



Original Research Article

## Predictors of Hypertension among Late Adolescents in Miraj, Maharashtra

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### ABSTRACT

**Introduction:** More than a quarter of the world's adult population, totaling nearly one billion, had hypertension in 2000 and this proportion will increase to 29% (1.56 billion) by 2025. Primary hypertension emerges from a complex inter-play of genetic, environmental and behavioural factors. Owing to the hereditary component of hypertension, the disorder is considered to have its origins in the young. By 2008 different Indian studies revealed magnitude of hypertension ranging from 0.41 – 2.93% among adolescents. Prospective cohort studies have shown that children with high blood pressure are more likely than other children to suffer from hypertension as adults, known as “tracking”. This knowledge can be applied in identifying children and adolescents “at risk” of developing hypertension at a future date.

**Aim & Objectives:** This study seeks to determine the prevalence of hypertension among adolescents in the age group of 15 to 19 years as well as to study certain predictors of hypertension amongst them.

**Study Design:** A cross-sectional study was conducted in Miraj from Aug 2009 to Sept 2010 among 2370 adolescents in the age group of 10-19 years. A pre-designed, pre-tested structural questionnaire was used for data collection. Physical examination was undertaken after the interview was over. It included anthropometric measurements such as height, weight and blood pressure. Mean, standard deviation and  $\chi^2$  test were used for statistical analysis.

**Results:** The prevalence of hypertension was 1.1% and highest prevalence (2.9%) was observed in the age group of 18-19 years. The mean systolic and diastolic blood pressure was higher in males than females. The prevalence was 5.2% in adolescents who gave parental history of hypertension. Age and family history of hypertension had a positive correlation with childhood blood pressure.

**Keywords:** Blood Pressure, Prevalence, Hypertension, late Adolescents, Cross Sectional Study.

### INTRODUCTION

Hypertension is a major health problem in developed and developing countries affecting approximately one billion individuals worldwide. [1] Hypertension is an important worldwide

public-health challenge because of its high frequency and concomitant risks of cardiovascular and kidney disease. It has been identified as the leading risk factor for mortality, and is ranked third as a cause of disability-adjusted life-years. [2] Systemic

hypertension is an important condition in childhood, with estimated population prevalence of 1-2% in the developed countries. Primary hypertension emerges from a complex inter-play of genetic, environmental, and behavioural factors. Owing to the hereditary component of hypertension, the disorder is considered to have its origins in the young. [3] Primary hypertension is detectable in children and adolescents and, as in adults, is associated with a positive family history of hypertension, obesity, and life-style factors. Owing to the well-established childhood obesity epidemic, the population prevalence of high blood pressure in the young is increasing. [3] No longer children, not yet adults. Adolescence is a period of rapid development when young people acquire new capacities and are faced with many new situations. This presents not only opportunities for progress but also risks to health and well-being. [4] The literature indicates that a lengthy time interval occurs between exposure to high risk factors and the development of disease, and that many such high risk exposures begin in young adolescence. [5] These findings underline the value of targeting children and adolescents for primary prevention efforts in health care and health education for the attainment of overall healthy population in any country including a country like India. [6] The study of childhood hypertension is important for several reasons:

The sequelae of long term hypertension are irreversible and are associated with significant morbidity and mortality. [7] Since blood pressure tends to “track” along the same percentile throughout life, children with higher blood pressures are more likely to become adults with hypertension. The best predictor of adult BP is childhood BP. [8] Studies of blood pressure in childhood may provide further clues to the aetiology and treatment of

subsequent hypertension in adulthood. [9] It is helpful in planning primordial preventive strategies. [8]

The present study was conducted to determine the prevalence of hypertension among adolescents in the age group of 15 to 19 years as well as to study certain predictors of hypertension amongst them.

## **MATERIALS AND METHODS**

The present descriptive cross-sectional study was conducted in Miraj from Aug 2009 to Sept 2010, 2370 adolescents in the age group of 15-19 years were included. Ethical clearance for this study was accorded by Institutional ethical committee in Aug 2009. Prior permission was obtained from school and college Principals and higher authorities. The purpose and process of study was explained to the teachers and students and parental consent was obtained. Pilot testing was done in schools to validate the proforma. There were total 21 schools and has strength of 4,000-5,000 (of age 15-17 years). Total colleges in the study area were 4 with app. 2,000 students (of age 17-19 years) 4 schools and 2 colleges were randomly selected. Adolescents in the age group of 15 to 19 years and willing to participate in study were included and stratified into four groups’ i.e. 15- 16, 16-17, 17-18, 18-19 years. It was decided to select 400 students from each stratum to study the calculated sample size of 1600. However, to achieve the relatively complete and higher figure and covering maximum number of students from each age group from a particular school/college, total sample size of 2370 was arrived. Adolescents below 15 years and above 19 years of age and not willing to participate were excluded.

A pre-designed, pre-tested structural questionnaire was used for data collection. All the questions were explained to the students and total confidentiality was assured. Physical examination was

undertaken after the interview was over. It included anthropometric measurements such as height, weight and blood pressure. For recording blood pressure, students were individually called in a room and were allowed to be seated quietly for 5-10 minutes to alley anxiety and restlessness. Blood pressure was recorded in sitting position in right arm, with his or her back supported, feet on the floor and right arm supported so that cubital fossa is at heart level, using a standard mercury sphygmomanometer with appropriate cuff size. Systolic blood pressure was determined by the onset of the “tapping” Korotkoff sounds (K1) and fifth Korotkoff sound (K5), or the disappearance of Korotkoff sounds, was recorded as Diastolic blood pressure. Hypertension was defined as average of two SBP or DBP readings recorded 3 minutes apart that is greater than or equal to the 95th percentile for sex, age, and height on at least three separate occasions. [10] Adolescents

found hypertensive were referred to Govt. Medical College, Miraj for further evaluation and treatment. Data was entered in Microsoft excel sheet and analysis was done using Statistical software SPSS 16 version. Mean, standard deviation and  $\chi^2$  test were used for statistical analysis.

## RESULTS

Out of 2370 adolescents in the age group of 15 to 19 years, 27 had hypertension (prevalence of 1.1%). Among 1675 males, 22 were hypertensive, and among 695 females, 5 were hypertensive. No significant difference was observed among males and females (1.3% vs 0.9%). Mean blood pressure increased significantly with age. Even within this short span of years in the study group of 15 - 19 years, significantly higher prevalence (2.9%) was observed in 18-19 year's age group.

**Table No. 1: Age and Gender-wise Prevalence of Hypertension**

Age	Male		Female		Total	
	Normotensive	Hypertensive	Normotensive	Hypertensive	Normotensive	Hypertensive
	No. (%)					
15-16	418 (24.9%)	1 (0.2%)	190 (27.3%)	0 (0%)	608 (25.75%)	1(0.2%)
16-17	370 (22.1%)	2 (0.5%)	193 (27.8%)	0(0%)	563 (23.7%)	2(0.3%)
17-18	437 (26.1%)	5(1.1%)	170 (24.5%)	2(1.1%)	607 (25.6%)	7(1.1%)
18-19	450 (26.9%)	14(3.1%)	142 (20.4%)	3(2.1%)	592 (25.0%)	17(2.9%)
Total	1675 (100%)	22(1.3%)	695 (100%)	5(0.7%)	2370(100%)	27(1.1%)

**Table No.2: Socio-demographic Features of study subjects**

Socio-demographic Features	Level of Features	Study Subjects					
		Male		Female		Total	
		No.	%	No.	%	No.	%
Age (years)	15-16	418	24.9	190	27.3	608	25.7
	16-17	370	22.1	193	27.8	563	23.7
	17-18	437	26.1	170	24.5	607	25.6
	18-19	450	26.9	142	20.4	592	25
	Total	1675	100	695	100	2370	100
Religion	Hindu	1172	70	502	72.2	1674	70.6
	Muslim	285	17	107	17	392	16.5
	Christian	176	10.5	56	8.1	232	9.8
	Other	42	2.5	30	4.3	72	3
	Total	1675	100	695	100	2370	100
Socio-economic Class	Upper	457	27.3	201	28.9	658	27.8
	Middle	563	33.6	287	41.3	850	35.9
	Lower	655	39.1	207	29.8	862	36.3
	Total	1675	100	695	100	2370	100
Type of family	Nuclear	990	59.1	407	58.5	1397	59
	Joint	478	28.5	192	27.6	670	28.3
	3Generation	207	12.4	96	13.9	303	12.7
	Total	1675	100	695	100	2370	100

**Table No.3: Prevalence of Hypertension according to family history of hypertension**

Family history of hypertension	Study Subjects		Total
	Normotensive	Hypertensive	
	No. (%)	No. (%)	No. (%)
Present	308(94.8%)	17(5.2%)	325(100%)
Absent	2035(99.5%)	10(0.5%)	2045(100%)
Total	2343(98.9%)	27(1.1%)	2370(100%)

**Table no.4: Determinants of Hypertension**

Variable (Risk)	p-value (df=1)	Odds ratio	95% C.I. for Odds Ratio	
			Lower	Upper
Age(>16 years)	0.008	5.73*	1.59	17.63
Gender (Male)	0.152	1.837	0.6928	4.869
SES (Upper)	0.333	0.74	0.3	1.84
Type of family (Nuclear)	0.435	1.21	0.53	2.82
Diet (Mixed)	0.559	1.26	0.53	3
Eat outside food (>Once a week)	0.135	1.822	0.7323	4.53
Extra Salt intake(Present)	0.343	1.46	0.66	3.2
Family History of Hypertension in single parent (Present)	<0.001	11.23*	5.09	24.75
Family History of Hypertension in both the parents	<0.001	19.19*	8.31	44.28
Tobacco use (Occasional + Regular)	0.276	1.892	0.4459	8.026
Alcohol intake (Occasional + Regular)	0.059	0.3378	0.1151	0.991
Physical activity	0.309	0.5619	0.1324	2.385

\* - statistically significant

**Table No.5: Physical Activity and prevalence of hypertension**

Physical Activity	Study Subjects				Total	
	Normotensive		Hypertensive		No	%
	No	%	No	%		
Sedentary	292	99.3	2	0.7	294	100
Mild	1732	98.9	19	1.1	1751	100
Moderate	301	98	6	2	307	100
Strenuous	18	100	0	0	18	100
Total	2343	98.9	27	1.1	2370	100

Adolescents from upper and middle socio-economic class had a higher prevalence rate of hypertension vs lower socioeconomic class (0.9% and 1.6% vs 0.8% respectively).

Higher prevalence of hypertension was seen in study participants adding extra table salt as compared to those not taking it (1.5 vs 0.5%). 325 (13.7%) adolescents gave family history of hypertension. The prevalence was quite high (5.2%) in adolescents in these adolescents with parental history of hypertension.

Age and positive family history of hypertension were the significant predictors of hypertension among adolescents. Unlike the findings reported in adults, there was no effect of type of diet, physical exercise, and extra salt intake, type of food intake,

smoking and alcohol consumption on blood pressure among adolescents.

## DISCUSSION

In the present study among adolescents in the age group of 15-19 years of Miraj, prevalence of hypertension was highest among study participants in the age group of 18-19 years. Age spurt rise in prevalence of hypertension is supported by the findings of Verma M et al <sup>[11]</sup> (1994), Thakor HG et al <sup>[12]</sup> (1998), Marina S et al <sup>[13]</sup> (2008). Mijinyawa MS et al <sup>[14]</sup> (2008) conducted a study including 1000 teenage students age ranged from 13 to 19 years and found that the prevalence rate of hypertension rose from 4.3% (among the younger participants) to 11.8% among the oldest students. The age-related increase in prevalence of hypertension may be attributable in part to increase in body mass as reflected by increase in BMI with age, biological maturation and hormonal changes.

Both mean SBP and mean DBP were higher among males than females. Present study also revealed higher prevalence of

hypertension in males. Similar observations were made by various other studies conducted by Hashem YJ et al <sup>[15]</sup> (2001), Ramos E et al <sup>[16]</sup> (2005). However studies conducted by Kilkoney MM et al <sup>[17]</sup> (1974) & Verma M et al <sup>[11]</sup> (1994) did not find any significant difference in prevalence of hypertension in males and females.

In present study prevalence of hypertension (1.6%) was highest in study participants belonging to middle socio-economic class. This may be because of the life style modification between the middle and lower socioeconomic classes could have had an indirect bearing on the blood pressure levels and thus on the prevalence of hypertension.

Dietary practices, especially sodium intake have been documented to influence BP. various other factors such as protein, fibre, saturated fats and alcohol intake have also been implicated in the aetiology of hypertension while calcium and magnesium may be having a protective effect. Again in childhood no evidence is available on this putative determinant. <sup>[18]</sup> Present study tried to correlate hypertension and dietary preferences, vegetarian or non-vegetarian but no relation could be observed. Similarly no significant differences were observed by Verma M et al <sup>[19]</sup> (1995), Singh AK et al <sup>[20]</sup> (2006), in type of food intake between hypertensive and non-hypertensive subjects.

Findings in the present study regarding extra table salt intake are contradictory to the findings by Soundarssanane MB et al <sup>[21]</sup> (2006) where the overall prevalence of hypertension was found to increase with increased amount of salt intake.

Physical activity influencing the blood pressure is well documented in many studies among adults; however no significant association was found between the physical activities at different levels in these adolescents.

In the present study, quite high prevalence of hypertension was observed amongst study participant having family history of hypertension in either parent (5.2%) as compared to prevalence rate of only 0.5% amongst study participant without family history of hypertension. These findings are comparable to the findings observed by Gupta A <sup>[5]</sup> (1991), Anand NK et al <sup>[22]</sup> (1996). Familial clustering of hypertension i.e. more frequent occurrence of hypertension in children whose parents suffer from hypertension or its complications, or show the presence of risk factors is well documented. <sup>[17]</sup>

## CONCLUSION

Thus it could be concluded that age and positive family history of hypertension has a positive correlation with childhood BP. Therefore if we can include routine blood pressure measurement during health check-up of adolescents, then secondary level of prevention including prompt diagnosis is an adequate treatment can be instituted at the earliest, to prevent further complications.

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