

Original Research Article

The Association Of Hypertension With Obesity And Positive Family History Of Hypertension In Adolescents In Uttar Pradesh, India.

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Contribution

VA conceptualise the topic and planning. Data collection & Review of literature was done by RS & SK under guidance & supervision of VA. All interpreted, analysed data, prepared manuscript and reviewed it.

Conflict of interest –None, **Funding**-None

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ABSTRACT

Introduction: Childhood hypertension is on rise globally yet it remains underdiagnosed. This study aims to document the prevalence of hypertension in adolescents and its risk factors. **Methods:** Eight hundred and sixteen children studying in class 9th of a public school aged between 14-15 years were enrolled between July 2021 to January 2022. Their BMI & blood pressure was recorded. Overweight and obesity were defined using BMI cut-offs & prehypertension/hypertension by blood pressure centile charts. **Results:** Prevalence of prehypertension & hypertension was 9.5% & 5.3%. Children categorised as obese/overweight had higher prevalence of prehypertension/hypertension. The odds of having hypertension were 2.7 times more in children with positive family history of hypertension irrespective of

BMI status. The prevalence of overweight & obesity was 19.1% & 9.6% Conclusion: Both overweight/obesity and hypertension are common health problems in adolescents. The prehypertension/ hypertension has significant association with overweight/obesity and positive family history of hypertension.

Keywords: High blood pressure, adolescents, obese, Body mass index

INTRODUCTION

Childhood essential hypertension is rising as is obesity [1-4] yet majority of times it remains underdiagnosed till early adulthood and often detected with the occurrence of some serious cardiovascular complications of long standing hypertension [5-8]. These two common non-infectious health conditions with serious long-term complications are entangled with today's lifestyle of unhealthy dietary habits, increased affordability & more facilities associated with physical inactivity. The available data on prevalence of hypertension in children and its risk factors has shown wide variation ranging from 0.98% to 24% [9-12].

The plausible explanation for it could be the difference in lifestyle, local factors, age group selected (varying from 3 years to 17 years). But it highlights the need of local data and follow up of the participants must be continued for some years to observe the trend. [13]

These were the reasons to plan this study to know the magnitude of hypertension and obesity in adolescents in the served population.

Material And Methods

The present study was a cross sectional study undertaken in a public school in urban western Uttar Pradesh situated in vicinity of study centre between July 2021 to January 2022. The sample size was calculated using formula $n = \frac{Z^2 P(1-P)}{d^2}$, where prevalence used was 6% [6] and d was 5% precision. The sample size required using this formula was 90. But it was decided to increase the number of participants to improve the accuracy and significance of observations 816 children studying in class 9th, age group 14-15 years were included after consent and assent. Children with any renal disease associated with secondary hypertension or taking medication known to affect blood pressure were excluded. The study was approved by Institute ethics committee. Necessary permission was obtained from school authorities and parental consent was must for participation in the study. The data collected was age, family history of hypertension, abdominal girth, weight & height which were used to calculate Body mass index (BMI) using formula $BMI = \frac{\text{weight(K)}}{\text{Height}(\text{m}^2)}$. Age and gender specific IAP charts were used to classify the children as having normal BMI, overweight (85th centile to 95th centile) or obese (above 95th centile). Blood pressure was recorded in sitting position in left arm after ensuring a rest of 15 minutes. For each child it was recorded thrice at an interval of 5 minutes in between each reading and mean of these three readings was the value used for statistical calculations. Blood pressure was recorded by Omron digital BP monitor

with appropriate size cuff. The blood pressure between 90th to 95th centile was considered as prehypertension & above 95th centile as hypertension.

Statistical analysis was done using MS excel and Stata software. Basic descriptive statistics (mean & standard deviation) were calculated for BMI, age, waist circumference and blood pressure (both systolic and diastolic). Odds ratio was calculated with 95% confidence interval and chi square test was applied for association between categorical variables

Results

The sample comprised of 816 children with a mean age of 14.5 months \pm 0.5 years with almost equal number of males to female. Overall prevalence of prehypertension & hypertension was 9.5% & 5.3% respectively. The prevalence of overweight & obesity was 19.1% & 9.6% respectively. Hypertension was commoner in overweight & obese children as compared to normal BMI children. This difference in the prevalence of hypertension in different BMI category was statistically significant (p value < 0.001). Prevalence of hypertension was also higher in children with abdominal obesity & in those with positive family history of hypertension. The prevalence of high blood pressure increased if the number of family members having essential hypertension was more.

Table I presents the characteristics of the study population.

Table II presents the distribution of Prehypertension & hypertension in study participants according to BMI status

Figure 1 shows the prevalence of prehypertension and hypertension in study participants stratified by BMI categories of obese, overweight, and normal. Both hypertension and prehypertension were commoner in children with BMI above normal.

Table III shows impact of positive family history of hypertension in individuals with normal BMI category. Children with positive family history of hypertension had higher odds of having hypertension as compared to negative family history counterparts with normal BMI.

Discussion

Present study was aimed to get an insight on prevailing prevalence of hypertension and obesity in adolescents in the served population, and to study the association of hypertension with some commonly implicated risk factors like overweight/obesity and positive family history of hypertension.

The prevalence of **prehypertension & hypertension in present study** was 9.5% & 5.3% respectively, much higher than the values quoted by studies about a decade old. The observations of present study are in concordance with the results of a recent study from Mumbai[6], they reported prevalence of prehypertension and hypertension in 9-15 years old children as 7.5% and 5.4%. Much higher prevalence of hypertension at 24.41% in urban school going adolescents (13 to 17 years) was reported from Chennai[9]. Prevalence of

16.2% was reported from Rajasthan[5],15.3% from Manipur in 5-15 years old children[14].Low prevalence of hypertension at 1.3% was reported from Guntur in a recent study[15] & 0.98% from Pondicherry [10] The data available related to the subject is patchy and it is difficult to compare the results as lifestyle habits vary greatly across the country. So, the follow-up studies will be required to compare, to know the trends of prevalence & to formulize the corrective steps.

Overweight/obesity

In present study the prevalence of overweight & obesity was high at 19.1% & 9.6% respectively. Even higher prevalence of overweight & obesity as 20.18% &16.01% has been reported recently (2018) from Mumbai in urban school going adolescents [6]. Slightly lower prevalence has been reported from Rajasthan [7] Their study included 6 to 14 years old children & the reported prevalence of overweight & obese was 11.2% & 5.2%.The rising trend of overweight/obesity becomes apparent by looking at a decade old studies in which the prevalence was lower and ranged from 16% [14-16] ,18.1% to 21.2% [17-19]

High blood pressure and overweight/obesity

18.5% overweight & 33% of obese children in present study had prehypertension/hypertension in comparison to 11.3% of children with normal BMI. This observation is similar to the findings of[6], they enrolled 1486(9-15 years old children),and reported that 14% of overweight and 30.2% of obese children had prehypertension or hypertension. The results of present study are also in concordance with a study [18] they reported that 52.1% of overweight & 56.2% of obese adolescents (13-17 years) in their study had Blood pressure in prehypertension or hypertension range. In a megaproject named ORANGE the reported prevalence of prehypertension & hypertension in adolescents was 20.4% & 5.2% respectively [17]. Another recent study on adolescents reported the prevalence of hypertension as 33% in obesity/ overweight children [19].

Strong association between BMI and blood pressure has been studied extensively. A study from Iran among 3-6 years old children reported a significant linear relationship between BMI and systolic and diastolic blood pressure [3]. A study from Tamil Nādu in 10-16 years old children reported strong positive association between BMI and hypertension [20]. The confirmed increasing trend of high prevalence of prehypertension/hypertension in adolescents especially those with high BMI has pushed the researchers into tracking these children till adulthood and reported that more than 70% subjects with high BP (90 to 95th centile/prehypertensive range) continued to have blood pressure in same centiles even in adulthood. There are studies which report that other than body mass index other indicators of obesity like waist hip ratio, abdominal circumference were also independent risk factors for both hypertension and prehypertension [21].

Association between BP & positive family history of hypertension

In present study the Children with positive family history of hypertensive parents or grandparents were at higher risk of having hypertension than those without. odds of having high BP were 2.7 times more in those with positive family history in comparison to their counter parts with negative family history of hypertension. This finding is similar to the observations of many studies from all over India and world. (1,19)

CONCLUSION

The prevalence of prehypertension /hypertension & overweight/ obesity in adolescents in present study was high as compared to the studies done about a decade ago. The strong association of BMI and blood pressure was evident in present study. as there was statistically significant higher prevalence of prehypertension/hypertension in overweight/obese children as compared to normal BMI counterparts. Another important risk factor for hypertension in children was positive family history of high blood pressure.

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Table I: The clinical characteristics & prevalence of prehypertension/hypertension in study participants

Variable	Individual N=816 N (%)	Hypertension/Prehypertension n=121(14.8) number (%)	X ²	P value
Age, years	14.5 +/- 0.5			
Gender				
Male	410(50.2)	76(18.5)	8.97	<0.002
Female	406(49.7)	45(11.1)		
Systolic BP, mm Hg mean+/-SD	107 +/-12			
Diastolic BP, mmHg mean+/-SD	63 +/-7			
BMI, mean+/-SD	17.58 +/-3.54			
BMI Status				
Normal	582(71.3)	66(11.3)	28.5	<0.001
Overweight	156(19.1)	29(18.5)		
Obesity	78(9.6)	26(33.3)		
Waist circumference (cm), mean +/-SD	70.2+/-10.9			
Abdominal obesity				
No	612(75)	81(13.2)	4.92	0.027
yes	204 (25)	40(19.6)		

Family history				
No	596(73)	77(12.9)	7.61	0.055
yes	220(27)	44(20.0)		
Number of members with +FH				
1	96	18(18.9)	7.65	0.022
2	76	10(13.2)		
3 or more	48	16(33.3)		

Table II: Distribution of Prehypertension & hypertension in study participants according to BMI category

BMI category	Total N=816	Combined (Prehypertension + Hypertension) n=121(14.8)	Prehypertension n=78(9.5)	Hypertension N=43(5.3)
Normal	582	66(11.3)	44(7.5)	22(3.7)
overweight	156	29(18.5)	19(12.1)	10(6.4)
obese	78	26(33.3)	15(20.5)	11(12.8)

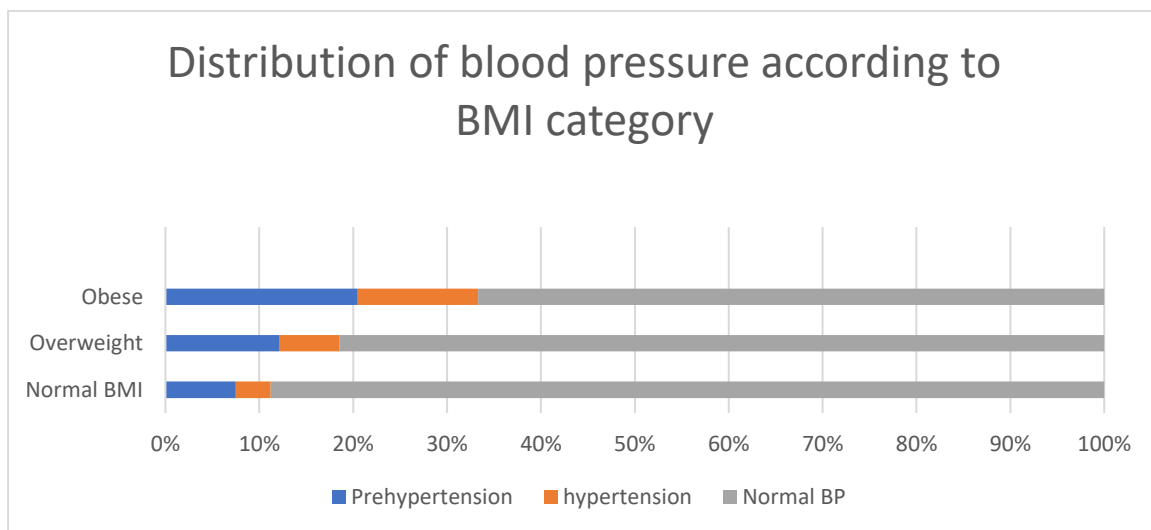


Figure 1: The prevalence of normal blood pressure, prehypertension, and hypertension according to the BMI category in study participants

Table III: Analysis of adolescents with normal BMI status (Total number=582), with hypertension (number =66) and positive family history of hypertension.

	High BP n	Normal BP n	Odd's ratio	Confidence interval
Positive family history of Hypertension	34	142	2.7	(4.54,1.60)
Negative family history of Hypertension	32	374	-	-
Total N=582	66	516		