

PREVALENCE OF HYPERTENSION IN CHILDREN IN TERTIARY CARE HOSPITAL

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Abstract

Background: Childhood hypertension has been reported with a global prevalence of 2% to 4%, with limited data on the etiological causes, correlation of BMI, and age factor. The current study aims to identify and cover the gap between the development of hypertension in children aged 0-12. **Materials and Methods:** The prospective study was conducted at a tertiary care hospital after approval from the ethics committee and consent signed by parents and children. The study enrolled 100 patients diagnosed with hypertension, stratified in the age group of 0-4, 4-8, and 8-12 years of age, respectively. Patients were further assessed based on BMI distribution, causes of hypertension, and chances of developing essential hypertension with increasing age. **Result:** Secondary hypertension was seen in the age range of 4-8 years (94.70%), followed by 0-4 years (93.10%). 64% of patients were male, and 36% were females, of which four were diagnosed with familial hypertension, and one had a hormonal disorder. However, after the three-month follow-up majority of the children's blood pressure was in the normal range, and anti-hypertensive drugs were continued in a patient with a risk of developing essential. Renal parenchymal disease was highly prevalent among children (70.0%), followed by other etiological causes (20.0%). Acute glomerular nephritis, nephrotic syndrome, and reflux nephropathy was the major diagnosis of developing hypertension in normal BMI patients. **Conclusion:** The study reports a higher prevalence of hypertension among children in India than in global data, which signifies a need for larger-scale studies.

INTRODUCTION

Hypertension is one of the morbid disorders that resulted in 1.63 million deaths in India in 2016. [1] A recent study among hypertensive patients reported a much higher prevalence of hypertension, 25%, which was reported to be ~20% in 2005.^[1,2] Children diagnosed with hypertension are more prone to develop essential hypertension in adulthood, increasing the risk of cardiovascular mortality and morbidity.^[3] Elevated blood pressure is one of the potential indicators for developing hypertension in adulthood, including the risk of multiple-end organ involvement such as hypertensive retinopathy, microalbuminuria due to renal damage, and learning disabilities reported as side effects of early hypertension in children.^[4] The prevalence of high blood pressure in adolescents is increasing, currently ranging between 1% and 5% in the United States, 16.4% in Central Europe, around 30% in northern Greece, and 13.8% in China.^[5]

Furthermore, from 1997 to 2006, hospital admissions for children with HTN more than doubled in India, from 18 to 35 per 100,000 admissions.^[6]

The link between obesity and high blood pressure is further supported by the fact that an overweight child is three times more likely to develop HTN than a normal BMI.^[7] Male sex and ethnicity, in addition to obesity, high sodium intake, a strong family history, increased fructose intake, and uric acid levels, are some of the other established risk factors for developing HTN in a child.^[8]

MATERIALS AND METHODS

The prospective study was conducted at the Tertiary care hospital with patients diagnosed with elevated hypertension. Ethical approval was taken from the hospital before the initiation of the study and assent was taken from the parents. The study was conducted at the Pediatric ward of the hospital for a

duration of 6 months with enrolment and 3 months post-treatment follow-up.

Inclusion Criteria

- Patients with a confirmed diagnosis of hypertension
- Patients age group from 0-12 years of age
- Patients with a familial history of hypertension
- Patients with an approved assent
- Patients with elevated blood pressure

Exclusion Criteria

- Parents who did not provide assent for their neonates
- Patients with other morbid diseases
- Children above the age of 12 years

100 patients were diagnosed with hypertension based on the diagnostic criteria. Patients admitted to the pediatric ward were diagnosed and identified for the prevalence of hypertension at the tertiary care hospital. A follow-up of three months was conducted to evaluate the elevated blood pressure, use of medications, incidence of primary or secondary hypertension with age, BMI-wise distribution, and causes of hypertension in patients.

Before the enrolment of the study, an ethical consideration was taken from the hospital ethics committee, followed by the assent form signed by the children and their parents as well.

Data Collection and Interpretation

Patient demographic details, the incidence of hypertension, and the correlation of age group with hypertension were represented as tables, frequency, and percentages by using SPSS software 20.0

RESULTS

The pediatric ward revealed a prevalence of hypertension among 100 patients, of which 64 were males (64.0%), and 36 were females (36.0%). A family history of hypertension was observed in 4 patients based on the medical history interview. One case of pheochromocytoma and one of hypothyroidism leading to hypertension were observed.

A three-month follow-up revealed normalization of blood pressure in most children. In addition, anti-hypertensive therapy was continued in patients diagnosed with essential hypertension.

Table 1: Percentage of conditions

Condition	Percentage	Number of cases
RPD: Renal parenchymal disease	70%	70
RVD: Renovascular disease	2%	2
HOR: Hormonal disorders	2%	2
EH: Essential hypertension	6%	6
OTH: Others	20%	20

Table 1 demonstrates a high prevalence of renal parenchymal disease in 70 patients (70.0%), followed by other causes of hypertension in 20 patients (20.0%) and essential hypertension in 6 patients (6.0%). In addition, renovascular disease was reported in 2 patients (2.0%), and hormonal disorder was reported in 2 patients (2.0%). A majority of the patients in the age group of 8-12 years of age were reported with secondary hypertension (90.90%), followed by the age group of 4-8 years with 94.70% secondary hypertension, and 0-4 years of age group with 93.10% prevalence of secondary hypertension. However, primary hypertension was reported with 9.10% prevalence in the 8-12 age group, followed by 5.3% of patients in the 4-8 years of age and 4.2% of patients with primary hypertension in the age group of 0-4 years of age [Table 2].

Table 2: Percentage distribution of primary and secondary hypertension with age group

Age in years	Primary HTN	Secondary HTN
0-4	4.2%	93.10%
4-8	5.3%	94.70%
8-12	9.10%	90.90%

The study reports 56 patients with normal BMI distribution, of which 26 patients were with normal BMI but were diagnosed with acute glomerular nephritis, followed by 13 patients with normal BMI and nephrotic syndrome. A total of 15 patients were reported with obesity, with eight patients diagnosed with nephrotic syndrome, followed by two patients with acute glomerular nephritis, one with chronic glomerular nephritis, and one with acute renal failure. Underweight BMI was seen in 29 patients, of which eight presented with acute glomerular nephritis, 6 patients with chronic glomerular nephritis, 3 with hormonal disorders, and one with REFLUX nephropathy and obstructive nephropathy respectively. An unknown cause of hypertension was seen in 4 patients with normal BMI, 2 with overweight BMI, and 3 with under-weight BMI distribution [Table 3].

Table 3: BMI-wise distribution with the diagnosis

Diagnosis	N	O	U
Acute glomerulonephritis	26	2	8
Chronic glomerular nephritis	4	1	2

Nephrotic syndrome	13	8	6
Reflux nephropathy	1	0	1
Obstructive uropathy	1	0	1
Renal artery stenosis	2	0	0
Acute renal failure	2	1	2
Other renal disorders	0	0	2
Hormonal disorders	1	0	1
miscellaneous	2	1	3
Unknown cause	4	2	3
Total	56	15	29

N-Normal range; O-Overweight/Obesity; U-Underweight

DISCUSSION

Patients in the age group of 4-8 years of age were highly prevalent with secondary hypertension (94.70%), followed by the age group of 0-4 years of age (93.10%), respectively. This significant prevalence can be related to the genetic predisposition of children to develop HTN or can be due to a rise in BMI, which is generally seen in the age group after an initial reduction in weight from the first year of life.^[9] Adiposity rebound is one of the strong indicators associated with the development of hypertension, obesity, and its complication at a later stage in life.^[10] The increase in hypertension with age has also been seen in the study by Bilal et al. He reported a 25.0% and 10.0% prevalence of hypertension in children aged between 4 to 7 years of age.^[11] The prevalence of HTN increases based on the study conducted by Moares et al. in the United States, who reported similar findings to our study.^[12] Another study from Canada by Eisenmann et al. reported a 24.8% prevalence of HYN among children aged 3-8 years of age.

Most of the patients in our study were diagnosed with the renal parenchymal disease as a secondary cause of developing hypertension. One of the most common hypertension cause in preadolescent children was reported by Arar et al.^[14] Patients with such conditions remain undiagnosed until young adulthood; however, other complications due to RPD can be glomerulonephritis, congenital abnormalities, and reflux nephropathy.^[15] Which was also similar to our study findings where 36 patients were diagnosed with acute glomerular nephritis and seven patients reported with chronic glomerular nephritis. In addition, the nephrotic syndrome was our study's second most prevalent cause with 27 patients. The etiology of HTN and nephrotic syndrome is a complex process developed by various renal and extra-renal contributing factors such as sodium retention, fibrosis/loss of GFR, and progression of kidney disease.^[16]

The prevalence of hypertension in our study is slightly higher than in the other studies due to geographical variation, genetic build-up, diet, and BMI distribution. A recent systematic review also reported similar findings where a higher prevalence of HTN was reported in children (7%) compared

with the global prevalence of 4.0% and 5.5% in African countries.^[17,18] In addition, the recent systematic review conducted by Meena et al. also reported a pooled prevalence of 10.0% for hypertension in children, which was higher than the global prevalence.^[19]

The current study reports a lower prevalence of familial hypertension in 4.0% of patients and no prevalence of BMI-associated hypertensive state in most patients. In the current study, patients were majorly diagnosed with secondary hypertension with increasing age from 0-4 years and 4-8 years which can be due to a sedentary lifestyle, genetic build-up, or unknown causes.

Our research has some limitations. First, the BP was measured only once, which may have resulted in overestimating results because it included a white coat and masked HTN. Second, this study was conducted in a government hospital in a single city, which may not accurately represent the entire country. Finally, because our study is cross-sectional, we cannot establish a temporal relationship between the risk factors and HTN.

CONCLUSION

Hypertension was prevalent in almost all patients diagnosed with secondary hypertension, followed by etiological causes of RPD, acute glomerulonephritis, and nephrotic syndrome. No significant variation of prevalence was reported with BMI distribution; however, with increasing age from 0-4 years and 4-8 years, a higher prevalence of secondary hypertension was noted. The analysis further states the need to conduct large-scale studies to assess the prevalence and incidence of hypertension in children and prevent the development of essential hypertension in young adulthood. The study also identifies the major causes of hypertension in patients aged between 0-8 years of age.

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