Frequency of Hypertension in Children Presenting at Combined Military Hospital Malir Cantt Karachi

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ABSTRACT

Objective: To determine the frequency of hypertension in our children and explore its relation to obesity to emphasize the importance of routine blood pressure check-ups in outpatient departments and clinics.

Study Design: Cross-sectional study.

Place and Duration of Study: Pediatric Outpatient Department and Child Ward of the Combined Military Hospital Malir Cantt Karachi Pakistan, from May to Dec 2020.

Methodology: A total of 1000 children of 3-13 years selected on consecutive sampling methods with no history of hypertension were enrolled. Three blood pressure readings were recorded using an aneroid sphygmomanometer using the standard protocol, and their weight and height were measured to calculate their BMI.

Results: Out of 1000 children, 62 (6.20%) were found hypertensive, out of which 42 (67.7%) were male, and 20 (32.3%) children were females. Overall 42/622 (6.75%) male children and 20/378 (5.87%) female children developed hypertension. Obesity was found in 6.45% of positive cases, while 3.22% of hypertensive children were overweight. The frequency of hypertension linearly increased with increasing age. In addition, 12.9% of cases had a positive family history of hypertension.

Conclusion: The frequency of hypertension in the Pediatric population was 6.20%. Male predominance was found in hypertensive cases. Hypertension was more prevalent among children of preadolescent age. Obese and overweight children were more likely to develop hypertension than normal-weight children.

Keywords: Children, Hypertension, Obesity.

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INTRODUCTION

Hypertension is not a very uncommon problem in the pediatric population. The global prevalence of hypertension ranges from 4.32% among 6yrs old children to 3.28% among those ageing 19 years, with a peak of 7.89% among those ageing 14 years.[1] In the pediatric age group (<13years old children), according to new clinical practice guidelines 2017 proposed by the American Academy of Pediatrics, hypertension is labelled when average systolic or diastolic blood pressure on three or more occasions is equal to or higher than the 95th centile appropriate for the gender, age and height of the child, while blood pressure of >90th centile and <95th centile is labelled as elevated blood pressure. Adult cut off-limits for children >13 years of age are used to label hypertension.[2] There are two types of hypertension. Primary (essential) hypertension is high blood pressure with no apparent underlying medical cause that is rare in children. Secondary hypertension is due to some underlying causes, including endocrinological pathologies such as Cushing syndrome, hyperthyroidism, conns syndrome, hyperparathyroidism and pheochromocytoma, coarctation of the aorta, renal artery and renal vein thrombosis and certain herbal medicines.[3,4] There is a male pre-dominance with male to female ratio of 3:1.[5]

Recent data indicates that primary hypertension is increasing in children. Various factors are responsible for this increment. Changes in dietary patterns, consumption of junk food containing high salt and saturated fatty acids, and low consumption of fruits and vegetables have increased hypertension risk.[6] Energy-dense diet promotes obesity which causes a threefold increase in the risk of developing hypertension.[7] Kids' Use of electronic gadgets has decreased physical activity and a sedentary lifestyle, promoting obesity and hypertension.[8] Altered sleep patterns play an additional role.[9] Genetic factors also play a role in causing a 40-60% probability of developing hypertension in kids of hypertensive parents.[9,10]

Early recognition of hypertension is essential to control its short and long-term complications, including left ventricular hypertrophy, atherosclerosis,

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heart attacks, strokes, blindness and renal failure. Unfortunately, regular screening for blood pressure abnormalities is not a part of usually observed clinical practices. Considering this a neglected area, we planned to conduct a prospective study to screen children presenting at Combined Military Hospital Malir Cantt for hypertension. Ongoing surveillance is needed to make it a routine practice.

The objectives of the study were to determine the frequency of hypertension in the study population and identify the relationship between obesity and hypertension.

METHODOLOGY

This cross-sectional study was carried out at the Out patient Department and Pediatric Ward of Combined Military Hospital Malir Cantt, Karachi Pakistan from May to December 2020 after taking ethical approval from the institutional ethical review committee. (ERC approval certificate number 1440/ 2019/Trg/adm, Dated 31st January, 2020). The sample size was calculated using Open Epi (version 3.01). At a 95% confidence interval with a 5% confidence limit. 48% prevalence rate of hypertension,[11] among the pediatric age group was found to be 150. However, the research covers a sample size of 1000 children.

A consecutive sampling method was used to select subjects.

Inclusion Criteria: All the children between 3 to 12 years of age were enrolled in the study whose parents agreed to participate.

Exclusion Criteria: The study did not include those who refused to participate, children presenting in very sick conditions and already diagnosed hypertensive patients.

Verbal informed consent was taken from the caregivers of participating children. Variables covering demographic details, including name, age and gender, were noted in a questionnaire. Using a standard protocol, the trained investigator measured anthropometric measurements, including weight and height. Weight was measured without footwear using a body-weight balance with the least count of 0.5kg. Height was taken using a stadiometer of the least count of 0.1cm. The child was made to stand straight and barefooted, with heels, buttock and back touching the vertical scale of the instrument and stretching upward to the fullest extent with arms hanging on the side. The head was aligned such that the lower rim of the orbit and the auditory canal was in the horizontal plane (Frankfurt plane).

BMI was calculated. Children were labelled as overweight if BMI was more than 85th centile for their respective age and gender and obese if BMI was more than 95th centile. Children were comfortable and explained the procedure before measuring blood pressure to alleviate anxiety. Blood pressure was recorded with an aneroid sphygmomanometer. The pediatric cuff of the appropriate size was used to cover most of the upper arm, leaving a one-centimetre gap below the axilla and above the anterior cubital fossa. The manometer was kept at the same level as the cuff on the patient's arm and the observer's eye. For each patient, blood pressure was measured during sitting position and thrice in the same visit, while mean blood pressure was calculated and recorded. Systolic pressure was determined by the onset of tapping the korotkoff-1 sound and diastolic at its disappearance (korotkoff-5). The recorded readings were then plotted on centile charts. The children were considered hypertensive if the systolic or diastolic pressure or both were equal to or more than the 95th percentile for height, age and gender.

Statistical Package for Social Sciences (SPSS) version 23.0 was used for the data analysis. Quantitative variables were summarized as mean ± SD and qualitative variables were summarized as frequency and percentages. Chi-square test was applied to find out the association.

RESULTS

Out of the total 1000 enrolled children, 622 (62.2%) were male, and 378 (37.8) were female hypertension was detected in 62 (6.20%) children. A family history of hypertension was found in 8 cases (12.9%) shown in Table-I.

Table-I: Family history of hypertension,(n=62).

Family History	n (%)
Father Hypertensive	5 (8.06%)
Mother Hypertensive	3 (4.83%)
Both Hypertensive	0 (0.00%)
No History of Hypertension	54 (87.09%)

Obesity was found in 4 (6.45%) positive cases (p <.02), while 2 (3.22%) cases were overweight. Overall 12/1000 (1.2%) children were obese, and 6/1000 (0.6%) children were overweight. So 4 out of 12 (33%) obese children and 2 out of 6 (33.3%) overweight children developed hypertension. It was found that obese children were six times more likely to develop hyper-

tension than the normal population. The prevalence of hypertension was linearly increased with increasing age, being maximum in the preadolescent age group. (33 hypertensive cases were 11-13 years old). Age distribution of hypertensive children has been shown in Table-II.

Table-II: Age distribution of hypertensive children,(n=62).

Age Range	n (%)
11 to 13 years	33 (53.22%)
8 to 11 years	28 (45.16%)
5 to 8 years	12 (19.35%)
3 to 5 years	2 (3.22%)

Among hypertensive patients, 42 (67.7%) were males, and 20 (32.33%) were females. Overall, 42/622 (6.75%) male children and 20/378 (5.29%) female children were found hypertensive (p <0.04) (Table-III).

Table-III: Association with gender and obesity.

Baseline Characteristics	Study Groups		*p*-value
	Non-hypertensive (n=938)	Hypertensive (n=62)	
Gender, n (%)			
Male	580 (61.83%)	42 (67.7%)	0.04
Female	358 (38.16%)	20 (32.33%)	
Obesity	8 (0.85%)	4 (6.45%)	0.02

DISCUSSION

The significant findings of our study were a significant frequency of hypertension detected in the general pediatric population visiting the study place, reasonable male predominance among the hypertensive patients, the noticeable association of obesity and hypertension and remarkable positive family history of hypertension in the affected study population. The results of our study were quite comparable with the previous studies on this subject. The prevalence of hypertension has been assessed in many studies in different countries. In Houston (USA), Cynthia and his colleagues observed a prevalence of 16.3% elevated blood pressure (previously labelled as pre-hypertensive) and 2-4% hypertension among 22224 students. However, the study population was aged 10-17 years.[12] The global pooled prevalence of hypertension based on data extracted from different studies was found to be 2.94% to 7.23%. The frequency variation was observed with the type of sphygmomanometer (being highest with aneroid sphygmomanometer), body mass index (being highest in overweight, high in obese and lowest with normal BMI) and age of the child (highest in adolescents and least among those aged 19years).[13] Hypertension frequency was 18.4% among Chinese children and 23% among Indian children.[14,15] These studies were conducted in multiple centres with a large sample size. Comparing our study results with the hypertension prevalence in our neighbouring countries, we found a relatively lower frequency of pediatric hypertension (6.20%). However, since this study was conducted in a closed set-up with relatively smaller sample size, large-scale studies with a bigger sample size are required to get a clearer picture and better understand the prevailing situation.

In our study, 67.7% of hypertensive children were male. The role of gender as a risk factor for hypertension is somewhat controversial. Some studies advocated hypertension to be more common in male children. Bilal *et al*, conducted a similar study in Karachi in 2019 in which hypertensive prevalence was 21.1% among males and 19.3% among female children, although this gender difference was not statistically significant considering hypertension prevalence.[16] Similar pattern was found in Zhai *et al*, study from China, where 20.2% of the male population and 16.3% of the female population were hypertensive.[17] Male gender and baseline masked hypertension were independent risk factors for developing sustained hypertension in preadolescents and adolescents.[18,19] At the same time, in the prepubertal period, it was found more prevalent among girls.[20] In our study, 53.2% of hypertensive children were 11-13 years old, which may explain the male predominance in developing hypertension.

Obesity is a well-known risk factor for developing hypertension in all age groups. The proposed mechanisms are increased sodium re-absorption and sympathetic tone resulting from hyperinsulinemia leading to elevated blood pressure. In our study population, 6.44% of hypertensive children were obese, and 3.22% were overweight based on their body mass index. 33.3% of obese children developed hypertension, making them six times more likely to develop hypertension than children with normal weight. The relationship between obesity and hypertension has been investigated in different ways in previous studies. Sort found a fivefold increment in the prevalence of hypertension as BMI increases from 5th-95th centile.[21] In 2019 Mohan *et al,* found a 12.5% and 28% prevalence of overweight and obesity in rural hypertensive patients of North India, and comparable figures were obtained while screening the urban population.[22] This association is much stronger than that found in our study, which can be explained by the overall low prevalence of obesity in our study population (1.2%),

an observation noticed in a previous local study as well.[23]

LIMITATIONS OF STUDY

The limitation of our study was an inability to investigate and find the aetiology of hypertension in individual cases. However, the hypertensive patients were referred to paediatricians for detailed evaluation. There is a need for continuous surveillance, so other community-based studies with larger sample sizes are suggested.

CONCLUSION

The observed frequency of hypertension was 6.20% in the study population. 6.75% of males and 5.29% of female children were hypertensive. Male predominance was found in the hypertensive cohort with a male to female ratio of 3:1. Hypertension was most common in the 10-13 years age group. The observed frequency of obesity in hypertension was 6.44%, and that of overweight was 3.22. The overall frequency of obesity in the study population was 1.2%. Considering these figures, our study emphasized checking the children's blood pressure with proper B.P apparatus and appropriate cuff size in routine clinical practices at the hospitals and clinics. It sensitized the caregivers regarding dietary and lifestyle modifications accordingly to reduce the cardiovascular-related mortalities and morbidities in the adult population.

Conflict of Interest: None.

Author's Contribution

AM: Prime author, collected data, compiled results, AA: Title selection, final approval, STHZ: Manuscript writing, AS: Calculation of statistics, WSA: Concieved and design the analysis, WA: Helped data collection.

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