<sup>(14)</sup>

### **Strengths of the study**

The detection of pre-hypertensive status and the risk of developing hypertension in future among the study participants increased the awareness and helped them to adopt healthy life style, thereby preventing the disease occurrence and its complications.

### **Limitations of the study**

The findings of the study cannot be generalized since the study has been conducted in minimal sample. Also, a follow-up study of the pre-hypertensive participants would give more qualitative assessment of progression to hypertension.

### **Conclusion and recommendations**

The high prevalence of pre-hypertension was found among males compared to females. The rate of pre-hypertension among obese and overweight participants were much higher compared to participants with normal weight and underweight with the association being statistically significant ( $P < 0.05$ ). Hence a healthy lifestyle must be adopted to avoid developing hypertension in future. It is also necessary to educate the importance of tracking of blood pressure to find any raise of blood pressure early thus avoid developing pre-hypertension and hypertension in later life.

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**Conflict of Interest:** None declared

**Ethical Approval:** This study was approved by Institutional Ethical Committee. **References**

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