

## A Study on Hypertension and Prehypertensive Status and Their Key Determinants among School Going Adolescents in Surendranagar City

Shashwat Nagar<sup>1</sup>, Ebbie Thomas<sup>2</sup>, Darshan Mahyavanshi<sup>3</sup>, Hiren Patel<sup>1</sup>, Noopur Nagar<sup>4</sup>, S. S. Nagar<sup>5</sup>

<sup>1</sup>Assistant Professor, <sup>2</sup>Tutor, Department of Community Medicine, Parul Institute of Medical Sciences and Research, Vadodara, Gujarat, India

<sup>3</sup>Assistant Professor, Department of Community Medicine, GMERS Medical College, Valsad, Gujarat, India

<sup>4</sup>Senior Resident, Department of Obstetrics and Gynecology, Parul Institute of Medical Sciences and Research, Vadodara, Gujarat, India

<sup>5</sup>Ex- Professor and Head, Department of Community Medicine, C U Shah Medical College, Surendranagar, Gujarat, India

**Correspondence :** Mr. Ebbie Thomas, Email: ebbiethomas@gmail.com

### Abstract:

**Introduction:** "Primary Hypertension" is detectable in children and adolescents as in adults; it is associated with positive family history of hypertension, obesity, and life-style factors. There is plenty of evidence to suggest that hypertension begins in childhood and adolescence. The present study was undertaken to determine the prevalence of hypertension and pre-hypertension and the associated risk factors among school going adolescents in Surendranagar city. **Objectives :** To estimate the prevalence of hypertension and pre-hypertension among school going adolescents. **Method :** The study carried out was cross sectional and for categorization of hypertension for adolescents, the JNC 7 classification was used. All the students from 2 schools of Surendranagar city selected randomly aged 10-19 years were included as subjects in the study. This came down to 374 students from government schools and 404 students from private schools. **Results :** It was seen that nearly 28% of children from Government schools and 32.4% of children from Private Schools were in category of pre-hypertensive and about 2% of students from Government schools and 6% of students from Private schools were found to be hypertensives. Family History of Hypertension, BMI status, frequency of junk food consumption outside home, type and regularity of physical activity and influence of gender were found to be predictors and contributors to elevated blood pressure using logistic regression analysis. **Conclusion :** It is recommended that the interventions for prevention of life style disorders among adolescents to be started at young age at schools by inclusion in curriculums and promotion of healthy lifestyle and healthy diet in schools.

**Keywords :** Adolescence, Hypertension, Junk Food, Physical Activity

### Introduction :

India is undergoing an epidemiological transition where non-communicable diseases (NCDs) are on rise. According to World Health Report 2002, cardiovascular diseases (CVDs) will be the largest cause of death and disability by 2020 in India.<sup>[1]</sup> The growing burden of Cardio Vascular Diseases is being contributed largely due to multitude of risk factors which are with hypertension being one of them.

Primary Hypertension is detectable in children and adolescents and as in adults it is associated with

positive family history of hypertension, obesity and life-style factors.<sup>[2]</sup> Hypertension is a disease following rule of halves making it largely an under-diagnosed problem.<sup>[3]</sup> There is plenty of evidence to suggest that hypertension begins in childhood and adolescence. In an attempt to study and prevent the development of hypertension, there is a growing interest in measuring blood pressure in children. The aim of this is to detect and monitor those with a relatively high level of blood pressure.<sup>[4]</sup>

The causes for increase in blood pressure are attributed to obesity, change in dietary habits,

decreased physical activity and increasing stress. Elevated blood pressure, systolic or diastolic at any age, in either sex is a contributor for all forms of cardiovascular disease. Identifying and modifying risk factors reduces the incidence and complications in adolescents and adult. Prevalence of hypertension varies across countries and states. It is multifactorial disease, influenced by genetic, racial, geographic, cultural and dietary patterns.<sup>[5]</sup> The asymptomatic nature of hypertension in early phases of its onset during adolescence increases the chances of developing complications during adulthood.<sup>[6]</sup>

Several studies in India have reported the prevalence of hypertension to be ranging between 0.46% and 11.7% amongst children and adolescents.<sup>[7]</sup> Considering the detection of hypertension in adolescence as the best possible preventive intervention to avoid complication later in life, the present study was undertaken to determine the prevalence of hypertension and pre-hypertension and the associated risk factors among school going adolescents in Surendranagar city.

#### **Aims & Objectives :**

1. To estimate the prevalence of hypertension and pre-hypertension among school going adolescents.
2. To study the difference between the prevalence among students of Private and Government schools of the city.
3. To study the potential determinants and risk factors among the students for elevated blood pressure.

#### **Method :**

Out of the total 12 government and 8 private schools in Surendranagar city, one school each from government and private schools were selected using simple random sampling after enumerating them alphabetically. All the students of these schools who consented to be a part of the study were enrolled as participants and included in the study. Only those students who fell in the age group of 10 to 19 years were included in the study. This came down to 404

students from private schools and 374 students from government schools.

A written and oral consent was sought (for children below 18 years of age, consent of their parents was sought) before the start of the study. The study carried out was cross sectional and for assessment of obesity the WHO classification of BMI was used. For categorization of hypertension for adolescents, the Joint National Committee (JNC) 7<sup>[8]</sup> classification was used.

An ethical clearance from the institutional ethics committee was taken before the commencement of the study.

The data were collected by examining the students for their physical parameters and directly questioned for collecting data for their dietary and exercise patterns and practices. The blood pressure of the students was recorded by taking an average of three readings while they were seated comfortably for 10 minutes.

The data obtained was analyzed using MS Excel and SPSS v24 (free trial version).

#### **Results :**

The Socio-Demographic graph of figure 1 shows the different characteristics of the adolescents under the study. We can see that the age group from 12-14 years and 14-16 years had the maximum representation among the Government schools in the study which comprised of 10 to 19-year olds; whereas among the Private schools it was age group 10-12 yrs. Majority of the respondents in both Government and Private schools were boys (83% and 77%) as compared to girls (17% and 23%).

The parents' occupation and education from both the Government schools and Private schools were also assessed; it showed that in Government schools almost 43% fathers were laborers, while 72% mothers were housewives. In Private schools, fathers were mostly in Service and Business industries with 35% and 30% respectively while 92% mothers were housewives.

**Table 1** Prevalent Risk factors of hypertension among the adolescents (Government schools n=374; Private schools n=404)

Prevalent Risk Factors for Hypertension	School Type				Total	Percent
	Government schools	Percent	Private schools	Percent		
<b>Frequency of junk food consumption *</b>						
Not consuming junk food	89	23.80%	112	27.70%	201	25.80%
Once a week	163	43.60%	117	29.00%	280	36.00%
Twice a week	91	24.30%	108	26.70%	199	25.60%
Thrice a week	19	5.10%	23	5.70%	42	5.40%
> Thrice a week	12	3.20%	3	0.70%	15	1.90%
Everyday	0	0.00%	41	10.10%	41	5.30%
<b>Total</b>	<b>374</b>	<b>100.00%</b>	<b>404</b>	<b>100.00%</b>	<b>778</b>	<b>100.00%</b>
<b>Frequency of physical activity**</b>						
Everyday	179	47.90%	38	9.40%	217	27.90%
Alternate day	48	12.80%	47	11.60%	95	12.20%
Twice a week	62	16.60%	169	41.80%	231	29.70%
Once a week	45	12.00%	77	19.10%	122	15.70%
No physical activity	40	10.70%	73	18.10%	113	14.50%
<b>Total</b>	<b>374</b>	<b>100.00%</b>	<b>404</b>	<b>100.00%</b>	<b>778</b>	<b>100.00%</b>
<b>Family history of Hypertension</b>						
No family history of hypertension	305	81.60%	327	80.90%	632	81.20%
Father	10	2.70%	18	4.50%	28	3.60%
Mother	16	4.30%	16	4.00%	32	4.10%
Siblings	1	0.30%	1	0.20%	2	0.30%
Paternal relatives	35	9.40%	38	9.40%	73	9.40%
Maternal relatives	7	1.90%	4	1.00%	11	1.40%
<b>Total</b>	<b>374</b>	<b>100.00%</b>	<b>404</b>	<b>100.00%</b>	<b>778</b>	<b>100.00%</b>

\*Junk food consumption included: PavBhaji, Pizza, Pasta, Maggi noodles, Soft drinks, sandwich and burger.

\*\* Data of Frequency of Physical Activity was collected for the last month.

**Table 2: Status of the students as per their blood pressure recorded**

Category of BP recorded	Government Schools		Private Schools		Chi square value*	P Value	Total
	No.	Percentage	No.	Percentage			
<b>Normal</b> (<120/<80)	261	69.8	247	61.1	6.108	0.013	508
<b>Pre-hypertensive</b> (120-139/8089)	104	27.8	131	32.4	1.738	0.1874	235
<b>Stage 1 hypertension</b> (140-159/9099)	6	1.6	26	6.4	6.361	0.0117	32
<b>Stage 2 hypertension</b> (≥160/≥100)	3	0.8	0	0			3
<b>Total</b>	374	100	404	100			778

\*Chi-squared test was used to find out the difference between the proportion in each category for government and private schools.

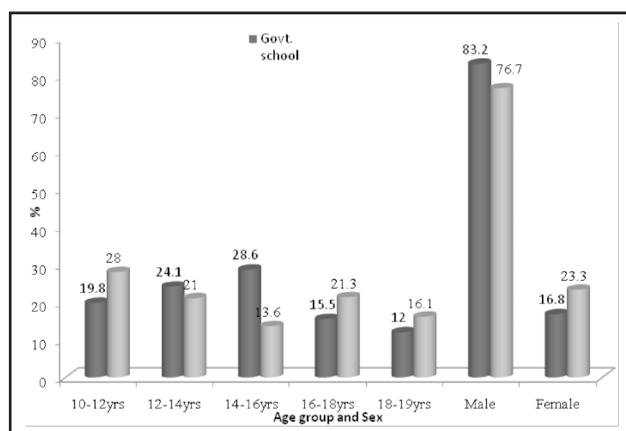
**Table 3: Determinants and contributors of adolescent hypertension among the adolescents using Logistic Regression analysis**

Variables in the Equation								
Variables	B	S.E.	Wald	Sig.	Exp(B)	95% C.I. for EXP(B)		
						Lower	Upper	
<b>Family history of Hypertension</b>	-0.141	0.47	0.09	0.764	0.868	0.345	2.183	
<b>BMI Category</b>	2.603	0.558	21.727	<b>0.000</b>	<b>13.499</b>	4.519	40.328	
<b>Frequency of consumption of Junk food</b>	0.732	0.358	4.189	<b>0.041</b>	<b>2.080</b>	1.031	4.195	
<b>Frequency of physical activity</b>	0.200	0.362	0.307	0.58	1.222	0.601	2.484	
<b>Sex</b>	0.478	0.513	0.868	0.351	1.613	0.59	4.411	

The risk factors preceding non communicable diseases like hypertension include routine junk food consumption, inadequate physical activity and family history of the disease. These risk factors were looked for (Table 1) in the study subjects as some of the habits like junk food and inadequate physical activity start right from the early age like adolescence. It was

seen that nearly 70% of the adolescents had a habit of regular junk food consumption with varying frequency and nearly 60% had infrequent physical activity. It was also seen that nearly 19% of the subjects had a family history of hypertension and hence had an increased risk of contracting the disease

**Figure 1 : Socio-Demographic characteristics of the adolescents (Government schools n=374; Private schools n=404)**



When the education of the parents in both school types were considered, about 55% of the fathers and 58% of the mothers were educated only till Primary or Secondary level and about 23% of mothers were illiterate among Government school going adolescents. In Private school goes too, maximum percentage of education that the fathers and the mothers had was Secondary level with 34% and 30%. Thus there wasn't much difference in Government and Private schools in this regard.

It can be seen from Table 2 that nearly 28% of children from Government schools and 32.4% of children from Private schools were in category of pre-hypertensive. Nearly 2% of students from Government schools and 6% of students from Private schools were found to have high blood pressure and in stage 1. Only 3 students from Government schools were found to be in stage 2 hypertensive.

The difference between two proportions was not found to be significant except for the normotensives. However, even though the numbers are statistically not significant, the numbers have a significant impact on the public health aspects of the disease at such an early age. The difference between two proportions for hypertensive showed that the prevalence in Private schools was much higher than the Government schools. ( $\chi^2=6.361, p=0.011$ )

(Table 3) The determinants and contributors of hypertension among the adolescents were analyzed

using Logistic Regression analysis, in which the determinants were chosen as per the table mentioned above which included their Family History of Hypertension, BMI status, frequency of junk food consumption outside home, type and regularity of physical activity and influence of gender. The P value and the beta exponential values were recorded and looked for. It was seen that the BMI status and frequency of junk food consumption were good predictors of hypertensive status whereas other variables even though were not having strong beta exponential values, but still could predict the outcome to an extent. As compared to normal BMI, those with elevated BMI had 13.5 times increased risk of developing hypertensive status and those having frequent consumption of junk food ( more than twice a week) as compared to infrequent consumption of junk food (once a week) had 2 times higher risk of developing hypertensive status at such young age. Other variables even though not having significant P values are still known risk factors in development of hypertension.

**Discussion :**

Present study shows nearly 80% of subjects were males and 20% females, a study conducted by TanuAnand et al also showed similar results in urban Delhi. [7] The overall hypertension in the present study was nearly 5% (4.5%). This was almost similar to the prevalence found in Tanu Anand et al in urban Delhi (7%). When the statistics of Government and Private schools were compared, it was seen that the prevalence in Government schools was 2.4% and that in Private schools was 6.4%. This difference in the two was statistically significant. This showed that the prevailing risk factors of hypertension like Family History, BMI Status, Frequency of Junk Food Consumption, Frequency of Physical Activity, etc. were found more among the Private schools as compared to the Government schools. This difference could be as the students in the Private schools are usually from a higher socio-economic class, are better off and thus involved in lesser physical activities and tend to have a more gadget friendly life as compared to the Government schools

counterparts who are more involved in games involving routine physical activities like cricket, kabaddi, soccer etc.<sup>[7]</sup>

Surveys which are small scale of similar types in India have suggested prevalence of 2 to 5% in school children. Study conducted by Buch et al in Surat suggested a prevalence of 6.48% in school going children.<sup>[5]</sup> These results are quite similar to the results found in the present study showing that the prevalence ranges from about 2 to 6% in school going children from different parts of the country.

Hypertension is a disease which shows an increase with the advancing age and shows a direct relationship with the variable.<sup>[9]</sup> The present study showed that there was no significant association between age and hypertension. However, even though not significant, the prevalence among the different age groups ranged from 3.1 to 7.6% which is quite high; the overall average being 4.5%. Further analysis revealed that the prevalence doubled after the age of 16yrs. This shows the increased prevalence with advanced age. Study conducted by Buch et al showed similar findings of increased prevalence with advancing age.<sup>[5]</sup>

The present study showed that the prevalence of hypertension was more in boys (4.8%) as compared to girls (3.2%) which is a little different from Banker et al which showed that the prevalence was similar in both the sexes.<sup>[10]</sup>

Logistic regression analysis of the predictors revealed that the BMI status of the students and frequency of outside junk food consumption were strong predictors whereas the others even though were not that significant (statistically) but still had some contribution to the regression model and explained the variability in the model and hence were important factors for development of hypertension in adolescence. Thus, it is imperative that if the hypertension among the adolescents is to be reduced, the predictors are needed to be modified or controlled at the earliest. Further studies would be needed in the same area of research to develop better models of regression so that the predictors can be

better identified and associated with the final outcome.

### **Conclusion & Recommendations :**

It can therefore be concluded from the study that the prevalence of adolescent hypertension is a growing concern on account of the changing life style which includes change in diet and marked reduction in physical activities. The prevalence in the present study which is nearly 5% could be even more in other larger districts which are more developed and populous. It is therefore needed that studies of similar type be replicated in other districts and states so that the overall problem can be estimated.

After estimation, it is much imperative that the results must be shared with the relevant authorities so that either the specific interventions are amalgamated with the NCD programme or with school health in a way that necessary results are achieved in a phased manner.

A very important method of achieving the results especially in educational institutions is inclusion of these topics in the curriculum at an early age so that the students are aware of the life style disorders and their complications in adulthood and old age.

Health education sessions should be planned regularly in addition to training the students by inculcating the advantages of regular physical activities and promotion of healthy diet. Interventions planned early in the life of an individual will go a long way in reducing the impact of the lifestyle disorders in our country.

### **Declaration :**

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Conflict of Interest : Nil

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