A Study on Burden of Prehypertension in Youth (or Pediatric Hypertension) in West Bengal, India

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J Child Sci 2021;11:e273–e279.

Abstract

Hypertension is a silent threat to the developing countries in recent times. The aim of this article was to determine the burden of prehypertension and hypertension among school-going children and the risk factors associated with those conditions. A cross-sectional study was conducted among school-going children (6–18 years) in seven schools of Burdwan, West Bengal, India, selected by stratified random sampling from March 2017 to August 2018. Anthropometric and blood pressure measurements were obtained along with sociodemographic parameters. Prehypertension and hypertension were defined as per American Pediatric Society's definition. Mean age of the study population was 11.3 ± 3.8 years ($n = 604$). Prevalence of prehypertension and hypertension was estimated to be 5% and 4.6%, respectively. Both prehypertension and hypertension were more common among children aged > 15 years (10.3% and 15.5%). In logistic regression, the independent determinants of hypertension were higher socioeconomic condition, increasing age, obesity, increased intake of junk food, parental hypertension, and obesity among first-degree relatives. Proper preventive measures are the need of the hour to tackle the emerging epidemic at its root. Periodic measurements of blood pressure at regular intervals are advisable at community levels to recognize high-risk children, control obesity, and prevent irreversible end organ damages.

Keywords

- obesity
- hypertension
- community
- pre-hypertension
- systolic hypertension
- children

Introduction

Currently, India is going through a phase of epidemic transition, and noncommunicable diseases are on the rise compared with the communicable diseases.[1] The World Health Organization (WHO) has reported prevalence of hypertension to decrease from 32% in 1980 to 27% in 2008, but the prevalence is increasing in the developing countries including Southeast Asia and Africa.[2] Many researchers thought that arterial hypertension has an early onset in early childhood. It has been estimated that 7% of adolescents with prehypertension are converted to hypertensive each year.[3] Historically, hypertension in children, particularly in the younger age group, was thought to be rare and secondary in origin. However, recent reports suggest an increased prevalence of childhood hypertension, particularly essential, also known as primary hypertension. No matter whether it is primary or secondary, it is always associated with significant end organ damage, which can be preventable by early diagnosis and treatment. However, a large portion of the disease still remains undiagnosed, known as the iceberg phenomenon.[4] So far, there is no national program in India for this major problem. As the prevalence of obesity is less in developing countries as compared with industrialized Western countries, prevalence of hypertension is also different in developing countries. Among the few studies done in different parts of India, Mohan et al included 3326 school-going

received
April 15, 2021
accepted after revision
August 19, 2021

DOI https://doi.org/10.1055/s-0041-1736240.
ISSN 2474-5871.

Georg Thieme Verlag KG, Rüdigerstraße 14, 70469 Stuttgart, Germany

children who were apparently healthy in northwest India. They found that incidence of hypertension was 6.6% and 2.2% among children of rural and urban areas, respectively.[5] Gupta et al estimated the prevalence of hypertension as 6.6% among 3861 school-going children aged between 5 to 15 years in northern India.[6] Sabapathy et al included school-children of Bangalore, south India, in their study and found that prevalence of prehypertension and hypertension was 2.7% and 3.2%, respectively.[7] Compared with this, overall prevalence of hypertension among adults in India was 11.4% (95% confidence interval [CI], 11.4–11.5) as shown by Rauniyar et al.[8] Our study aims to determine the prevalence of prehypertension and hypertension in the community levels of India in the eastern parts, which has not been documented on a large scale, and identify its contributing factors, which would establish an early prevention program in the long run.

Materials and Methods

A community based, observational, epidemiological, cross-sectional study was conducted from March 2017 to August 2018 in seven different schools of Burdwan town, West Bengal, India after obtaining institutional ethical clearance (Memo No.BMC-2963/ Dated: 1/12/2016).

Total primary and secondary school-going children in Burdwan town are 19770 and 16632, respectively (source —District Office of Education). Taking 95% CI and 4% sampling error, total sample size was calculated to be approximately 591. A total of 604 students were selected by stratified random sampling. Children or parents who were not willing to participate in the study, suffered from any acute illness in the last 7 days, were suffering from any chronic or systemic disease, or were on any long-term medication were excluded from the study group. A detailed well-informed consent was taken from school authorities and parents. Mostly free periods and after school hours were utilized for conducting the study.

A semistructured pretested questionnaire was given to each parent regarding demographic details like age, sex, religion, residence, socioeconomic status, type of family, dietary habits, intake of junk food per week, and family history of hypertension and diabetes mellitus in both parents and first-degree relatives.

All anthropometric measurements like height and weight were taken for each child. Body mass index (BMI) was calculated in kg/m^2.

Blood pressure measurement procedure was explained in details to the children to alleviate any anxiety. They were given rest for 10 minutes before recording. It was recorded by mercury sphygmomanometer for three times in each visit, with at least a minimum gap of 5 minutes rest between each measurement.

Definitions

Classification of blood pressure[9]:

- Normal: systolic blood pressure (SBP) and diastolic blood pressure (DBP) less than $<$ 90th percentile.
- Prehypertension: SBP or DBP greater than or equal to 90th percentile but less than 95th percentile or BP levels greater than or equal to 120/80 mm Hg.
- Stage 1: SBP or DBP from 95th percentile to 99th plus 5 mm of Hg.
- Stage 2: SBP or DBP greater than 99th percentile plus 5 mm Hg.

BMI:[10] Age- and gender-specific BMI $\geq$ 95th percentile is defined as obese and BMI $\geq$ 85th percentile but $<$ 95th percentile is defined as overweight.

Statistical Analysis

Data collected was entered in Microsoft Excel datasheet. Categorical data were expressed in terms of proportion, whereas continuous data were expressed in terms of mean and standard deviation (SD). Data were represented in tables and figures. Chi-square test was used to check the significance of difference of proportions. Student's *t*-test and one-way ANOVA were used to check the significance of difference between two and more than two means. Significantly associated variables in contingency tables were further considered for correlation for calculating the degree and direction of association. Independent determinants of hypertension were identified for multivariate regression analysis after removal of confounding factors. All the statistical data analysis was performed by using SPSS software version 19.0. p-value < 0.05 was taken as statistically significant.

Results

Demographic Characteristics

Different factors were considered and their association with study population determined, which has been summed up in ►**Table 1**.

Out of 604 children included in the study, 257 (43%) were females and 347 (57%) were males. The age distribution of participants was as follows: $<$ 9.9 years, 34.4%; 10 to 14.99 years, 44.0%; $\geq$ 15 years, 21.5%. The religion distribution of participants showed: Hindus, 69.3%; Muslims, 29.3%; and others 1.3%. As much as 75.3% of the population resided in cities, while 24.3% resided in villages.

Prevalence of Hypertension

The distribution of participants according to blood pressure measured was as follows: normotensives, 546 (90.4%); prehypertensives, 30 (5%); hypertensives, 28 (4.6%).

Analysis of Factors Responsible for Hypertension

Association with type of food habits and obesity was analyzed, and the findings have been summed up in ►**Table 2**.

We observed both prehypertension and hypertension were more prevalent among $>$ 15 years age group (10.3% and 15.5%, respectively). A gradual and significant increase of both SBP and DBP was noted with increase in age. Both prehypertension and hypertension were more commonly observed among Hindus (5.5% and 5.0%, respectively). As much as 92.4% of children from Muslim and other

Table 1 Distribution of the study population according to demographic parameters ($n = 604$)

Variables	Normal no. (%)	Prehypertension no. (%)	Hypertension no. (%)	SBP Mean ± SD	DBP Mean ± SD	Statistical analysis
Age (years)						$\chi^2 = 65.3$, $p < 0.05$ [a], d.f. = 4 ANOVA F SBP = 83.3, $p < 0.05$ [a], d.f. = 3 ANOVA F DBP = 75.5, $p < 0.05$ [a], d.f. = 3
< 6	52 (100.0)	0 (0.0)	0 (0.0)	83.5 ± 8.9	55.2 ± 4.6	
6–9.99	153 (98.1)	2 (1.3)	1 (0.6)	87.3 ± 9.2	56.2 ± 4.6	
10–14.99	240 (92.3)	14 (5.4)	6 (2.3)	91.6 ± 13.4	61.2 ± 7.3	
> 15	101 (74.2)	14 (10.3)	21 (15.5)	108.6 ± 17.2	67.4 ± 8.9	
Sex						$\chi^2 = 0.2$, $p = 0.9$, d.f. = 2 Student's t SBP = 0.0, $p = 1.0$ Student's t DBP = 0.8, $p = 0.29$
Males	315 (90.7)	17 (4.9)	15 (4.4)	93.6 ± 14.7	60.7 ± 7.8	
Females	231 (89.8)	13 (5.1)	13 (5.1)	93.6 ± 16.8	60.9 ± 18.6	
Religion						$\chi^2 = 1.3$, $p = 0.5$, d.f. = 2; Student's t SBP = 0.9, $p = 0.4$; Student's t DBP = 0.4, $p = 0.7$
Hindu	375 (89.5)	23 (5.5)	21(5.0)	94.0 ± 15.4	60.7 ± 8.0	
Muslim + other	171 (92.4)	7 (3.8)	7 (3.8)	92.8 ± 16.2	61.0 ± 8.5	
Socioeconomic status						$\chi^2 = 65.3$, $p < 0.05$ [a], d.f. = 4; ANOVA F SBP = 83.3, $p < 0.05$ [a], d.f. =3; ANOVA F DBP = 75.5, $p < 0.05$ [a], d.f. = 3
Upper	95 (88.0)	6 (5.6)	7 (6.4)	84.2 ± 11.4	57.8 ± 5.7	
Middle	402 (90.5)	23 (5.2)	19 (4.3)	94.3 ± 15.6	60.2 ± 7.9	
Lower	49 (94.2)	1 (1.9)	2 (3.9)	95.5 ± 16.0	64.5 ± 9.0	
Place of residence						$\chi^2 = 8.1$, $p = 0.01$, d.f. = 2; Student's t SBP = 0.01, $p = 0.99$; Student's t DBP = 0.09, $p = 0.92$
Urban	420 (92.3)	19 (4.2)	16 (3.5)	93.5 ± 14.4	60.4 ± 8.2	
Rural	126 (84.6)	11 (7.4)	12 (8.0)	93.8 ± 18.8	61.9 ± 7.8	
Type of family						$\chi^2 = 2.6$, $p = 0.27$, d.f. = 2; Student's t SBP = 0.39, $p = 0.69$; Student's t DBP = 0.27, $p = 0.78$
Nuclear	273 (88.6)	17 (5.5)	18 (5.9)	97.7 ± 15.6	62.3 ± 8.9	
Joint	273 (92.2)	13 (4.4)	10 (3.4)	89.4 ± 14.4	59.2 ± 7.0	

Abbreviations: DBP, diastolic blood pressure; d.f., degrees of freedom; SD, standard deviation; SBP, systolic blood pressure.
[a]$p < 0.05$ considered to be statistically significant.

Table 2 Distribution of the study population according to food habits and obesity in study population ($n = 604$)

Variables	Normal no. (%)	Prehypertension no. (%)	Hypertension no. (%)	SBP Mean ± SD	DBP Mean ± SD	Statistical analysis
Food habits						$\chi^2 = 2.3$, $p = 0.30$, d.f. = 2; Student's t SBP = 0.70, $p = 0.48$; Student's t DBP= 0.35, $p = 0.72$
Vegetarian	35 (97.2)	0 (0.0)	1(2.8)	95.4 ± 12.9	61.3 ± 7.4	
Nonvegetarian	511 (90.0)	30 (5.3)	27 (4.7)	93.5 ± 15.8	60.8 ± 8.2	
Junk food/week						$\chi^2 = 547.6$, $p < 0.01$, d.f. = 2; Student's t SBP = 18.97, $p < 0.01$ [a]; Student's t DBP= 13.35, $p < 0.01$ [a]
≤ 1	544 (99.5)	2 (0.3)	1 (0.2)	90.3 ± 12.2	59.9 ± 7.2	
> 1	2 (3.5)	28 (49.1)	27 (47.4)	123.5 ± 15.1	73.2 ± 6.7	
BMI						$\chi^2 = 437.5$, $p < 0.05$, d.f. = 4; ANOVA F SBP = 355.2, $p < 0.05$, d.f. = 4; ANOVA F DBP = 95.3, $p < 0.05$ [a], d.f. = 4
Normal	489 (99.4)	2 (0.4)	1 (0.2)	87.3 ± 8.3	55.1 ± 5.9	
Overweight	50 (89.2)	3(5.4)	3(5.4)	91.3 ± 11.8	63.5 ± 5.2	
Obese	7 (12.5)	25 (44.6)	24 (42.9)	122.1 ± 13.5	72.3 ± 6.2	

Abbreviations: BMI, body mass index; DBP, diastolic blood pressure; d.f., degrees of freedom; SD, standard deviation; SBP, systolic blood pressure.
[a]$p < 0.05$ considered to be statistically significant.

communities showed normal blood pressure level. There was no significant difference between the two groups. Both prehypertension and hypertension were more common among upper socioeconomic status (5.6% and 6.4%). Normotension was seen more commonly among lower socioeconomic status (94.2%), which was statistically significant. Both mean SBP and DBP were gradually and significantly increasing with decrease in socioeconomic status. Both prehypertension and hypertension were more prevalent among rural population (7.4% and 8.0%). Normotension was more common among urban children (92.3%). This difference is significant statistically ($p < 0.05$). Mean SBP was higher among urban children, but the reverse was true for mean DBP: neither of these differences were statistically significant. Both prehypertension and hypertension were more prevalent among children of nuclear family (5.5% and 5.9%). Normotension was mostly found among children of joint families (92.2%). This difference was not statistically significant.

Association with type of food habits and obesity was analyzed, and the findings have been summed up in ►**Table 2**.

Prehypertension and hypertension both were more commonly seen among nonvegetarians (5.3% and 4.7%). While normotension was more prevalent among vegetarians (97.2%), this difference was not statistically significant. Prehypertension and hypertension both were more commonly noticed among the children who consumed junk food > 1 times in a week (49.1% and 47.4%). Mean SBP and DBP were also higher among those who consumed junk-food > 1 times in a week. Maximum prevalence of prehypertension and hypertension were noted among children with obesity (44.6% and 42.9%). A significant increase of both SBP and DBP were noted with increase in grades of obesity ($p < 0.05$).

Association of occurrence of hypertension in father, occurrence of hypertension in mother, presence of diabetes mellitus in father, presence of diabetes mellitus in mother, occurrence of hypertension in first-degree relatives, and occurrence of diabetes mellitus in first-degree relatives among study population were analyzed, and findings have been discussed in ►**Table 3**.

Both prehypertension and hypertension were most commonly found among children of hypertensive fathers (46.0% and 42.9%). Mean SBP and DBP were also significantly higher

Table 3 Distribution of the study population according to risk factors in family in study population. ($n = 604$)

Variables	Normal no. (%)	Prehypertension no. (%)	Hypertension no. (%)	SBP Mean ± SD	DBP Mean ± SD	Statistical analysis
Hypertension in father						$\chi^2 = 509.4$, $p < 0.01$[a], d.f. = 2; Student's t SBP = 20.05, $p < 0.01$[a]; Student's t DBP = 13.52, $p < 0.01$[a]
Absent	539 (99.6)	1 (0.2)	1 (0.2)	90.4 ± 11.9	59.5 ± 7.1	
Present	7 (11.1)	29 (46.0)	27 (42.9)	121.7 ± 17.0	72.3 ± 7.2	
Hypertension in mother						$\chi^2 = 503.2$, $p < 0.01$[a], d.f. = 2; Student's t SBP = 18.3, $p < 0.01$[a]; Student's t DBP = 13.24, $p < 0.01$[a]
Absent	537 (99.8)	0(0.0)	1 (0.2)	90.4 ± 11.8	59.4 ± 7.1	
Present	9 (13.6)	30 (45.5)	27 (40.9)	120.3 ± 17.4	71.8 ± 7.8	
Diabetes mellitus in father						$\chi^2 = 405.1$, $p < 0.01$[a], d.f. = 2; Student's t SBP = 15.9, $p < 0.01$[a]; Student's t DBP = 11.5, $p < 0.01$[a]
Absent	525 (99.6)	1 (0.3)	1 (0.3)	90.4 ± 11.8	59.4 ± 7.0	
Present	21 (27.3)	29 (37.7)	27 (35.0)	115.8 ± 19.9	70.6 ± 8.9	
Diabetes mellitus in mother						$\chi^2 = 369.8$, $p < 0.01$[a], d.f. = 2; Student's t SBP = 13.6, $p < 0.01$[a]; Student's t DBP = 10.8, $p < 0.01$[a]
Absent	526 (98.8)	4 (0.8)	2 (0.4)	90.8 ± 12.1	59.6 ± 7.1	
Present	20 (27.8)	26 (36.1)	26 (36.1)	114.4 ± 21.9	114.4 ± 21.9	
Hypertension in relative in no.						$\chi^2 = 514.4$, $p < 0.05$[a], d.f. = 4; ANOVA F SBP = 162.0, $p < 0.05$[a], d.f. = 4; ANOVA F DBP = 102.2, $p < 0.05$[a], d.f. = 4
0	505 (99.8)	1 (0.2)	0 (0.0)	90.1 ± 11.7	59.2 ± 6.8	
1–2	41 (75.9)	11 (20.4)	2 (3.7)	101.5 ± 17.6	64.8 ± 9.9	
≥ 3	0 (0.0)	18 (40.9)	26 (59.1)	124.5 ± 15.4	74.3 ± 5.7	
Diabetes mellitus in relatives in no.						$\chi^2 = 582.2$, $p < 0.05$[a], d.f. = 4; ANOVA F SBP = 202.8, $p < 0.05$[a], d.f. = 4; ANOVA F DBP = 95.3, $p < 0.05$[a], d.f. = 4
0	522 (100.0)	0 (0.0)	0 (0.0)	90.6 ± 11.7	59.5 ± 7.1	
1–2	23 (95.8)	1 (4.2)	0 (0.0)	87.3 ± 13.1	57.5 ± 5.4	
≥ 3	1 (1.7)	29 (50.0)	28 (48.3)	123.9 ± 14.5	72.6 ± 6.1	

Abbreviations: DBP, diastolic blood pressure; d.f., degrees of freedom; SD, standard deviation; SBP, systolic blood pressure.
[a]$p < 0.05$ considered to be statistically significant.

among children of hypertensive fathers than normotensive fathers. Both prehypertension and hypertension were most commonly found among children of hypertensive mothers (45.5% and 40.9%). Mean SBP and DBP were also significantly higher among children of hypertensive than normotensive mothers. Both prehypertension and hypertension were most commonly found among children of diabetic fathers (37.7% and 35.0%) and mothers (36.1% both). Mean SBP and DBP were also significantly higher among children of diabetic fathers and mothers than nondiabetics.

Maximum prevalence of prehypertension and hypertension were noted among children with ≥ 3 relatives with hypertension (40.9% and 59.1%). Maximum prevalence of prehypertension and hypertension were noted among children with ≥ 3 relatives with DM (50.0% and 48.3%). A significant increase of both SBP and DBP were noted with increase in relatives with DM.

Section 4: Multifactorial Analysis of SBP and DBP

Ten of the independent variables, that is, age, socioeconomic status, fast-food consumption, presence of hypertension in father, presence of hypertension in mother, diabetes mellitus in father, diabetes mellitus in mother, presence of hypertension in relatives, and presence of diabetes mellitus in relatives had significant positive correlation with both the dependent variables, that is, SBP and DBP. Statistically significant correlation was also found between different independent variables, signifying that interaction between these variables may also influence the outcome variables (►**Tables 4** and **5**).

Logistic regression has showed the impact of unit change in independent variables on SBP. The significant predictors are age, BMI, junk food/week, hypertension in father, hypertension in mother, and obesity in relative. All these have a per se positive impact on SBP. As age increases by 1 year, SBP rises by 0.802 mm of Hg. As BMI increases by 1 unit, SBP will rise by 1.171 mm of Hg. Increase in junk food/week by 1 increases SBP by 8.034 mm of Hg. If father had hypertension, then SBP was seen to increase by 7.435 mm of Hg. If mother had hypertension, then SBP was seen to increase by 6.151 mm of Hg. If first-degree relatives had obesity, then SBP was seen to increase by 3.311 mm of Hg.

Logistic regression has showed the impact of unit change in independent variables on DBP. The significant predictors are socioeconomic status, age, BMI, and obesity in relative. All these have a per se positive impact on DBP. As socioeconomic condition improved by one unit, the DBP rose by 0.998 mm of Hg. As age increased by one year, DBP rose by 0.467 mm of Hg. As BMI increased by 1 unit, DBP was seen to rise by 0.801 mm of Hg. If first-degree relatives had obesity, then DBP was seen to increase by 2.595 mm of Hg.

Discussion

Chronic noncommunicable diseases are now becoming important public health problems in developing countries. There was a lack of significant research regarding prevalence of hypertension in children in India, especially in northeastern parts.

Out of the 604 study subjects, prevalence of prehypertension and hypertension was found to be 5% and 4.6%. As much as 90.4% of study subjects were normotensive. Different authors estimated the prevalence of hypertension was different in different countries. Noubiap et al (Africa), Liang et al (China), Peters et al (United Kingdom), and Sinaiko et al found the prevalence of hypertension in the similar range in different countries of world.[11–14] McNeece et al conducted their study among 7000 United States school children and found that prevalence of hypertension was 9.4%. It may be due to higher socioeconomic status and greater prevalence of obesity among school-going children of United States. But they repeated blood pressure measurement for three times, and in the third measurement, they found that the prevalence was 3.4%, which is similar to our findings.[15] Hence,

Table 4 Showing multifactorial analysis of SBP

SBP	Coefficients	*p*-Value	95.0% CI for B	
			Lower bound	Upper bound
(Constant)	55.818	< 0.001	50.904	60.732
SES	0.849	0.079	−0.098	1.795
Age	0.802	< 0.001	0.528	1.076
BMI	1.171	< 0.001	0.888	1.455
Junk food/week	8.034	0.041	0.328	15.741
Father hypertension	7.435	0.019	1.245	13.625
Mother hypertension	6.151	0.038	0.331	11.970
Father diabetes mellitus	0.548	0.798	−3.658	4.754
Mother diabetes mellitus	0.292	0.885	−3.662	4.245
Obesity in relative	3.311	0.017	0.601	6.021
Diabetes mellitus in relative	0.607	0.729	-2.838	4.051

Abbreviations: BMI, body mass index; CI, confidence interval; SBP, systolic blood pressure; SES, socioeconomic status.

Table 5 Showing multifactorial analysis of DBP

DBP	Coefficients	*p*-Value	95.0% CI for B	
			Lower bound	Upper bound
(Constant)	35.220	< 0.001	32.593	37.847
SES	0.998	< 0.001	0.492	1.504
Age	0.467	< 0.001	0.320	0.613
BMI	0.801	< 0.001	0.649	0.953
Junk food/week	0.975	0.642	−3.145	5.095
Father hypertension	2.901	0.086	−0.408	6.211
Mother hypertension	1.041	0.511	−2.070	4.152
Father diabetes mellitus	0.715	0.532	−1.533	2.964
Mother diabetes mellitus	0.527	0.625	−1.587	2.640
Obesity in relative	2.595	< 0.001	1.146	4.044
Diabetes mellitus in relative	0.323	0.730	−1.518	2.165

Abbreviations: BMI, body mass index; CI, confidence interval; DBP, diastolic blood pressure; SES, socioeconomic status.

white-coat hypertension may also be responsible for higher prevalence of hypertension in the first time. Mohan et al found that the prevalence of hypertension was 6.6% and 2.2% among children of urban and rural areas, respectively.[5] Laroia et al and Verma et al observed that prevalence of hypertension among children was 2.93% and 2.8%, respectively.[16,17] Verma et al repeated their measurement for a second time and found that prevalence of hypertension decreased to 1.1%. Similarly, Gupta et al and Sabapathy et al also observed that prevalence of hypertension was 6.6% and 3.2%, respectively.

We found that prevalence of both prehypertension and hypertension was higher among aged children. A significant increase of blood pressure was also noted with increase in age. Similar observation was also noted by Falkner et al, Rockwood et al, Wu et al, and Everett et al.[18–21] Prehypertension and hypertension were more prevalent among female children, although not of statistical significance. Contrary to our findings, Everett et al and Reckeloff observed that prevalence of hypertension was significantly higher among males.[22,23] Hypertension was more prevalent among children of Hindu religion, but this difference is not significant statistically. Similar observation was also made by Fitchet et al[24] Prevalence of prehypertension and hypertension was higher among children of upper socioeconomic status. A gradual increase of mean blood pressure was also noted with increase in socioeconomic status. Similarly, Soylu et al noticed that children from lower socioeconomic status were less likely to develop hypertension.[25] Contrary to our findings, Conen et al noticed an inverse association between hypertension and socioeconomic status.[26] Prevalence of both prehypertension and hypertension was higher among rural children. No difference of mean blood pressure was noted between rural and urban children. Contrary to our finding, Daştan et al and SarrafZadegan et al observed that residing in an urban area is an independent risk factor of elevated blood pressure.[27,28] Prevalence of both prehypertension and hypertension was more among children who take fewer vegetables and who consumed more junk food. Similarly, Sweazea et al also observed that vegetarian diet is helpful in reducing both SBP and DBP.[29] Both prehypertension and hypertension were more common among children who have family history of hypertension and diabetes mellitus. Gando et al, Liu et al and Shen et al also observed a similar thing.[30–32] Prevalence of both prehypertension and hypertension were more common among the obese. A gradual increase of blood pressure was noted with increase in BMI. Similar observations were also made by Gupta et al and Brouhard et al.[6,33]

Independent variables, that is, increasing age, richer socioeconomic status, more junk food consumption, presence of hypertension in father, presence of hypertension in mother, and presence of obesity in relatives had significant positive correlation with both the dependent variables, that is, SBP and DBP in logistic regression analysis, which should be controlled at early stages to prevent early development of hypertensive states.

More research, preferably multicenter studies with adequate sample size need to be undertaken to find out the true prevalence of hypertension, as different studies estimated that prevalence of hypertension is different in different populations. Genetic studies were beyond our reach. Further studies should be undertaken to find out genetic cause of primary hypertension.

Authors' Contributions

S.R.C. conceived and designed the survey. J.S. drafted the manuscript. J.S. and S.R.C. were responsible for the collection of data. J.S. participated in statistical analysis of data and the interpretation of the data. K.N. critically evaluated the manuscript and rechecked all data. All authors reviewed and approved the final version of the manuscript for submission.

Funding
None.

Conflict of Interest
None declared.

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