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ORIGINAL RESEARCH

PREVALENCE OF HYPERTENSION AND ITS ASSOCIATION WITH OBESITY AMONG SCHOOL GOING CHILDREN IN SELECTED SCHOOLS OF INDORE

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ABSTRACT:

Background: Obesity and obesity-related disorders are worldwide concerns in both developing and developed countries. Present study has been conducted to determine the prevalence of hypertension and its association with obesity among school going children in selected schools of Indore

Materials and methods: This cross-sectional study was conducted among 3 private school students of Indore city, aged between 12—15 years in one private school of Indore.The questionnaires were sent to the students' families to obtain information related to age, sex, socioeconomic status of the students, and whether they or their families have any diseases such as diabetes or hypertension.The students were examined at school, and their weights, heights, and blood pressures (BPs) was measured & physical Examination was done.

Results: Of 2118 children, 118 were excluded in the study as parents were uncooperative and due to absenteeism. A total of 2000 students aged between 12 and 15 years were evaluated in our study. Among the total students, 56% were females (n= 1,120) & 44% were males (n= 880). The prevalence of hypertension and obesity was 4.8% (n=96) and 8.8% (n=176), respectively. In obese group, 10.2% had >90th percentile BP for the age and sex, and 6.8% had >95th percentile, and in the non-obese group, 4.3% had >90th percentile, and 2.4% had >95th percentile. The difference between the obese and non-obese group was statistically significant. In the obese group, mean SBP was 128.7 mmHg while in the non-obese group; it was 119.2 mmHg which was statistically significant. In obese group, mean DBP was 83.2 mmHg while it was 77.6 mmHg in the non-obese group which was statistically significant. It was found that a higher percentage of students who were obese had high BP when compared with children who were not obese. In obese group, the prevalence of hypertension was significantly higher than in normal weight groups.

Conclusion: The prevalence of obesity and hypertension are high among school children of 12-15 years of age in Bengaluru. Obesity is associated with hypertension and it is more common in females. BP measurements should be part of the routine clinical examination, especially in obese children.

Keywords: hypertension, obesity, overweight.

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INTRODUCTION

Obesity and obesity-related disorders are worldwide concerns in both developing and developed countries. Since many kinds of chronic metabolic diseases are associated with obesity, the management of obesity and other related disorders has been the focus of investigation. Hypertension is a major chronic disorder, which is associated with obesity (1).

The adoption of western diet contributes to the increasing rates of obesity and overweight in both children and adults. (2)

The occurrence of hypertension has been increasing alarmingly in both low and middle-income countries (3)

The prevalence of childhood hypertension has been increasing; it currently occurs at a rate of 1%–2% in developed countries and a rate of 5%– 10% in developing countries (4,5).

Even asymptomatic children with elevated blood pressure can develop target organ damage, and they are at an increased risk of cardiovascular disease in adulthood. Due to this, early detection, proper evaluation, and appropriate management of hypertension at an early age is important for the prevention or restriction of the diseases related to hypertension (6-8).

It is also important to note that cardiovascular disease, including hypertension, is one of the most common reasons of death (9).

MATERIALS AND METHODS

This cross-sectional study was conducted among 3 private school students of Indore city, aged between 12—15 years in one private school of Indore.

The schools were selected randomly.

The permission from School authorities was taken with the help of institution to undertake the study.

The aim of the was explained to students and their family, and written informed consent was obtained from the families 2–3 days before collecting the data. The questionnaires weresent to the students' families to obtain information related to age, sex, socioeconomic status of the students, and whether they or their families have any diseases such as diabetes or hypertension.

The students were examined at school, and their weights, heights, and blood pressures (BPs) was measured & physical Examination was done.

The weight was measured with a standard portable scale with children wearing standard school clothes without shoes. A standard measuring tape was used to measure the height while the children were barefoot.

BPs were measured from the students' right arms after the students had been seated for 5 min. An appropriate cuff that fit the students' arms was chosen. BP was measured 3 times at intervals of 5 min, and the mean of the 3 BP measurements was calculated.

BP was evaluated in accordance with the report published by the American Pediatrics Academy's National High Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents (10).

Hypertension is defined as having the average systolic BP (SBP) or diastolic BP (DBP) fall between the 95th percentile and the 99th percentile for sex, age, and height. Prehypertension is classified as the average SBP or DBP falling between the 90th percentile and the 95th

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percentile. Malignant hypertension is defined as having the average SBP or DBP at or above the 99th percentile (11).

Body mass index (BMI) was calculated as the body weight in kilograms divided by the square of height in meters. Since there was a wide range of ages, from 12 to 15 years, a BMI-for-age curve was used to classify the nutritional status of the students in accordance with the 2007 World Health Organization (WHO) growth charts (http://www.who.int/childgrowth/en/).

A BMI value in the 95th percentile or greater was defined as obesity, and a value between the 85th and 95th percentiles for age and sex was considered as overweight.

Furthermore, the families of students who were found to be hypertensive and obese were informed about the situation and referred to family doctors for further observation.

RESULTS

Of 2118 children, 118 were excluded in the study as parents were uncooperative and due to absenteeism. A total of 2000 students aged between 12 and 15 years were evaluated in our study. Among the total students, 56% were females (n= 1,120)& 44% were males (n= 880). Distribution of hypertension cases by BMI is given in Table 1. The prevalence of hypertension and obesity was 4.8% (n=96) and 8.8% (n=176), respectively.

The relationship between obesity and hypertension is presented in Table 2.

In obese group, 10.2% had >90th percentile BP for the age and sex, and 6.8% had >95th percentile, and in the non-obese group, 4.3% had >90th percentile, and 2.4% had >95th percentile. The difference between the obese and non-obese group was statistically significant.

In the obese group, mean SBP was 128.7 mmHg while in the non-obese group; it was 119.2 mmHg which was statistically significant. In obese group, mean DBP was 83.2 mmHg while it was 77.6 mmHg in the non-obese group which was statistically significant. It was found that a higher percentage of students who were obese had high BP when compared with children who were not obese.

When the relationships between hypertension and BMI, age and sex were considered, the significant variable was BMI. In obese group, the prevalence of hypertension was significantly higher than in normal weight groups.

Table 1: Distribution of hypertension cases by BMI

BMI	Hypertensive cases n= 96	
	Male n (%)	Female n (%)
Normal	32 (78)	43 (78.1)
Overweight	4 (9.7)	5 (9)
Obese	5 (12.2)	7 (12.7)
Total	41 (100)	55 (100)

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Table 2: Relationship between obesity and hypertension

BP	Obese (%)	Non obese (%)	Total (%)
90^{th}-95^{th}	6 (3.4)	35 (1.9)	41 (2)
$>95^{th}$	12 (6.8)	44 (2.4)	56 (2.8)
Normal	158 (89.7)	1745 (95.6)	1903 (95.1)
Total	176 (100)	1824 (100)	2000 (100)

Table 3: Distribution of BP as per BMI

BP	Normal n (%)	Overweight n (%)	Obese n (%)
Normal	1496 (93.4)	209 (93.7)	158 (89.7)
90^{th}-95^{th}	30 (1.8)	5 (2.2)	6 (3.4)
$>95^{th}$	75 (4.6)	9 (4)	12 (6.8)
Total	1601 (100)	223 (100)	176 (100)

Table 4: Distribution of children as per BMI

BMI	Male n (%)	Female n (%)
Normal	708 (80.4)	893 (79.7)
Overweight	95 (10.8)	128 (11.4)
Obese	77 (8.7)	99 (8.8)
Total	880 (100)	1120 (100)

DISCUSSION

In the present study, we found a high prevalence of hypertension and obesity among school children 12-15 years of age in Indore. Obesity was found to be associated with hypertension in children. In this study, 2000 students were examined, and the prevalence of hypertension and obesity was 4.8% (n=96) and 8.8% (n=176), respectively. 7.6% of obese children had high BP compared to 2.4% in non-obese children. Both mean SBP and DBP were higher in obese children than in non-obese children. This was comparable with the results of a study by Gupta and Ahmad [11]. The exact prevalence of childhood hypertension is difficult to assess, as the results vary significantly depending on the age, selection of children for the survey (general population compared with school-based survey), BP measurement methods and a number of BP readings.

The present study found the significant rise of hypertension with obesity, around 22.2% of the obese children in our study had hypertension, and 11.1% had pre-hypertension for the age. This association also demonstrated in many studies such as the Norwegian study [12] and the Taiwan study [13] and the Framingham study [14] which also showed increased the prevalence of obesity in participants with hypertension as well increase in BP in established obesity. Many studies from India [11,15-17] had similar observations. Similar observations were also reported among the adolescent population in Hungary [18] and France [19] and such association in early childhood with SBP alone was reported by British cohort [20]. Andriska et al. [21] found 41% of their hypertensive children were obese, so they concluded that obesity plays very important role in development of childhood hypertension.

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Children who are at risk for hypertension should be identified earlier to prevent them from developing adult hypertension. Primary health care centers have routine pediatric well-child visits and hence are important for early identification of hypertension. In these visits, a child's weight, which is an important predictor of hypertension, must be measured and BMI should be evaluated. For this reason, school health programs and school health centres must be well established. Using these strategies to prevent the disease in childhood can affect the reduction of disease in adulthood, which remains one of the most important public health challenges. Findings of our study suggest a need for larger population-based studies to accurately estimate the prevalence and risk factors for hypertension among the adolescents and young adults in our country.

Limitations of our study were that the study was conducted in an urban area. The children in urban settings and higher socioeconomic groups had a higher prevalence of overweight and obesity; all BP measurement was taken by a single observer, which may be a source of bias. We have not studied other factors such as physical activity, diets, and salt intake. We also did not follow-up, so we did not know how many of children require antihypertensive medications, and do they develop any complications.

CONCLUSION

The prevalence of obesity and hypertension are high among school children of 12-15 years of age in Bengaluru. Obesity is associated with hypertension and it is more common in females. BP measurements should be part of the routine clinical examination, especially in obese children.

REFERENCES

1. Ostchega Y, Hughes JP, Terry A, Fakhouri TH, Miller I. Abdominal obesity, body mass index, and hypertension in US adults: NHANES 2007-2010. Am J Hypertens 2012; 25: 1271– 1278.
2. Matjuda et al. Association of Hypertension and Obesity with Risk Factors of Cardiovascular Diseases in Children Aged 6–9 Years Old in the Eastern Cape Province of South Africa. Children 2020, 7, 25.
3. Sharma et al. prevalence of hypertension and its associated risk factors in a rural black population of Mthatha town, South Africa. Int. J. Environ. Res. Public Health 2021, 18,1215.
4. Luma GB, Spiotta RT. Hypertension in children and adolescents. AmFam Physician 2006; 73: 1558–1568.
5. Sorof JM, Lai D, Turner J, Poffenbarger T, Portman RJ. Overweight, ethnicity, and the prevalence of hypertension in school-aged children. Pediatrics 2004; 113: 475–482.
6. Morgenstern B. Blood pressure, hypertension, and ambulatory blood pressure monitoring in children and adolescents. Am J Hypertens 2002; 15: 64–66.
7. . Misra A. Risk factors for atherosclerosis in young individuals. J Cardiovasc Risk 2000; 7: 215–229.
8. McCrindle BW. Cardiovascular risk factors in adolescents: relevance, detection, and intervention. Adolesc Med 2001; 12: 147–162.

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 05, 2022

9. Akis N, Pala K, Irgil E, Utku AM, Bingol S. Prevalence and risk factors of hypertension among school children aged 12-14 years in Bursa, Turkey. Saudi Med J 2007; 28: 1263–1268.
10. National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents. The fourth report on the diagnosis, evaluation, and treatment of high blood pressure in children and adolescents. Pediatrics 2004; 114: 555–576.
11. Gupta AK, Ahmad AJ. Normal blood pressures and the evaluation of sustained blood pressure elevation in childhood. Indian Pediatr. 1990;27(1):33-42.
12. Sandvik L, Erikssen J, Thaulow E, Erikssen G, Mundal R, Rodahl K. Physical fitness as a predictor of mortality among healthy, middle-aged Norwegian men. N Engl J Med. 1993;328(8):533-7.
13. Paffenbarger RS Jr, Hyde RT, Wing AL, Lee IM, Jung DL, Kampert JB. The association of changes in physical-activity level and other lifestyle characteristics with mortality among men. N Engl J Med. 1993;328(8):538-45.
14. Dannenberg AL, Garrison RJ, Kannel WB. Incidence of hypertension in the Framingham study. Am J Public Health. 1988;78(6):676-9.
15. Laroia D, Sharma M, Diwedi V, Belapurkar KM, Mathur PS. Profile of blood pressure in normal school children. Indian Pediatr. 1989;26(6):531-6.
16. Soudarssanane M, Mathanraj S, Sumanth M, Sahai A, Karthigeyan M. Tracking of blood pressure among adolescents and young adults in an urban slum of Puducherry. Indian J Community Med. 2008;33(2):107-12.
17. Thakor HG, Kumar P, Desai VK. An epidemiological study of hypertension amongst children from various primary schools of Surat city. Indian J Community Med. 1998;23:110-5.
18. Török E, Gyárfás I, Csukás M. Factors associated with stable high blood pressure in adolescents. J Hypertens Suppl. 1985;3:S389-90.
19. Aullen JP. Obesity, hypertension and their relationship in children and adolescents. An epidemiological study in schools (author's transl). Sem Hop. 1978;54(17-20):637-43.
20. Hardy R, Wadsworth ME, Langenberg C, Kuh D. Birthweight, childhood growth, and blood pressure at 43 years in a British birth cohort. Int J Epidemiol. 2004;33(1):121-9.
21. Andriska J, Gombik M, Breyer H, Tarr A. Hypertension in children and adolescents. Results of a long-term follow-up study 1975-1985. ClinExpHypertens A. 1986;8(4-5):567-9.