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Research Article

PREVALENCE OF PREHYPERTENSION AMONG MEDICAL STUDENTS IN PUDUCHERRY, INDIA

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ABSTRACT

Objectives: Prehypertension have a greater risk of developing hypertension later and risk of cardiovascular events. Cardiovascular diseases contribute to atleast of one third of deaths in India every year. The objective of this study is to evaluate the prevalence of pre-hypertension among first year medical students who are from a similar socioeconomic status, dietary habits and lifestyle.

Methods: A total of 137 first year medical students were selected for this study. BP was measured using digital blood pressure (BP) monitor on three different occasions and the average was taken and also a questionnaire was obtained to assess the associated factors and other demographic details. Data were analyzed with the use of SPSS software and results were demonstrated using descriptive tables where Chi-square test and one-way analysis was used.

Results: The prevalence of elevated BP (pre-hypertension and hypertension) as per JNC 7 criteria, among the medical students was 42.4 %. There was a significant association of pre-hypertension with the individual risk factor like the increased BMI, family history of diabetes mellitus, diet and stress.

Conclusion: It can be concluded that in our study among healthy medical students, prevalence of prehypertension is 42.4% which is more in males than females. We have found significant correlation between BMI and SBP. These results suggest the need for routine blood pressure measurement for further evaluation.

INTRODUCTION

Hypertension is a major killer disease in the world. Pre-hypertension is a significant risk for progression of hypertension thereby increasing the risk for cardiovascular diseases and cerebrovascular diseases. The Seventh report of the Joint National committee on prevention, detection, evaluation and treatment of high blood Pressure (JNC 7) defines, systolic blood pressure of 121-139 mmHg or diastolic blood pressure of 81-89mmHg are called as prehypertension. Prehypertension have a greater risk of developing hypertension later and risk of cardiovascular events. Cardiovascular diseases contribute to atleast one third of deaths in India every year. In India hypertension has been studied well, but there is dearth of data on the prevalence and risk factors of prehypertension. Framingham states that prehypertension is strongly associated with risk of coronary artery diseases. Prehypertension is an important clinical problem in childrens, and the approach to its management differs from that in adults in several aspects. As the symptoms of childhood hypertension are largely non-specific, most children with essential hypertension are likely to be asymptomatic [1]. Early identification of prehypertension, would provide an estimate of the future magnitude of the problem and assist to control of hypertension and Cardiovascular diseases [2].

Children at risk for prehypertension, proper evaluation and appropriate management are important to prevent the serious, long term complications. Secondary hypertension is more common in children than in adults, the common causes of

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hypertension in children include renal disease, coarctation of aorta and endocrine diseases. The majority of children and adolescents with mild to moderate hypertension have primary hypertension in which a cause is not identifiable. Routine blood pressure measurement is recommended at 3 years of age, because approximately one third of obese children have high blood pressure [3]. Prehypertension in children has been shown to correlate with family history of hypertension, low birth weight and excess weight. With increasing prevalence of childhood weight problems, attention to weight related health conditions including hypertension is warranted [4].

Due to urbanization, socio-economic development and life style modification from traditional to modern have lead to physical inactivity. Standard of living has also modified the dietary pattern and increased consumption of diets rich in fat, sugar [5]. The normal standards for blood pressure have been established for the children and adolescents of different ages, in both sex, ethnicity, overweight in Western countries. No such standards are available for Indian children. ICMR have established normal standards for anthropometric measurements for Indian childrens and adolescents. At the same time Western standards cannot be applied to Indian children, because of difference in factors such as ethnic, socio-economic, dietary, environmental and emotional factors between Indian and Western countries. Hence there is a need to establish the normal blood pressure standards for Indian children, adolescents and find out the prevalence of prehypertension among them. Many studies in India have been done to know the blood pressure in students in various age groups. There is much variation in the blood pressure profile of these studies. There is a need to have blood pressure profile of these studies every region of the country. Drug therapy for prehypertension is not recommended for various reasons [6, 7].

Hence, the present study was taken up to determine blood pressure levels in healthy, asymptomatic first year medical students in Sri Lakshmi naryana institute of medical sciences (SLIMS), Puducherry. The students are from similar socioeconomic status, dietary habits, and lifestyle.

Definition of Hypertension in Adults

According to Seventh Report on Joint National Committee (JNC 7) on Prevention, Detection, Evaluation and Treatment of High Blood Pressure 2003, the hypertension in adults is defined as follows [8].

Classification of BP based on JNC 7

BP status	SBP (mmHg)	DBP (mmHg)
Normal	< 120	< 80
Prehypertension	121-139	81-89
Hypertension Stage I	140-159	90-99
Hypertension Stage II	160 or above	100 or above

METHODOLOGY

- Study design : Cross sectional study
- Study area : First Year Medical students of SLIMS,
- Study period : 1 months
- Study population : 137 students

Inclusion criteria

- 17-19 years of age
- Both male and female medical students.

Exclusion criteria

- Congenital disorder
- Cardiac disorder
- Renal disorder
- Any chronic drug intake

History taking

A detailed history with particulars of age, sex, history of illness suggestive of renal diseases, family history of hypertension or stroke, history of taking any drugs, which are known to produce hypertension, like corticosteroids and any symptom suggestive of increased blood pressure were recorded in the Proforma.

Anthropometric measurements

Age was taken in complete years and was recorded from the college register. Height and weight were recorded by standard techniques as described by Indian Council of Medical Research and the ratios between weight and height were calculated.

Clinical examinations

Blood pressure was recorded using a standard mercury Sphygmomanometer (Diamond deluxe) and OMRON Digital BP apparatus.

Blood pressure recording was taken, as recommended by 1987 Second Task Force on blood pressure control. Blood pressure was recorded in sitting position and recorded in right arm. After applying appropriate size cuff, it was inflated to about 30 mm Hg above the point at which the radial pulse disappears. The pressure within the cuff was then released at a rate of about 2 to 3 mm Hg per second, while the auscultation was done over brachial artery. The onset of sound was taken as the systolic pressure (Korotkoff Phase I) and the absence of all sounds (Korotkoff Phase V) was taken as diastolic blood pressure. Three readings were taken in succession with an interval of 1½ to 2 minutes and the cuff was completely deflated between the readings. In those cases where the difference between first reading and third reading was more than 10 mm Hg, the first reading was omitted and another recording was obtained. The average of the three readings was calculated and entered in the proforma. Those children in whom blood pressure could not be recorded satisfactorily were omitted from the study. Those children in whom blood pressure was found to be abnormal for his/her age, were reexamined on two different occasions at an interval of 1 to 2 weeks and blood pressure was recorded in lying posture also. All blood pressure recordings were taken during afternoon hours and recorded by the same person. Blood pressure was recorded after all other procedures were completed. Systemic examination was also done to exclude cardiovascular, renal and other diseases which could affect blood pressure.

Statistical Analysis

The data collected were tabulated according to various epidemiological parameters like age, sex, etc. The mean values and standard deviation of all Anthropometric parameters were calculated. Chi- square test was used to find the difference between the mean values among boys and girls concerned with systolic blood pressure, diastolic blood pressure, height with systolic blood pressure and diastolic blood pressure and weight

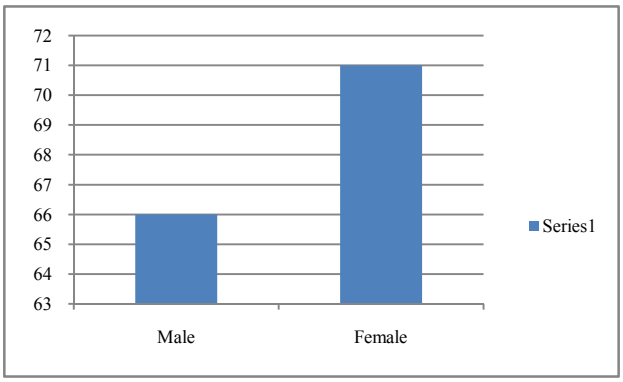
with systolic blood pressure and diastolic blood pressure.

The Pearson's or product moment correlation coefficients (r) were calculated to assess the correlation between BMI and systolic blood pressure, BMI and diastolic blood pressure for boys and girls. The strength of the correlation coefficient was determined by using t- test $p > 0.05$ (5% level of significance) was considered as not significant (NS) and $p < 0.01$ was considered as significant (S) for the corresponding degrees of freedom (df).

RESULTS

Table 1 Gender distribution of the study group

Sex	No. Of Students	Percentage
Male	66	48.2
Female	71	51.8
Total	137	100



In this study, out of 137 medical students 66 (48.2%) were boys and 71 (51.8%) were girls who enrolled in this study.

In the present study, out of 137, 83 (60.6%) students were enrolled in the age group of 18 years. Among them 43 were females and 40 were males.

Table 2 Age and sex distribution of the study group

Age	No. of Students	Percentage
17	38	27.7
18	83	60.6
19	16	11.7
Total	137	100

Age	Male	Female	Total
17	18	20	38
18	40	43	83
19	8	8	16
Total	66	71	137

Systolic Blood pressure of this study group 48 (35%) were Prehypertensive and 5 (3.6%) were hypertensive.

Table 3 Systolic BP & Diastolic BP distribution of the study group

Systolic Bp	No. of Students	Percentage
Normotensive	84	61.3
Prehpertensive	48	35.0
Hypertensive	5	3.6
Total	137	100

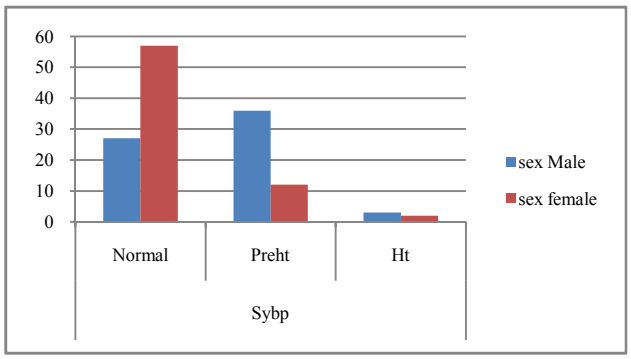
Diastolic Blood Pressure of this study group out of 14 (10.2%) were prehypertensive and 8 (5.8%) were hypertensive.

Table 4 Sex Vs SBP & DBP distribution of the study group

Diastolic BP	No. Of Students	Percentage
Normotensive	115	83.9
Prehpertensive	14	10.2
Hypertensive	8	5.8
Total	137	100

Sex Vs Systolic Blood pressure

Systolic Blood pressure of this study group 48(35%) were Prehypertensive and 5 (3.6) were hypertensive. Out of 48, males were predominant for prehypertension.

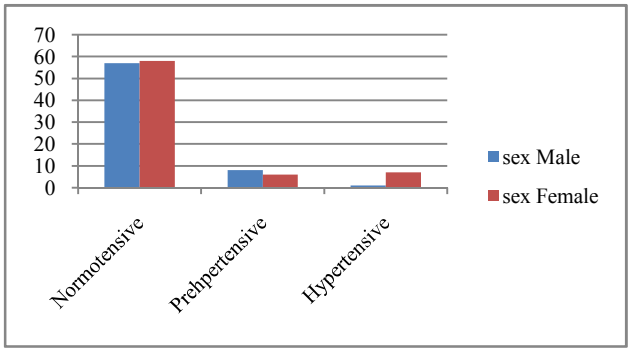


Chi-Square Tests			
Test	Value	df	. Sig. (2-sided)
Pearson Chi-Square	22.762[a]	2	.000

Sex Vs Diastolic Blood pressure

Diastolic Blood Pressure of this study group out 14 (10.2%) were perhypertensive and 8 (5.8%) were hypertensive. Among 14, 8 males were Prehypertensive. Out of 8 hypertensive, 7 were females.

sex	Normotensive	Prehpertensive	Hypertensive	Total
Male	57	8	1	66
Female	58	6	7	71
Total	115	14	8	137



Chi-Square Tests			
	Value	df	Sig. (2-sided)
Pearson Chi-Square	4.618[a]	2	.043

Table 5 Correlation between BMI & SBP of the study group

	Mean	Std. Deviation	N
BMI	24.392	4.5275	137
SBP	73.19	8.861	137

Correlations			
		SBP	BMI
SBP	Pearson Correlation	1	.049
	Sig. (2-tailed)		.526
	N	137	137
BMI	Pearson Correlation	.049	1
	Sig. (2-tailed)	.526	
	N	137	137

In this study, there was significant correlation between systolic blood pressure with BMI.

Table 6 Correlation between BMI & DBP of the study group

	Mean	Std. Deviation	N
DBP	73.19	8.861	137
BMI	24.392	4.5275	137

Correlations			
		DBP	BMI
DBP	Pearson Correlation	1	.144
	Sig. (2-tailed)		.094
	N	137	137
BMI	Pearson Correlation	.144	1
	Sig. (2-tailed)	.094	
	N	137	137

The correlation between diastolic blood pressure and BMI was not significant, because the Diastolic blood pressure in the students were very less compare to the systolic blood pressure.

Table 7 Distribution of Students according to Sex and BP

Sex	Normotensive	Prehypertensive	Total
Male	23	39	62
	(18.4%)	(31.2%)	(49.6%)
Female	49	14	63
	(39.2%)	(11.2%)	(50.4%)
Total	72	53	125
	(57.6%)	(42.4%)	(100%)

Out of 137 students, 53 were Prehypertensive, out of these 39 (31.2%) were males and 14 (11.2%) were females. Among 137 students, 12 (8.7%) were hypertensive, out of these 8 were females and 4 were males.

DISCUSSION

Pre-hypertension, the recent JNC-7 report says that even normal Blood Pressure, Systolic blood pressure ranges from 120-129 mmHg or diastolic blood pressure ranges from 80-89 mmHg is considered as the potential risk of Hypertension and cardiovascular diseases [9]. According to the Framingham heart study, pre-hypertensive individuals have 2 times higher risk of progression to hypertension than normotensive people. Increased baseline BP leads to increase the rate of development of hypertension [10,11] which is proved by many longitudinal studies. The prevalence of pre-hypertension among our study population was similar to that of other studies [12,13]. In our study, the percentage of pre-hypertension (42.4%) and hypertension (8.7%).

Hypertension develops at a faster rate in adults with BP in the pre-hypertensive range than adults with optimal blood pressure [14]. Among the pre-hypertensive group, 31.2% of male and 11.2 % of female had pre-hypertension that showed that there was a strong association for developing hypertension among males when compared to females. In our study, the prevalence of hypertension was higher among females.

We have also found that the subjects with pre-hypertension had a strong family history of diabetes, and it is statistically significant. Furthermore, some studies have reported that DM is an independent risk factor for hypertension and that the baseline fasting serum glucose level has been associated with the progression to hypertension in men and women [15,16]. Thus, our data suggests that the familial history of DM should be viewed as an independent risk factor for the development of pre-hypertension.

Also, studies have shown that prehypertensive individuals have increased thickness of tunica intima of the artery that is equivalent to the changes observed in hypertensive individuals. This suggests that even a slight elevation in BP causes changes in the arterial wall that predisposes the subject to cardiovascular risk [17,18].

Further studies suggest that youth with BP in the pre-hypertensive range have a vascular resistance equal to healthy individuals at least 20 years older than their chronological age. Since BP levels are simply a biomarker of the diseases process, it should be monitored from the adolescent period itself. Elevated BP at the younger age increases the risk for the development of hypertension during adolescence [19].

First year medical students undergo more stress during their learning period, which is proven by many studies with a prevalence rate of about 30-50% [20, 21]. Numerous studies have revealed that persistent stressful conditions are associated with mental and physical health problems in medical students at various stages of their training. Further excessive stress is known to be associated with lowered self-esteem, anxiety and depression, difficulties in solving interpersonal conflicts, sleeping disorders, increased alcohol and drug consumption, cynicism, decreased attention, reduced concentration and academic dishonesty. Thus, the students are more prone for stress induced pre-hypertension and hypertension [22]. A cross sectional study done by kishor kumar et al, concluded that prehypertension is potentially modifiable with simple life style modification [24].

In our study group, students who eat more of non-vegetarian diet than a vegetarian diet had pre-hypertension and hypertension which was statistically significant. Therefore, it can be concluded that dietary modification might have a significant role in controlling hypertension as proved in a study done by koley et al [24]. Further decreased physical activity and spending more times on mobile phone and computer, thereby leading to more sedentary lifestyle might have also shown to have an increased prevalence of pre-hypertension and hypertension in first year students but this is not statistically significant. In another study, both systolic and diastolic gradually increases with age, the increase being more pronounced in systolic blood pressure than in diastolic pressure [25].

We stress the need to inculcate this in the early training period among the medical students to keep the health care fraternity in better shape. Prehypertension & hypertension are also significant risk factors for the development of insulin resistance & hence metabolic syndrome which is reported frequently in India. In present situation pharmacological therapy has not been recommended to treat prehypertension.

The observation of the present study is in agreement with the above statement as all the 53 (42.4%) students were prehypertensive. Out of these 53 students, 39 were boys amounting 31.2% of total number of boys and 14 were girls amounting 11.2 % of the total number of girls. The prevalence of prehypertension was more in boys.

CONCLUSION

It can be concluded that in our study among healthy medical students prevalence of prehypertension is 53 students (42.4%), which is more in males than females. We have found a significant correlation between BMI and SBP. These results suggest the need for routine blood pressure measurement for further evaluation. Development and implementation of national health programmes and interventions towards improving health related variables among overweight or obese adolescents, such as dietary modifications, weight reduction and prevention of obesity and increasing physical activity are suggested to prevent high blood pressure in adolescence and its complication in later life.

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