

Prevalence of Hypertension among Obese Children of Private Schools - A Cross-Sectional Study

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ABSTRACT

Background: Hypertension in childhood, are typically uncommon, as most of the children are asymptomatic. Keeping a check on blood pressure in children can help to identify underlying health condition. Childhood obesity is associated with its high risk of, cardiovascular diseases, premature death, and disability in adulthood. It is also associated with its future risk of breathing difficulties, fractures, HTN, insulin resistance and psychological effects. This study was done to document the prevalence of hypertension among private school children aged 5-10 years in the state of Maharashtra, India

Objective: To evaluate prevalence of hypertension with obese children of private schools and to find the correlation of hypertension and obesity in children of private schools.

Methods: This cross-sectional study was undertaken on 600 children aged 5 to 10 years of both sexes from private schools in Sangli district, Maharashtra. Prevalence of hypertension was estimated according to cut-off for Indian children. The prevalence of hypertension was compared for different age groups and gender

Results: Data was collected from 157 children consisting of 62 females and 95 males. Statistical analysis was done using Pearson's correlation coefficient test

Conclusion: The prevalence of hypertension was 28% with ($p < 0.001$), 19.7% were in pre-hypertensive and 52.2% were normal. The prevalence was higher in females than in males. The study showed a positive correlation with ($r = 0.61$). The prevalence of hypertension increased with BMI and age in both sexes.

Keywords: Hypertension, obesity, school children, private schools.

INTRODUCTION

Hypertension is a severe, non-infectious disease and an important risk factor in the causation of CHD, stroke, renal disease and retinal injuries and other cardiovascular complications. [1-3] The disease is a silent threat to the health of individuals all over the world [4]. It is the typical vascular disorder, contributing to a significant public health challenge to population in socio-economic transition [1]. Pediatric HTN is an upcoming issue in the

developed as well as developing countries with prevalence of ~3.5% in children [2, 4, 5].

1/3rd of school going children to be overweight/obese, with the proportion significantly higher in private schools compared to government schools. Socioeconomic status and lifestyle factors like reduced physical activity, escalated intake of junk foods and travelling to schools by buses may be the major factors of overweight/obesity among private school children. BMI was significantly higher in private school children than in government

school children [6]. Prevalence of obesity in children ranges up to 2.9% - 14.3% according to recent studies done in 2017 [7]. The important risk factor of HTN is obesity and family history [3-4]. Therefore, regular BP measurement is extremely necessary in children for early detection, intervention, and prevention of complications due to hypertension [4]. The onset of puberty is related with increases in systolic and diastolic blood pressures [8].

A study was undertaken to know the prevalence of hypertension among urban school children aged 5-10 years in North India in Faridabad, Haryana. A total of 5636 children aged 5 to 10 years from both sexes undergone blood pressure, height and weight measurement and the prevalence of hypertension and pre-hypertension was compared for different body mass index categories and gender. Overall, the prevalence of hypertension was 19.7%, while 13.4% children were in pre-hypertensive range [9]. Another study was done in southern India to determine normal blood pressure in apparently healthy, asymptomatic school children in the age group of 6–16 years. They concluded that the blood pressure tends to increase with age, weight, height, and BMI. The blood pressure values (SBP and DBP) increases grossly after 11 years of age. The students with positive family history of hypertension had higher value when compared to another student. The BP of children and adolescents can be assessed using the reference table according to age [2].

Aim of this study is to find out the prevalence of hypertension among obese children aged 5-10 years of private schools. There are two objectives of this study, which are to evaluate prevalence of hypertension and to find the correlation of hypertension and obesity among children of private schools in Maharashtra.

MATERIALS AND METHODS

This cross-sectional observational study was conducted in 157 obese school children aged 5-10 years of Private schools

in Sangli district, Maharashtra. Ethical clearance was obtained from the institutional ethical committee of MMC. College of Physiotherapy, Wanless Hospital, Miraj, Maharashtra. Permission from the concern school principals was taken. Purposive sampling technique was used. A written consent form was taken from all the study participants. The Inclusion criteria for the study were, subjects with BMI >95th percentile, systemically healthy students, with no history of mental disorder or illness, age group 5 years-10 years. Both boys and girls. Children with Recent cardiac, pulmonary, neurological or musculoskeletal surgeries, systemic illness and co-morbidities were excluded from the study to avoid its influence on obesity.

All the children who were eligible were selected for the measurement of their height and weight. Height was measured with MCP stature meter while the child standing on barefoot with head in Frankfurt plane position.

Weight was measured using OMRON weighing scale with the child wearing only school uniform (without shoes). Three measures for each were obtained and mean of the measure was used for body mass index (BMI) calculation BMI to be calculated using the formula weight (kg)/height (m) [2]. BMI classification according to Indian academy of Pediatrics: As per recommendation of Khadilkar, et al criteria, children were from 5- 17 years [10].

Subjects with BMI >95th percentile was selected for further study. Diamond mercurial deluxe BP monitor with MSI Microtone stethoscope was used for measuring blood pressure with appropriate cuff for the arm length. Three readings were measured and mean was considered as final reading. Hypertension classification according to Indian academy of Pediatrics [8]. Children were classified as per recommendation of Raj M et al blood pressure distribution for Indian children [8].

Statistical analysis:

Data was collected from 157 children. Statistical analysis was done by SPSS software version 20.0 using Pearson’s correlation coefficient test. P<0.001 was considered to be statistically significant.

RESULT

The study included 157 school children from which 62 were females and 95 were males.

Table 1 shows Age wise prevalence of hypertensive children of private schools. It was found that in 5 years, children, prevalence of hypertension was 20%. In 6 years, children, prevalence of hypertension was 25.5%. In 7 years, children, prevalence of hypertension was 19.4%. In 8 years, children, prevalence of hypertension was 42.1%. In 9 years, children, prevalence of hypertension was 35%. In 10 years, children, prevalence of hypertension was 35.3%. Table 2 depicts gender wise prevalence of hypertensive children of

private schools. It was found that female children prevalence of hypertension was 32.3% and in male children, prevalence of hypertension was 25.3%. Table 3 depicts Correlation between HTN and obesity in children of private schools which Correlation analyses revealed a strong positive relationship between HTN and obesity in children of private schools (r=0.61, p<0.001). So, it indicates that as obesity increases, HTN in children of private schools increases

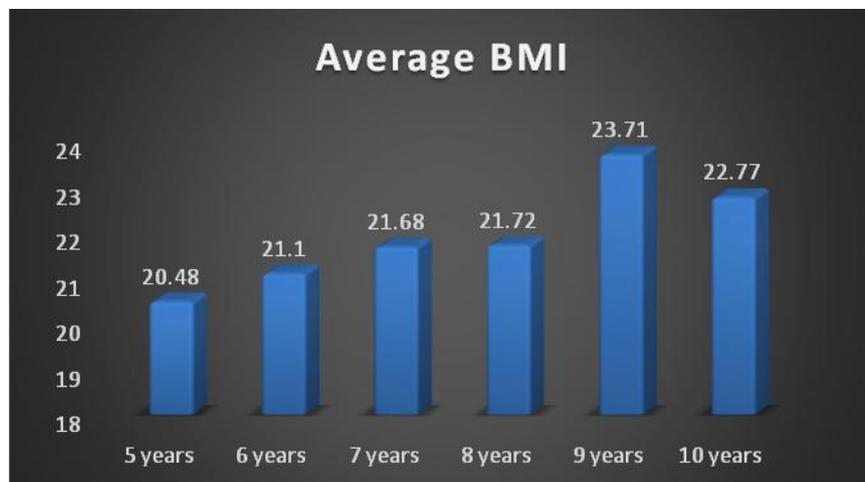
Graph 1 shows average BMI of children of private schools according to their age showing 5 years was 20.48 kg/m^{2c}, 6 years was 21.1kg/m², 7 years was 21.68 kg/m², 8 years was 21.72 kg/m², 9 years was 23.71 kg/m² and that of 10 years was 22.77 kg/m². Graph 2 represents distribution of HTN of children of private schools, that, there were 82 (52.2%) children of private school having normal BP, 31(19.7%) children were prehypertensive while 44(28%) children were hypertensive.

Table 1: Age wise prevalence of hypertensive children of private schools

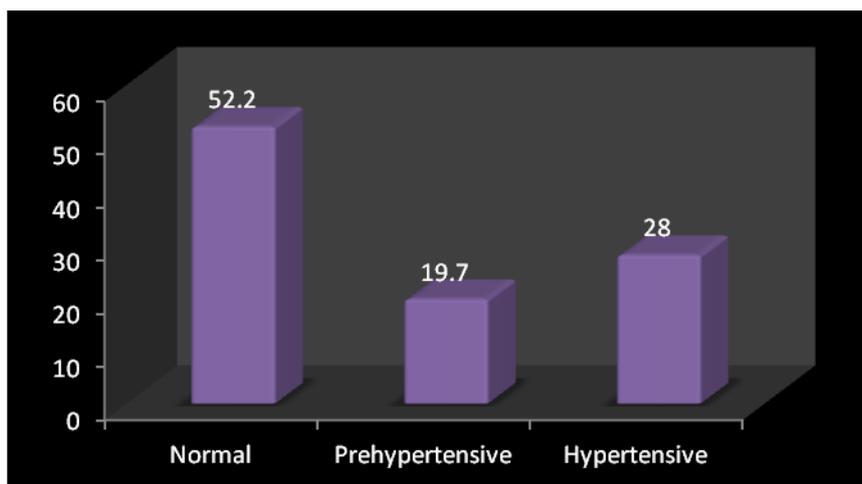
Age	Normal		Prehypertensive		Hypertensive		Total	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
5 years	5	50.0	3	30.0	2	20.0	10	6.4
6 years	30	54.5	11	20.0	14	25.5	55	35.0
7 years	24	66.7	5	13.9	7	19.4	36	22.9
8 years	8	42.1	3	15.8	8	42.1	19	12.1
9 years	8	40.0	5	25.0	7	35.0	20	12.7
10 years	7	41.2	4	23.5	6	35.3	17	10.8
Total	82	52.2	31	19.7	44	28.0	157	100.0

Table 2: Gender wise prevalence of hypertensive children of private schools

Gender	Normal		Prehypertensive		Hypertensive		Total	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Females	30	48.4	12	19.4	20	32.3	62	39.5
Males	52	54.7	19	20.0	24	25.3	95	60.5
Total	82	52.2	31	19.7	44	28.0	157	100.0



Graph 1: Bar diagram representing average BMI of children of private schools



Graph 2: Bar diagram representing distribution of HTN of children of private schools

Table 3: Correlation between HTN and obesity in children of private schools

BMI	BP percentile
Pearson Correlation	p value
0.61	<0.001

DISCUSSION

Six hundred subjects returned with positive parental consent and were screened for blood pressure. 157 children were found obese. The present study highlights the prevalence of hypertension among 157 (26.2%) obese school children aged 5-10 years from Sangli district Maharashtra. As there was strict lockdown restriction across state and districts amid Covid-19 pandemic, obese children were called in the batch of 3 in respective schools to avoid mass gathering for BP measurement. All norms of social distancing and sanitization of BP cuffs after each child were followed strictly.

About (28%) of the children were detected to be hypertensive, (19.7%) were in pre-hypertensive and (52.2%) were in normal category. From which hypertensive (32.3%) and (25.3%) females and males respectively and prehypertensive (19.4%) and (20.0%) females and males respectively. More females were documented to be hypertensive than males of same age where as more males were prehypertensive than females of same age. In 5 years, children, prevalence of hypertension and prehypertension was 20% and 30% respectively. In 6 years, children, prevalence of hypertension and prehypertension was 25.5% and 20%

respectively. In 7 years, children, prevalence of hypertension and prehypertension was 19.4% and 13.9% respectively. In 8 years, children, prevalence of hypertension and prehypertension was 42.1% and 15.8% respectively. In 9 years, children, prevalence of hypertension and prehypertension was 35% and 25.0 respectively. In 10 years, children, prevalence of hypertension and prehypertension was 35.3% and 23.5 respectively. There was increase in prevalence of hypertension and prehypertension with age and BMI status. Correlation analyses revealed a strong positive relationship between HTN and obesity in children of private schools ($r=0.61$, $p<0.001$). So, it indicates that as obesity increases, HTN in children of private schools increases.

Similarly, results were seen in studies done among school going children by Behram shahid *et al.* [11], Manoja Kumar Das *et al* [9]. and N.K. Anand *et al* [4] and reported hypertension was 7.5%, 19.7% and 3.5% of the study population, respectively. Similar observations were reported by study from Haryana, India, were the prevalence of hypertension to be 19.1% in boys and 20.3% in girls [9]. Among 6-14 years old children in Amritsar, hypertension was documented in 7.5% of health children (boys = 8.33% and girls = 6.52%). The prevalence of hypertension increased with age in boys till 10 years of age and in girls till 11 years of age and then dropped till 14

years of age [12]. In Bhopal, among the children aged 14-17 years, a highly significant association ($P < 0.01$) of sex, BMI status of the population and sedentary lifestyle as socioeconomic status and lifestyle factors like reduced physical activity, escalated intake of junk foods and travelling to schools by buses may be the major factors of overweight/obesity [6].

This study indicates the high prevalence ($p < 0.001$) of hypertension in children of 5-10 years in Sangli district, India. With increase in age and BMI, the prevalence of hypertension increased in both sexes. As this study was conducted in 2021, the schools, playground, parks etc., were closed due COVID-19 pandemic there is a decreased physical activity and increased sedentary life style of the child, might be a reason of increased prevalence of obesity. The findings suggest for systematic nationwide documentation of the prevalence of hypertension and its relationship with the risk factors to identify suitable preventive measures. Also, it mandates blood pressure check-up for children during routine Pediatrics clinical practice and school health check-up, including dietary advice, exercise protocol according to their age and heart rate should be prescribed.

Meyer AA et al [13], studies show there was an Improvement of early vascular changes and cardiovascular risk factors in obese children after a six-month exercise program. Exercises were conducted 3 times/week: on Mondays, swimming and aqua aerobic training (60 min); Wednesdays, sports games (90 min); and Fridays, walking (60 min), by qualified coaches and physiotherapists. Intervention produced a significant decrease in systolic mean BP and an increase in physical fitness data (maximum work capacity [Wmax] [13].

There are few limitations in this study. This study was conducted with the available students of private schools due to COVID-19 pandemic restrictions and guidelines; all schools were closed due to states were having strict lockdown rules and regulations in India. Only private schools of

Sangli district were included and subjects from rural schools were not. Experimental Studies on hypertensive and prehypertensive obese children can be done by giving detailed exercise protocol to reduce BMI of obese school children of private schools and recording their blood pressure readings before intervention and after intervention once their BMI is between 3rd – 85th percentile according to their age group. Similar study can be done on lower and middle socioeconomic class children.

CONCLUSION

In this study, there is a prevalence of hypertension in obese children of private schools among 5-10 years of age is 28%. There is a high significant association $p < 0.001$ of BMI and blood pressure was seen. There is a significantly positive correlation analyses revealed a strong positive relationship between hypertension and obesity in children of private schools ($r = 0.61$), which indicates that as obesity increases, hypertension in children increases. It is necessary to keep a check on blood pressure for children during routine Pediatrics clinical follow up, school health check-up, and detailed exercise protocol to be advised by a qualified physiotherapist like swimming, sports, outdoor games, walking etc., to maintain normal body mass and BMI which will help to prevent future cardiovascular complications.

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