



# STUDY OF HYPERTENSION IN YOUTH AND ITS CONTRIBUTORY FACTORS - A CROSS SECTIONAL STUDY OF 600 SUBJECTS

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## ABSTRACT

**Introduction:** Hypertension, a critical determinant of vascular disease and component of metabolic syndrome, remains scarcely studied in youth.

### Objectives:

1. To study the prevalence of hypertension in the age group 14-26years
2. To study its association with the variables- gender, stress, obesity, dietary habits, exercise, smoking, alcohol consumption, religion and family history of hypertension

**Methods:** In this cross-sectional study, 600 individuals in the age group 14-26 years were enrolled from a metropolitan city. Prevalence of hypertension and its association with contributory variables was studied for 2 months. Hypertension was diagnosed according to the Indian Academy of Pediatrics and Joint National Committee 7 guidelines. Data regarding contributory factors was collected on a pre-validated questionnaire. Statistical analysis was performed using Mann Whitney U test and Pearson's Chi square test. Binary logistic regression was performed to eliminate confounding factors.

**Results:** The prevalence of prehypertension and hypertension in the age groups 14-18 years, 19-22 years and 23-16years was 40.5%, 45.5% and 53% respectively. 42.2% hypertensives belonged to the age group 23-26years. Of the prehypertensives and hypertensives, 77% were males; 8.3% obese; 54.7% admitted that they took stress; 66.5% had a family history of hypertension and 23% were alcohol consumers. No significant association was noted with smoking ( $p=0.071$ ), religion ( $p=0.102$ ), exercise and dietary pattern ( $p=0.452$ ).

**Conclusion:** Prevalence of hypertension in age group 14 to 26 years is 10.67% and prehypertension is 35.67% showing an increasing trend with age and a higher prevalence in males, obese and alcohol consumers

**Key Words:** Hypertension, Prehypertension, Youth, Obesity

## INTRODUCTION

### Background:

Hypertension is an important modifiable risk factor for coronary heart disease, stroke, congestive heart failure, end-stage renal disease, and peripheral vascular disease. Earlier thought to be a disease affecting mainly the elderly, it now has a firm grip on youth in developing countries like India. Rising affluence has modified dietary pattern characterized by increased consumption of fats and salt. Increasing population and technological advancement have shrunken employment opportunities among

youth leading to stress and hypertension in the younger generation, including students. Alcoholism and smoking have become a trend among the youth. Sports and physical activity have decreased with the advent of gaming devices and smartphones. Such factors have led to a rise in hypertension in the youth. Thus, it becomes imperative to carry out a study on the prevalence of hypertension in youth and work towards lowering its incidence.

### Objectives:

1. To study the prevalence of hypertension in the age group 14-26years

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2. To study the association of hypertension with the variables- gender, stress, obesity, dietary habits, exercise, smoking, alcohol consumption, religion and family history of hypertension

## MATERIAL AND METHODS

This study is cross sectional in design. 600 individuals belonging to the age group 14 to 26years were recruited from the metropolitan city of Mumbai. 200 students belonged to each of the age groups- 14 to 18years, 19 to 22years and 23 to 26years. They were randomly selected from a secondary school and junior college, a medical college and a tertiary health care institute respectively.

Inclusion Criteria:

1. Individuals consenting to participate in the study
2. Individuals belonging to the age groups under study

Exclusion Criteria:

1. Individuals not consenting for the study
2. Pregnant females
3. Patients diagnosed with secondary hypertension

After obtaining informed consent, a physical examination was performed and findings of blood pressure, anthropometry and general examination recorded. Personal details regarding stress, dietary habits, exercise regime, smoking, alcohol consumption, religion and family history of hypertension and cardiovascular disease were collected from each subject through a pre-validated questionnaire administered by volunteers. The study duration was two months.

### Diagnosis of Hypertension:

Blood pressure was measured using a standardized calibrated column type mercury sphygmomanometer with appropriately sized cuff, on the right arm in seated posture with the instrument at the level of the heart.

In cases where blood pressure was more than 140/90 mm of Hg, it was measured again after 30 minutes of rest.

For children aged 14-17 years, hypertension was classified on the basis of guidelines of the Indian Pediatric Nephrology Group, Indian Academy of Pediatrics. Pre-hypertension was defined as systolic or diastolic blood pressure between the 90th and 95th percentile for age, gender and height. When blood pressure exceeded 120/80 mm Hg in adolescents, but was below the 95th percentile, they were included in this category. Systolic or diastolic blood pressure exceeding the 95th percentile for age, gender and height was diagnostic of hypertension.<sup>1</sup>

In adults, hypertension was diagnosed as per the guidelines laid by the Joint National Committee 7 (Table 1). Individuals on medication for hypertension were also classified as hypertensives irrespective of blood pressure.

### Psychological Stress:

The participants were asked if they took too much stress or tension. If the answer was 'YES', they were grouped as stressed.

### Obesity:

Weight was measured on a standard bathroom weighing scale with clothes and without shoes. Height was measured on a standard wall-mounted chart with subject standing straight and head held in Frankfurt's plane. Error due to subject's hair was eliminated with the help of a flat board.

Children aged 14-17 years were classified into underweight, normal, overweight and obese on the basis of charts published in the study titled 'Physical Growth Assessment in Adolescence' by KN Agrawal, A. Saxena, AK Bansal and DK Agrawal in June, 2001.<sup>3</sup>

Adults were classified similarly on the basis of the WHO guidelines based on their Body Mass Index (B.M.I.).

### Physical Activity:

Individuals were classified into three categories depending on the duration of physical exercise-

- i) Those who did not perform any exercise
- ii) Light exercise- individuals who performed any form of physical exercise for upto 2 hours per week
- iii) Heavy exercise- individuals performing more than 2 hours per week of any form of physical exercise.

### Smoking:

Any amount of smoking habit was considered positive in our study.

### Alcohol consumption:

Males consuming more than or equal to 80g alcohol per day and females consuming more than 40g alcohol per day were considered to have a positive history of alcohol consumption based on a study by U Keil et al.<sup>4</sup>

### Family History:

Family history of hypertension was noted as positive if any first degree relative of the participant was a known hypertensive.

Other aspects of general examination were done by routine methods.

All measurements were taken late in the afternoon or in the evening between 3 p.m. and 7 p.m.

### Statistical Analysis:

#### 1. Quantitative data:

a) Kolmogorov Smirnov test was used to check normality of data. A 'p' value of less than 0.05 suggests that the underlying data distribution is not normal.

b) As the underlying data distribution is non normal, Mann Whitney U test was applied to test the relationship of group and age.

#### 2. Qualitative data:

Pearson's chi-square test is used to test the relationship of categorised independent and dependent variable. To examine the relationship of each independent variable with the dependent variable, Binary Logistic Regression was performed. This procedure examines the above relationship after accounting for interaction and confounding. A 'p' value of < 0.05 is deemed statistically significant.

## RESULTS

The study sample consisted of 200 individuals in each of the age groups 14-18years, 19-22years and 23-26years. 64.7% of the sample comprised of males and the rest were non-pregnant females.

The prevalence of prehypertension and hypertension in the age groups 14-18, 19-22 and 23-26years was 40.5%, 45.5% and 53% respectively. 35.67% of the sample was found to be prehypertensive and 10.67% hypertensive (Table 2).

Age, gender, BMI, stress, family history of hypertension and alcohol consumption were found to be statistically significant independent risk factors of hypertension in youth.

The prevalence of hypertension and prehypertension shows an increase with age- in the age group 14 to 18 years it is 29.1%, in the group of individuals 19 to 22 years old it is 32.7% and amongst the age group 23 to 26 years it is 38.1% of the total hypertension and prehypertension group. 77% of the individuals in the prehypertensive and hypertensive age group are males. Among the group with deranged blood pressure, 8.9% are obese and 25.2% are overweight, and 54.7% admitted leading a stressful life. Family history is found to be significantly associated with hypertension with 66.5% having a positive history. Alcohol consumption was noted in 23% prehypertensive and hypertensive individuals. Smoking, found to be a significant risk factor on univariate analysis, was proved to be insignificant on performing binary logistic regression (p=0.071). Exercise (p=0.221), die-

tary habits (p=0.452) and religion (p=0.102) were statistically insignificant associations (Table 3).

## DISCUSSION

The prevalence of hypertension in youth was found to be 10.67%. An increasing trend is evident with age rising from 8.5% in 14-18 year old individuals to 11.8% in 19-26year olds. Another study carried out by Soudarssanane MB et al showed an increasing prevalence of hypertension with age in an urban Indian setting.<sup>5</sup>A study conducted in the urban setting by Kath A. Moser et al on 10,671 subjects showed a prevalence of 13% amongst 18-30year old participants. This study also supports our result of an increasing prevalence with age.<sup>6</sup>

A prevalence of 10.1% was reported by PA Dyson et al (2014) in the age group 12-18years in India.<sup>7</sup>R. Gupta et al (2009) reported a lower prevalence of hypertension among young Asian Indians of 1.4% in the age group 15-19 years and 3.1% in the age group 20-29 years.<sup>8</sup>Similarly D. Narayanappa et al conducted a prevalence study in 2012 on a group of school children 10-16 years old and reported a prevalence of prehypertension and hypertension as 2.9% and 2.8% respectively demonstrating and increasing trend with time.<sup>9</sup>

In our study, the prevalence of prehypertensives and hypertensives was comparatively higher in the male sex. 77% of the prehypertensive and hypertensive population were males. Gender was a significant risk factor for hypertension (Odds ratio 0.352). Similarly, the Framingham Offspring Study by Garrison RJ et al. also showed that men below 40 years of age were twice as likely to be hypertensive as women. A hormonal role is believed to be responsible for this difference.

Body Mass Index was found to be a very significant risk factor for hypertension. In our study, from the total hypertensives and prehypertensives, 3.6% were underweight, 62.9% were normal, 25.2% were overweight and 8.3% were obese. PA Dyson et al reported a 3.5-5.5 times likelihood of obese children developing hypertension and 1.7-2.3 times probability for overweight children.<sup>7</sup>A threefold increase in the risk of hypertension in obese children as compared to the non-obese has been reported by M. Salvadori et al.<sup>10</sup>Stress was found to be a very highly significant risk factor in our study (p< 0.0001, Odds ratio 1.867). 54.7% subjects admitted to taking too much stress. According to a study by Karen Matthews et al., 13 years of follow-up in a sample of >4100 normotensive black and white men and women showed a very high co-relation of stress and hypertension (p<0.0001 to <0.01).<sup>11</sup> A study by Lijing L. Yan on 3308 individuals aged 18 to 30 years showed that stress in the form of time urgency/impatience (p= 0.001) and hostility (p< 0.001) were associated with a long term risk

of hypertension.<sup>12</sup>We report family history as a significant risk factor for hypertension ( $p < 0.0001$ , Odds ratio 2.31). Of the total prehypertensive and hypertensive subjects, 66.5% had a family history of hypertension.

In our study, intake of alcohol was a significant risk factor ( $p = 0.048$ ) for hypertension. From the total prehypertensive and hypertensive subjects, 23% were alcohol consumers. An attributable risk of 16% has been reported by a previous study to signify the role of alcohol consumption in the development of hypertension.<sup>13</sup> Our study confirms a positive association.

Smoking is not a significant risk factor for hypertension ( $p = 0.071$ ) in youth. This could be attributable to mass education programmes and the fact that youngsters do not have sufficient exposure to this habit.

Lack of physical activity was not found to be a significant risk factor for hypertension in youth ( $p = 0.221$ ). 46.8% subjects performed no exercise and 12.6% subjects exercised up to 2 hours per week. This is in contrast to the inverse association between physical activity and incidence of hypertension demonstrated in a longitudinal study over 20 years.<sup>14</sup>

Diet and religion were found to be insignificant risk factors in our study ( $p = 0.452$ ,  $p = 0.102$ ).

### CONCLUSION:

The prevalence of hypertension in the age group 14 to 26 years is 10.67% and prehypertension is 35.67%. The prevalence of hypertension and prehypertension has shown an increase with age. Hypertension is more common in males than in females. It is associated with the Body Mass Index of a person, being more common in the overweight and obese.

Stress is a highly significant risk factor for hypertension, the prevalence being high in individuals admitting to taking stress.

There is a positive association between hypertension in youth and family history of hypertension.

Personal habits like alcoholism show a small contribution to hypertension, while smoking shows no significant contribution. Physical activity, diet (vegetarian or mixed) and religion are insignificant risk factors of hypertension.

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**Table 1: Seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure Guidelines<sup>2</sup>**

Category	Systolic Blood Pressure (mm Hg)	Diastolic Blood Pressure (mm Hg)
Normal	<120	<80
Prehypertension	120–139	80–89
Hypertension, Stage 1	140–159	90–99
Hypertension, Stage 2	>160	>100

**Table 2: Prevalence of Hypertension in Youth**

Age	14 to 18 years	19 to 22 years	23 to 26 years	Total
Normotensive	119 (59.5%)	109 (54.5%)	94 (47%)	322 (53.67%)
Prehypertensive	64 (32%)	71 (35.5%)	79 (39.5%)	214 (35.67%)
Hypertensive	17 (8.5%)	20 (10%)	27 (13.5%)	64 (10.67%)
Total	200	200	200	600

**Table 3: Contributory variables of hypertension in youth**

Contributory Factor	Categories	Normotensives (322/600)	Prehypertensives and Hypertensives (278/600)	Total	p value
Age (years)*	14-18	119	91	200	0.041*
	19-22	109	91	200	
	23-26	94	106	200	
Gender*	Male	174	214	388	<0.0001*
	Female	148	64	212	
BMI*	Low	45	10	55	<0.0001*
	Normal	239	175	414	
	Overweight	31	70	101	
	Obese	7	23	30	
Alcohol Consumption*	Yes	28	64	92	<0.0001*
	No	294	214	508	



**Table 3: (Continued)**

Contributory Factor	Categories	Normotensives (322/600)	Prehypertensives and Hypertensives (278/600)	Total	p value
Stress*	Yes	126	152	278	<0.0001*
	No	195	126	321	
Family History*	Yes	149	185	334	<0.0001*
	No	173	93	266	
Exercise	No	130	130	260	0.221
	Light	39	35	74	
	Heavy	153	113	266	
Smoking*	Yes	14	43	57	<0.0001*
	No	308	235	543	
Diet	Vegetarian	157	127	284	0.452
	Mixed	165	151	316	
Religion	Hindu	305	252	557	0.102
	Muslim	8	16	24	
	Others	9	10	19	

\* p<0.05 signifies a statistically significant association with hypertension