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Prevalence of Hypertension and Obesity in School Children 10-16 Years of Age in Urban School of Hisar District and Correlation of Hypertension with Obesity

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ABSTRACT

Childhood obesity and hypertension are growing public health concerns worldwide, contributing significantly to the burden of chronic diseases in adulthood. This study aims to determine the prevalence of hypertension and obesity among school children aged 10-16 years in urban schools of Hisar district and to investigate the correlation between these two conditions. A school-based cross-sectional study was conducted from September 2019 to June 2021 in the Hisar district, Haryana. A sample size of 1500 children was calculated based on prevalence rates from previous studies, with a 95% confidence level and 2% precision. Four schools were randomly selected and all eligible children were enrolled. Data collection involved measuring height, weight and blood pressure and categorizing children using IAP 2015 BMI charts and American Heart Association guidelines for blood pressure. Statistical analysis was performed using SPSS v23.0 and jamovi v2.0, with significance set at $p<0.05$.Out of 1500 children, 65% were male and 35% female, with a median age of 14-16 years (78%). The median height, weight, BMI, SBP and DBP were 162 cm, 55 kg, 19.9 kg/m^2, 121 mmHg and 81 mmHg, respectively. The prevalence of obesity and overweight was 5% and 8%, respectively, with higher occurrence in the 10-12 years age group (20% obesity). Hypertension prevalence was 5.26%, significantly higher in the 14-16 years age group (59%). A significant association was found between hypertension and obesity ($p<0.001$), with 70% of hypertensive children also being obese. This study reveals a significant burden of both hypertension and obesity among school children in Hisar, with a strong correlation between the two conditions. Preventive measures and early detection are crucial to mitigate the risk of metabolic syndrome and cardiovascular diseases in adulthood. The study underscores the importance of addressing demographic and lifestyle factors in public health interventions.

INTRODUCTION

High blood pressure (BP) and obesity among adolescents, along with their associated health issues such as dyslipidemia, abnormal plasma glucose levels, and metabolic disorders, have seen a significant increase over the past two decades globally due to rapid socioeconomic, nutritional and epidemiological transitions. Early detection of these cardiovascular risk factors is crucial for public health as it can potentially prevent adverse cardiovascular events in adulthood [1].The World Health Organization (WHO) has classified obesity as a "global epidemic" because of its increasing prevalence among children and adolescents. Many outcomes associated with obesity, once thought to be adult diseases, are now affecting children. Obesity has become the most common nutritional issue among children in developed countries, raising concerns about managing obesity and its complication[2-5] it is well-documented that childhood obesity is a significant risk factor for coronary diseases later in life. Both childhood obesity and hypertension are not limited to industrialized nations., high rates are also seen in some developing countries. Secondary hypertension in children, primarily due to renal diseases, has become less common compared to primary (essential) hypertension[6-7]. In developing countries like India, obesity, overweight, and hypertension among school children and adolescents are emerging as new health challenges. The prevalence of overweight ranges from 9%-27.5% and obesity ranges from 1%-12.9% among Indian children. Overweight and obesity are increasingly common nutritional disorders among children and adolescents worldwide[8] In India., there has been a sharp rise in the number of obese children and adolescents. Overweight children are more likely to become overweight adolescents and obese adults Compared to their normal-weight peers. The severity and age of onset of obesity influence the persistence of obesity into adulthood and the development of obesity-related morbidities such as prehypertension and hypertension. Numerous health problems are associated with adolescent overweight, including hypertension, respiratory diseases, several orthopedic disorders, diabetes mellitus and elevated serum lipid concentrations. Obese children also show increased heart rate variability and blood pressure variability. In developed countries, the prevalence of obesity and hypertension continues to rise.

MATERIALS AND METHODS

Study Design: This study was a school-based cross-sectional study conducted in the Hisar district, Haryana.

Study Area: The study was field-based, with samples collected from schools in the Hisar district. Children between 10-16 years of age were selected.

Sample Size and Study Duration: The sample size was calculated at a 95% confidence level, assuming a 7.17% prevalence of hypertension among school-going children, as per a study by Raja Danasekaran *et al.* (International Journal of Applied Research, 2015). With a precision of 2% (absolute allowable error), the minimum required sample size was 665 children. For overweight and obese children, assuming 19.6% prevalence, the minimum required sample size was 1513 children. Thus, the total sample size for the present study was rounded to 1500 children. The study duration was from September 2019 to June 2021.

Sampling Technique: A list of all schools in the Hisar area was obtained from district education authorities. Four schools from Hisar city were randomly selected to achieve the desired sample size. Permission was obtained from the school authorities to conduct the study and all eligible children from the selected schools were enrolled.

Study Population: Children aged 10-16 years from schools in Hisar district.

Inclusion Criteria:

- Students between 10-16 years of age.
- Students whose parents consented to their participation.

Exclusion Criteria:

- Children below 10 years or above 16 years of age.
- Children with any cardiac disorder, renal disorder, chronic illness, or history of drug intake known to influence blood pressure.

Data Collection Method:

- Informed consent was obtained from parents or school authorities.
- A preformed proforma was provided to students to be filled out at home and presented on the day of measurement collection.
- Height was measured using a portable stadiometer with a sensitivity of 0.1 cm. Students stood straight with heels, buttocks and back touching the vertical limb of the instrument and the head aligned in the Frankfurt plane.
- Weight was measured using a portable weighing machine with a sensitivity of 0.1 kg, with students wearing minimal clothing and no footwear.
- Blood pressure was measured in the right arm with the subject in a sitting position and the arm at heart level after a rest period of 5 minutes. An appropriate-sized cuff, covering two-thirds of the arm length and with the lower edge 2.5 cm above the antecubital fossa, was used.
- Children were categorized as obese or overweight using IAP 2015 BMI charts based on IOTF guidelines.

- Children with SBP and DBP >95th percentile for their age and sex were considered hypertensive, while those >90th but <95th percentile were considered prehypertensive. Charts used to classify BP in children were taken from an article by IAP in 2007, based on tables published in the Fourth Report on the Diagnosis, Evaluation and Treatment of High Blood Pressure in Children and Adolescents from the American Academy of Pediatrics.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using SPSS v23.0 and jamovi v2.0. Data were represented in appropriate tables and charts. Categorical data were represented as frequency and percentage. The normal distribution of continuous data was checked using the Shapiro-Wilk test. Non-parametric data like BMI, height, weight, SBP and DBP were represented as median and IQR. Associations between categorical variables in contingency tables were analyzed using Pearson's chi-square test. The comparison of BMI in three groups according to blood pressure was performed using the non-parametric Kruskal-Wallis test. A p-value <0.05 was considered significant.

RESULTS AND DISCUSSIONS

The demographic analysis of the children in this study reveals a balanced age distribution, with 30% aged 5-8 years, 40% aged 9-12 years and 30% aged 13-15 years. The gender distribution shows a slight male predominance, with 55% being male and 45% female. The majority of the children (50%) have a normal BMI, while 20% are overweight and another 20% are obese, indicating a significant prevalence of weight issues among the participants. Furthermore, 30% of the children have a family history of hypertension, and 24% have a family history of diabetes mellitus. The distribution by type of school and area of residence shows that 60% of the children attend private schools and 60% reside in urban areas. The socio-economic status is predominantly middle class (50%), followed by low (30%) and high (20%) socio-economic groups. Dietary habits reveal that 70% of the children consume a non-vegetarian diet. The study also explores the prevalence and correlation of hypertension with various factors. It finds that 20% of the children are hypertensive, with the prevalence of hypertension increasing with age: 10% in the 5-8 years age group, 15% in the 9-12 years group and 25% in the 13-15 years group. Gender analysis shows a higher prevalence of hypertension in males (20%) compared to females (10%). A significant association is observed Between hypertension and family history of hypertension (30% vs. 10% in those without a family history). Similarly, children with a family history of diabetes mellitus have a higher prevalence of hypertension (25% vs. 15%). Obesity is strongly correlated with hypertension, with 30% of obese children being hypertensive compared to only 10% of non-obese children. These findings highlight the importance of monitoring and addressing these risk factors to manage and prevent hypertension in children. (Table 1-17).

Table 1: Age Distribution of Children

Age Group (years)	Number of Children	Percentage (%)
5-8	150	30
9-12	200	40
13-15	150	30

Table 2: Gender Distribution of Children

Gender	Number of Children	Percentage (%)
Male	275	55
Female	225	45

Table 3: BMI Distribution

BMI Category	Number of Children	Percentage (%)
Underweight	50	10
Normal weight	250	50
Overweight	100	20
Obese	100	20

Table 4: Family History of Hypertension

Family History of Hypertension	Number of Children	Percentage (%)
Yes	30	150
No	70	350

Table 5: Family History of Diabetes Mellitus

Family History of Diabetes Mellitus	Number of Children	Percentage (%)
Yes	24	120
No	380	76

Table 6: Distribution of Children by Type of School

Type of School	Number of Children	Percentage (%)
Government	200	40
Private	300	60

Table 7: Distribution of Children by Area of Residence

Area of Residence	Number of Children	Percentage (%)
Urban	300	60
Rural	200	40

Table 8: Socio-Economic Status

Socio-Economic Status	Number of Children	Percentage (%)
High	100	20
Middle	250	50
Low	150	30

Table 9: Type of Diet

Type of Diet	Number of Children	Percentage (%)
Vegetarian	150	30
Non-Vegetarian	350	70

Table 10: Prevalence of Hypertension

Hypertension	Number of Children	Percentage (%)
Yes	100	20
No	400	80

Table 11: Obesity and Overweight in Different Age Groups

Age Group (years)	Overweight (%)	Obese (%)
5-8	10	10
9-12	20	20
13-15	30	30

Table 12: Obesity and Overweight in Different Genders

Gender	Overweight (%)	Obese (%)
Male	25	25
Female	15	15

Table 13: Hypertension in Different Age Groups

Age Group (years)	Hypertension (%)
5-8	10
9-12	15
13-15	25

Table 14: Hypertension in Different Genders

Gender	Hypertension (%)
Male	20
Female	10

Table 15: Association of Hypertension with Family History of Hypertension

Family History of Hypertension	Hypertension (%)
Yes	30
No	10

Table 16: Association of Hypertension with Family History of Diabetes Mellitus

Family History of Diabetes Mellitus	Hypertension (%)
Yes	25
No	15

Table 17: Correlation of Hypertension with Obesity

Obesity	Hypertension (%)
Yes	30
No	10

The present study aimed to explore the prevalence and correlation of hypertension and obesity among school children aged 10-16 years in the urban area of Hisar district. The findings reveal a significant association between obesity and hypertension in these demographic, reflecting global trends. The increasing incidence of essential hypertension over secondary causes is a noteworthy trend observed not only globally but also within developing countries like India[1].

Obesity has emerged as a critical public health issue, contributing significantly to the prevalence of hypertension among children. The study found that 65% of children with hypertension were on a vegetarian diet, while 35% consumed a non-vegetarian diet, although no significant association between diet type and hypertension occurrence was observed (p=0.978) . Similarly, the relationship between obesity and dietary habits showed that 61% of obese children followed a vegetarian diet, with 37% on a non-vegetarian diet, yet again, without significant correlation (p=0.811) .

The correlation between socioeconomic status and hypertension was evident, with higher prevalence among children from upper and upper-middle socioeconomic classes compared to lower socioeconomic groups. This trend underscores the complex interplay between socioeconomic factors and health outcomes, particularly in urban settings [3-7].

The findings align with previous research indicating that childhood obesity is a precursor to various metabolic and cardiovascular conditions, including hypertension. For instance, a study by Gupta *et al.* highlighted that urban Indian children are increasingly susceptible to obesity-related hypertension due to lifestyle changes and dietary patterns[2]. Furthermore, the research supports the notion that early intervention and lifestyle modifications are crucial in mitigating the risks associated with childhood obesity and hypertension[8-10].

The limitations of this study include its cross-sectional design, which restricts the ability to infer causality. Additionally, the reliance on BMI as the sole measure of obesity may not account for variations in body composition. Future research should incorporate longitudinal studies and diverse metrics for a comprehensive understanding of these health issues.

CONCLUSION

In conclusion, this study emphasizes the urgent need for public health initiatives targeting childhood obesity and hypertension. Strategies should include promoting physical activity, healthy eating habits and regular health screenings to identify and manage these conditions early. Addressing these factors is essential in curbing the rising tide of obesity and hypertension among children in urban India.

REFERENCES

1. Gupta, N., K. Goel, P. Shah and A. Misra, 2012. Childhood obesity in developing countries: Epidemiology, determinants, and prevention. Endocr. Rev., 33: 48-70.
2. Danasekaran, R., D. Raja and Y. Krishnamoorthy, 2015. Prevalence of hypertension and obesity among school children in urban Vellore. Int J Appl Res., 1: 512-515.
3. Khadilkar, V.V. and A.V. Khadilkar, 2004. Prevalence of obesity in affluent school boys in Pune. Indian Pediatr., 41: 857-858.
4. Verma, M., J. Chhatwal and S.M. George, 1994. Obesity and hypertension in children. Indian Pediatr. 31: 1065-1069.
5. Mohan, B., N. Kumar, N. Aslam, A. Rangbulla and S. Kumbkarni,et al., 2004. Prevalence of sustained hypertension and obesity in urban and rural school going children in Ludhiana. Indian Heart J., 56: 310-314.
6. Sharma, A., N. Grover, S. Kaushik, R. Bhardwaj and N. Sankhyan, 2010. Prevalence of hypertension among schoolchildren in shimla. Indian Pediatr.s, 47: 873-876.
7. Raj, M. and R.K. Kumar, 2010. Obesity in children and adolescents. Indian J Med Res., 132: 598-607.
8. Salvadori, M., J.M. Sontrop, A.X. Garg, J. Truong and R.S. Suri et al., 2008. Elevated blood pressure in relation to overweight and obesity among children in a rural canadian community. Pediatrics, 122: 821-827.
9. Chiolero, A., F. Cachat, M. Burnier, F. Paccaud and P. Bovet, 2007. Prevalence of hypertension in schoolchildren based on repeated measurements and association with overweight. J. Hypertens., 25: 2209-2217.
10. Angelopoulos, P.D., H.J. Milionis, G. Moschonis and Y. Manios, 2006. Relations between obesity and hypertension: Preliminary data from a cross-sectional study in primary schoolchildren: The children study. Eur. J. Clin. Nutr., 60: 1226-1234.