Etiological and clinical features of pediatric hypertension in a tertiary hospital of Central India

Manjusha Goel[1], Bharati Choubey[2], Kiran Meena[3], Amit Agarwal[4]

From [1]Professor, [2]Assistant Professor, [3]Postgraduate, [4]Associate Professor, Department of Pediatrics, Gandhi Medical College, Bhopal, Madhya Pradesh, India

Correspondence to: Dr. Bharati Choubey, Hig 28, J Sector, Ayodhya Nagar, Bhopal, Madhya Pradesh, India. E-mail: drbharatichoubey@gmail.com

Received - 01 June 2019 Initial Review - 17 June 2019 Accepted - 08 August 2019

ABSTRACT

Background: Hypertension (HTN) in children and adolescents seems to have increased in the past few decades. Although the prevalence of essential HTN has increased, secondary causes account for majority of childhood HTN. Essential HTN in childhood is a diagnosis arrived at by excluding the known causes of secondary HTN. **Objectives:** The objectives of this study were to study the etiology and clinical features of childhood HTN in admitted children. **Materials and Methods:** This observational prospective study was carried out at a tertiary care referral center of Central India. All children of 1–12 years of age admitted in hospital in the study period were screened for HTN. Those found to be hypertensive were studied for etiology and clinical features. **Results:** A total of 112 children were found to be hypertensive, 54 were in 1–6 years of age group and 58 were in 7–12 age group. Male-to-female ratio was 62:50, 95 had secondary HTN and no definitive cause of HTN could be found in 5% of patients. Mean blood pressure was 124/84. Majority (75%) of patients were in Stage II HTN, 25% of patients were in hypertensive crisis. About 69% had renal etiology, 25% central nervous system (CNS), 1% endocrine, and unidentified 5%. **Conclusion:** The most common etiology of hypertensive emergency is chronic kidney disease followed by acute glomerulonephritis.

Key words: *Blood pressure, Hypertension, Chronic kidney disease*

Hypertension (HTN) in the pediatric population is estimated to have a worldwide prevalence of 2–5% [1,2]. Although HTN is a relatively uncommon problem in childhood, its incidence among children is increasing with the increasing prevalence of obesity, salt intake, and hyperlipidemia, leading to a greater number of HTN children coming to medical attention [3,4]. It has been demonstrated that high blood pressure (BP) contributes to the early development of cardiovascular structural and functional changes in children [5]. With increasingly high BP, autoregulation eventually fails, leading to damage of the vascular wall and further organ hypoperfusion. The common causes of HTN in childhood include chronic glomerulonephritis (GN), reflux nephropathy, and obstructive nephropathy; the etiologies vary with different age groups [2,6]. Childhood HTN is a risk factor for early cardiovascular morbidity and mortality along with other end-organ damage and hypertensive encephalopathy [2]. Early detection and treatment of high BP helps to reduce the chance of these complications. This study was planned to analyze the underlying etiology and clinical features of children admitted with HTN in 1–12 years of age.

MATERIALS AND METHODS

An observational prospective study was conducted on all the children of 1–12 years of age admitted to the pediatric department of a tertiary hospital of Central India. All the admitted patients of 1–12 years with HTN were included in the study. Those who were found to be hypertensive were studied for etiology and clinical features, and cause of HTN was evaluated. Children with BP in pre-hypertensive range and whose duration of stay was <24 h (death or LAMA or abscond) were excluded from the study. The patients were divided into two age groups: 1–6 years of age and 7–12 years of age. The study was approved by the ethical review committee of the hospital.

Initial BP measurements were carried out for all the subjects. BP was checked in lying down position in the right arm, with the cubital fossa at heart level. A manual sphygmomanometer was used to measure BP with an appropriate cuff. If the systolic BP (SBP) or diastolic BP (DBP) was in hypertensive range as per the fourth report on evaluation and management of HTN, the BP was monitored. BP measurements were performed every hour in the patients who presented with an unstable BP and in the patients requiring further observation.

HTN in children more than 12 months of age was defined according to BP standards based on gender, age, and height as stipulated in the updated classification of HTN [7]. HTN was identified when the SBP or DBP was greater than or equal to the 95th percentile; Stage 1 HTN was defined as an SBP or DBP within the range of the 95th percentile to the 99th percentile

plus 5 mmHg; Stage 2 HTN was an SBP or DBP greater than the 99th percentile plus 5 mmHg. When systolic and diastolic percentiles differed, they were categorized according to the higher value.

The identified patients were clinically evaluated for age, sex, weight, height, body mass index, clinical features at presentation, and family history of HTN. All patients initially underwent urinalysis and culture, complete blood counts and blood levels of sodium, potassium, urea, creatinine, calcium, and phosphorus were also assessed. Chest roentgenogram, electrocardiogram, and abdominal ultrasound were obtained in all cases. Fundoscopy, echocardiogram, urinary catecholamine levels, voiding cystourethrogram, intravenous pyelogram, and percutaneous renal biopsy were performed whenever indicated. Essential HTN was diagnosed only if a detailed evaluation did not show an identifiable etiology.

Data were analyzed using Microsoft Excel 2010 and SPSS 20. Data were collected as per protocol. Continuous variables are described on mean±SD and categorical variables are described in percentage. Chi-square test was used to assess categorical variables and Student's t-test used to assess continuous variables. $p<0.05$ was taken as statistically significant at 95% confidence interval. Pearson correlation coefficient was used to see correlation between two variables. Odds ratio was used to see relative risk ratio.

RESULTS

Of the 112 hypertensive patients, 95 had secondary HTN and no definitive cause of HTN could be found in 5% of patients. Male-to-female ratio was 62:38. About 51% of patients were of 1–6 years of age. Mean BP was 124/84. The majority (75%) of patients were in Stage II HTN and 25% of patients were in hypertensive crisis. Therefore, Stage 2 HTN may serve as a critical threshold for a high risk of hypertensive crisis in children. The causes of HTN are discussed in Table 1.

Among CNS causes tubercular meningitis with raised intracranial tension which was found to be most common (14%) followed by acute encephalitic syndrome (5%). The details of the presenting symptoms in hypertensive patients are given in Table 2.

Table 1: Distribution according to etiology

Causes number (%)	1–6 years (n=54)	7–12 years (n=58)	Total (n=112)
Renal	35 (64.8)	42 (72.4)	77 (68.75)
Chronic kidney disease	10 (18.5)	21 (36)	31 (27.67)
Acute glomerulonephritis	11 (20.3)	11 (18.9)	22 (19.6)
Nephrotic syndrome steroid resistance	6 (11)	5 (8.6)	11 (9.8)
Nephrotic syndrome steroid sensitive	3 (5.5)	3 (5.1)	6 (5.35)
Obstructive uropathy	3 (5.5)	2 (3.4)	5 (4.46)
Renal artery stenosis	1 (1.8)	2 (3.4)	3 (2.7)
Sickle cell nephropathy	1 (1.8)	0	1 (0.89)
Central nervous system	19 (35.18)	9 (15.5)	28 (25)
Tuberculous meningitis	10 (18.5)	5 (8.6)	15 (13.39)
Acute encephalopathy	4 (7.4)	3 (5.1)	7 (6.25)
Guillain–Barré syndrome	3 (5.5)	1 (1.7)	4 (3.57)
Cerebral palsy	2 (3.7)	0	2 (1.78)
Endocrine (Cushing syndrome)	1 (1.8)	0	1 (0.89)
Others	2 (3.7)	4 (6.9)	6 (5.35)

Table 2: Distribution according to clinical features

Presenting symptom, number (%)	1–6 years (n=54)	7–12 years (n=58)	Total (n=112)
Swelling over body	34 (62)	47 (81)	81 (72)
Oliguria	31 (57)	47 (81)	78 (70)
Breathlessness	36 (66)	28 (48)	74 (66)
Headache	24 (44)	32 (55)	56 (50)
Nausea/vomiting	28 (48)	26 (44.8)	54 (48)
Convulsions	16 (29)	20 (34)	36 (32)
Hematuria	3 (5.5)	6 (10)	9 (8)
Fever	5 (9.2)	3 (5)	8 (7)
Weakness in lower limbs	3 (6)	1 (1.7)	4 (3.5)
Altered sensorium	2 (3.7)	2 (3)	4 (3.5)

DISCUSSION

A total of 2552 patients of 1–12 years were admitted in the department of pediatrics during the study period and 112 were found to be hypertensive. The study population was divided in the age group of 1–6 years and 7–12 years. The male-to-female ratio in 1–6 years was 1.1:1 and 1.4:1 in 7–12 years. In both the age groups, males were slightly more affected than females, but this difference in gender predilection was not statistically significant ($p=0.58$). Majority (75%) of the patients are presented in the Stage II HTN ($p\leq0.001$). This emphasizes for regular BP monitoring in children presenting to health facility, to identify it at earlier stages.

Earlier studies on HTN in children have revealed that it is mostly secondary though the incidence of essential HTN is also rising [8]. Most studies on symptomatic sick children revealed renal parenchymal diseases to be the most common cause of HTN [9-11]. In this study, 69% of the children had an underlying renal etiology. In our study, 14% of cases of HTN were associated with nephrotic syndrome. Of these 14 children, six responded to steroid therapy while eight were steroid resistant.

Very few studies have reported neurological disorders as important cause of HTN in children [12]. Our study shows that 25% of pediatric hypertensive patients had neurological cause, most important being tubercular meningitis [12] with increased intracranial tension. About 25% of cases at the time of presentation were in hypertensive crisis. All these patients were in Stage II HTN, which makes it important for the primary clinicians to diagnose such patients and initiate treatment early. The leading

presentation of hypertensive crisis was congestive cardiac failure (52%), followed by acute renal failure (40%), encephalopathy (24%), and others 15%. Among other symptoms were papilledema, pulmonary edema, visual disturbances, headache, vomiting, irritability, and lethargy. Mostly, the symptoms were acute, probably because most of the patients presented in Stage II and hypertensive crisis. The etiology of hypertensive crisis was renal (92%) followed by CNS (8%).

About 15% of the hypertensive children were obese. Our study suggested that obesity does not have a significant correlation with severity of HTN in children (p=0.32). In our study, we found that 17% of patients had short stature and 11% among these were chronic kidney disease (CKD) patients. Occurrence of short stature among CKD patients was found to be statistically significant (p≤0.001). The short stature of patients has been established to be associated with increased HTN [13]. The size of the sample was the major limitation of the study. As this study was conducted among admitted patients, results cannot be extrapolated to community children.

CONCLUSION

In our study, we found 4.3% prevalence of HTN. The most common etiology of hypertensive emergency is CKD followed by acute GN. About 5% of children were labeled as having essential HTN.

REFERENCES

1. 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;114:555-76.
2. Sorof JM, Alexandrov AV, Cardwell G, Portman RJ. Carotid artery intimal-medial thickness and left ventricular hypertrophy in children with elevated blood pressure. Pediatrics 2003;111:61-6.
3. Sorof JM, Lai D, Turner J, Poffenbarger T, Portman RJ. Overweight, ethnicity, and the prevalence of hypertension in school-aged children. Pediatrics 2004;113:475-82.
4. Moore WE, Stephens A, Wilson T, Wilson W, Eichner JE. Body mass index and blood pressure screening in a rural public school system: The healthy kids project. Prev Chronic Dis 2006;3:A114.
5. Flechtner-Mors M, Thamm M, Rosario AS, Goldapp C, Hoffmeister U, Mann R, *et al.* Hypertension, dyslipoproteinemia and BMI-category characterise the cardiovascular risk in overweight or obese children and adolescents: Data of the BZgA-observational study (EvAKu-J-project) and the KiGGS-study. Klin Padiatr 2011;223:445-9.
6. Wu YT, Chen YH, Lue HC, Chen CH. Relationship between the levels of blood pressure and the age, body mass in school children. Acta Cardiol Sin 1986;2:95-101.
7. The Fourth Report on the Diagnosis, Evaluation, and Treatment of High Blood Pressure in Children and Adolescents. U.S. Department of Health and Human Services, National Institutes of Health, National Heart, Lung, and Blood Institute. NIH Publication No. 05-5267 Originally printed September 1996 (96-3790); 2005.
8. Sinaiko AR. Hypertension in children. N Engl J Med 1996;335:1968-73.
9. Arar MY, Hogg RJ, Arant BS Jr., Seikaly MG. Etiology of sustained hypertension in children in the Southwestern United States. Pediatr Nephrol 1994;8:186-9.
10. Khalil A, Singh TP, Arora R, Puri RK. Pediatric hypertension: Clinical profile and etiology. Indian Pediatr 1991;28:141-6.
11. Ooi BS, Chen BT, Toh CC, Khoo OT. Causes of hypertension in the young. Br Med J 1970;3:744-6.
12. Mahan JD, Warady BA, Consensus Committee. Assessment and treatment of short stature in pediatric patients with chronic kidney disease: A consensus statement. Pediatr Nephrol 2006;21:917-30.
13. Gazzaruso C, Gola M, Karamouzis I, Giubbini R, Giustina A. Cardiovascular risk in adult patients with growth hormone (GH) deficiency and following substitution with GH an update. J Clin Endocrinol Metab 2014;99:18-29.

Funding: None; Conflict of Interest: None Stated.

How to cite this article: Goel M, Choubey B, Meena K, Agarwal A. Etiological and clinical features of pediatric hypertension in a tertiary hospital of Central India. Indian J Child Health. 2019; 6(8):428-430.

Doi: 10.32677/IJCH.2019.v06.i08.008