Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/rxkrp178

ANALYZE THE CAUSES OF HYPERTENSION AMONG YOUNG CHILDREN AND ITS COMPREHENSIVE CLINICAL CORRELATION AT TEACHING HOSPITAL, TURBAT

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ABSTRACT

Objective: To find out the etiology and presenting features of hypertension in children came to pediatric department, teaching hospital, Turbat.

Materials and Methods: A cross-sectional study conducted at the teaching hospital, turbat with a total period of six months from July, 2023 to Jan, 2024. The study participants included 90 children from 1 to 15 years of age, with diagnosed case of hypertension having 95 percentiles for age, sex and height. Patient information was recorded on the proforma including age, sex, weight, systolic BP, diastolic BP, presenting complaints (including headache, decrease sensorium, seizures, pallor, congestive cardiac failure, vomiting), the investigations (Hb, urea, creatinine) and finally diagnosis. The data was analyzed by using SPSS version 21.

Results: Out of 90 children included in this study, there were 54 (60%) males and 36 (40%) females. Mean age was 8 ± 2.32 years while most (90%) of the patients were above 5 years' age. Mean systolic BP was 145.24 ± 17.02 mm Hg and mean diastolic BP was 98.84 ± 14.57 mm Hg. The most common diagnosis was acute glomerulonephritis (AGN) in 52.2% followed by 32.2% of chronic kidney disease (CKD), 7.7% of pyelonephritis, 6.6% of nephrotic syndrome and remaining 1.1% of Wilm's tumor. The most common clinical feature was seizures in 38.8% and headache 32.2% patients. Seizures were significantly noticed in 20 out of 47 (44.8%) AGN patients and 13 out of 29 (42.5%) CKD patients. Regarding headache, the highest frequency was noticed 5 out of 6 (83.3%) in nephrotic syndrome while 17 out of 47 (36.1%) in AKG patients.

Conclusion: Renal disease is the most common cause of hypertension in children at turbat region, and the majority of patients presented with headache and seizures as the signs of high blood pressure.

Key Words: Hypertension, Acute glomerulonephritis, chronic kidney disease, seizures.

INTRODUCTION

Hypertension is considered as a leading cause of global disease burden as well as a modifiable risk factor for myocardial infarction, stroke, atrial fibrillation and progressive renal impairment

development. The year 2000 saw around one billion grown-ups overall suffering with hypertension, a number expected to raise to 1.56 billion by 2025 which is consider to be an alarming globally.[1] As indicated by the latest guidelines from 2023 by the European Society of Hypertension (ESH) and the International Society of Hypertension (ISH), it is encouraged to describe hypertension in view of percentile dispersion. There is an overall agreement that beginning from the age of 3 years (or prior in youngsters with risk factors for high blood pressure), blood pressure ought to be consistently estimated. Manual auscultator devices should be used for blood pressure measurement in children's while automated devices are frequently used now a days and it must be validated specially in children, and this raised blood pressure in children detected by electronic devices must be confirmed by auscultatory measuements.[2] In children, at least 3 abnormal readings of increase blood pressure are considered to be significant and even up to 13 years of age, blood pressure increase to 95th percentile of age, sex and height considered as significant hypertension.[3] The exact prevalence of hypertension in children are still unknown and vary region to region, however, while 2% to 5% is considered to be the estimated prevalence in children. Underdiagnoses of hypertension in children frequently leads to inadequate follow-up.[4] Millions of people including children around the worldwide are getting affected by hypertension. Primary hypertension is considered in patients having no known pathology while in secondary hypertension, there are more than 75% to 80% of children suffered from renal disease.[5]

Currently, the Primary hypertension in children is frequently associated with subclinical target organ harm, it isn't viewed as a basic hemodynamic disorder, yet the main stage in the improvement of cardiovascular illnesses. An institution conducted the study in past also revealed among almost 15 000 patients, doctors failed to recognize 76% of cases of hypertension in children's, suggesting the possibility of 1.5 million undiagnosed cases in the United States.[6] There is evidence demonstrating that hypertension in children might emerge from a blend of hereditary, natural and organic elements. Children with raised blood pressure have been seen to be in danger of developing hypertension in adulthood, and also it has been proved by the previous studies that hypertension in adulthood has its onset points in childhood.[7]

Prevalence of hypertension in adolescents/ children's are influence by so many different factors. For instance, inheritance impact the occurrence of hypertension under changing water reabsorption and sodium level. A high-sodium, low potassium diet is another significant risk factor for teenage hypertension, as the risk of hypertension shows a positive correlation with an increase in sodium intake.[8] There are many complaints from patients but decrease growth, headache, failure to thrive, pallor, nausea, dizziness, visual disturbances, epistaxis and seizures are the most common presenting complaints of the patients suffering from secondary hypertension all around the world.[9]

Despite the fact that there is not the substantial research on the factors associated with hypertension in Pakistan, the findings of individual studies are sufficiently not enough to illuminate clinical choices in our area like turbat. In this manner, efficient research significant in light of the fact that they basically evaluate all the accessible evidence and consolidate the outcomes to arrive at a superior determination about a research subject.[10]

This study tries to unveil not even prevalence of hypertension but also associated risk factors among children's of turbat district, Balochistan, consequently adding to how we might interpret this basic medical problem.

MATERIALS AND METHODS

A cross-sectional study conducted at teaching hospital, turbat from the duration of July 2023 till Jan 2024. By using Epi sample size calculator, 90 patients were included with 5% prevalence in children and 97% confidence interval. Diagnosed cases of hypertensive children whom blood pressure was more than 95 percentiles of their height, sex and age were included. Children from 1-15 years of age were included while those having any kind of prescribed treatment, suffering from any syndrome or having transient hypertension were excluded from the study. Questionnaire is used for data collection, fastidiously created through a thorough examination of going before exploration and writing relevant

to the ongoing research study subject. This questionnaire consists of two distinct parts for data compilation. The first section of the questionnaire will be administered through face-to-face interviews with the patients. On the other hand, the second part will involve data collection from the parents of the patients. Blood pressure assessments were conducted using a standardized mercury sphygmomanometer, paired with a manually inflated cuff of appropriate size, and a stethoscope. Measurements were taken from the right arm while the child was in a calm sitting position for a minimum of 5 minutes to alleviate any anxiety. If the mean systolic blood pressure or additionally diastolic blood pressure readings were raised during the beginning visit, two extra blood pressure estimations were performed inside a fourteen-day time period. This multi-step approach guaranteed exact and dependable blood pressure evaluation, taking into thought potential varieties in measurements. Patient information was recorded on a proforma which included information regarding the age, sex, weight, systolic blood pressure, diastolic blood pressure, clinical features (which included headache, decrease sensorium, seizures, pallor, congestive cardiac failure, vomiting), investigations (Hb, urea, creatinine) and finally diagnosis. The frequency test was used to calculate and SPSS version 21 was used to analyze the data. A p value of less than 0.05 was considered significant.

RESULTS

A total of 90 patients were included in this study. Out of 90 patients, 54 (60%) were males and 36 (40%) were females. The mean age of range 01-15 years was 08 $\pm$ 2.32. The majority (90%) of patients were above the age of 05 years. Systolic blood pressure (SBP) ranged from 115 to 215 mm Hg with mean blood pressure of 145.24 ± 17.02 mmHg, while diastolic blood pressure (DBP) ranged from 85 to 155 mm Hg with mean blood pressure of 98.84 ± 14.57 mmHg. Hemoglobin (Hb) ranged from 4.7 to 14.1 with mean of 9.95 $\pm$ 1.93 standard deviation while urea ranged from 17 to 610 with mean of 106.82 $\pm$ 108.6 standard deviation and creatinine ranged from 0.22 to 14.95 with mean of 2.24 $\pm$ 3.10 standard deviation. **(Table no.1)**

Among all the diseases diagnosed patients with hypertension in this study, acute glomerulonephritis was the most common that accounts for 47 cases (52.2%) followed by 29 cases (32.2%) of chronic kidney disease, 07 cases (7.7%) of pyelonephritis, 06 cases (6.6%) of nephrotic syndrome and remaining 01 case (1.1%) of Wilm's tumor. **(Table no.2)**

The common clinical features on presentation were seizures in 35 (38.8%) patients followed by headache 29 (32.2%) patients, vomiting in 10 (11.1%) patients, congestive cardiac failure in 07 (7.7%) patients, pallor in 07 (7.7%) patients and decrease sensorium in 02 (2.2%) patients. **(Table no.3).** Family history of hypertension was present in 14 (15.5%) patients. There were 21 (23.3%) patients who had history of culture proven urinary tract infection also.

Table no.1: Patients age, blood pressure, hemoglobin, Urea & Creatinine findings.

	Minimum	Maximum	Mean	Standard Deviation
Age (years)	1.00	15.00	8	4.32
SBP (mm Hg)	115	215	145.24	17.02
DBP (mm Hg)	85	155	98.84	14.57
Hb (gm/dl)	4.7	14.1	9.95	1.93
Urea (mg/dl)	17	610	106.82	108.65
Creatinine (mg/dl)	0.22	14.95	2.24	3.10

Disease	Frequency	Percentage
Chronic kidney disease	29	32.2
Acute glomerulonephritis	47	52.2
Pyelonephritis	7	7.7
Nephrotic syndrome	6	6.6
Wilms tumor	1	1.1
Total	90	100.0

Table no.2: Details of different presenting diseases in patients.

According to the clinical features, seizures was significantly noticed in 20 out of 47 (44.8%) acute glomerulonephritis (AGN) patients and 13 out of 29 (42.5%) chronic kidney disease (CKD) patients. Regarding headache, the highest frequency was noticed 5 out of 6 (83.3%) in nephrotic syndrome while 17 out of 47 (36.1%) in acute glomerulonephritis patients. In vomiting, acute glomerulonephritis showed 5 out of 47 (10%) and chronic kidney disease with 4 out of 29 (13.7%) in count. Decrease sensorium and pallor were presented only in chronic kidney disease patients with 6.9% and 17.2% only. Lastly, the congestive heart failure was commonly observed in acute glomerulonephritis patients (18.3%). **(Table no.4)**

Table no.3: Details of presenting clinical features of cases.

Presenting features	Frequency	Percentage
Headache	29	32.2
Vomiting	10	11.1
Seizures	35	38.8
Decrease sensorium	2	2.2
Pallor	7	7.7
Congestive cardiac failure	7	7.7
Total	90	100.0

Table No.4: Cross table: Clinical presentation and diagnosis

Clinical features	Diagnosis					Total
	CKD	AGN	Pyelonephritis	Nephrotic syndrome	Wilms tumor	
Headache	4	17	3	5	0	**29**
Vomiting	4	5	0	1	0	**10**
Seizures	13	20	2	0	0	**35**
Decrease sensorium	2	0	0	0	0	**2**
Pallor	5	0	2	0	0	**7**
Congestive cardiac failure	1	5	0	0	1	**7**
	29	**47**	**7**	**6**	**1**	**90**

DISCUSSION

Albeit the event of clinical hypertension among children is altogether lower contrasted with adults, significant proof shows that the starting points of fundamental hypertension can be followed back to childhood. Various epidemiological examinations have tended to levels of blood pressure in children. In any case, there exists impressive variety in the techniques utilized and in the rules characterizing normal and elevated blood pressure. Similarly, as in adults, different natural and hereditary factors influence blood pressure of children. Accordingly, it is significant to direct broad populace based research endeavors to accumulate standardized reference information concerning blood pressure

levels in children. Symptoms emerging from hypertension are inconsistent during the beginning phases of life.

Critically, it ought to be featured that the World Health Organization (WHO) doesn't underwrite routine blood pressure screening for adolescents and children. The American Academy of Pediatrics (AAP) recently published updated guidelines with a four-step approach that includes diagnosis, evaluation, workup, and management of children's hypertension. The prevalence of hypertension in children in Canada is estimated to be in between 1% and 2% among children while finding of hypertension is rising dramatically which will create an issue for future population.[11] There is also a negative impact on child health in long term other than a significant risk of cardiovascular morbidity and mortality related to hypertension.[12] Due to renal etiology such as acute glomerulonephritis and chronic kidney disease, secondary hypertension is very common in children, and it is considered to be the most significant etiology regarding secondary hypertension among children's worldwide.[13] According to Kaplinski M et al. in his study, primary hypertension and obesity are the main significant etiological factor among other factors in developed countries[14] but in contrast, our study reveals acute glomerulonephritis (AGN) & chronic kidney disease (CKD) are highly associated with childhood hypertension and majority patients suffered from them. Increase vascular aging and biological maturation were also considered to be an important factor to highlight while the association of hypertension with increase vascular aging and biological maturation was also reported by Litwin M et al. in his study.[15]

According to Hari P et al., the mean age was 8.2±3.9 years and age ranged from 2 months to 16 years while in our study, age range from 1-15 with mean 8±2.[16] Chronic glomerulonephritis was the significant cause as it represented 49.2% cases while in our research, chronic kidney disease (CKD) was found in 32.2% patients while 52.2% cases account to acute glomerulonephritis (AGN). Another presenting feature was encephalopathy and chronic cardiac failure (CCF) while in our study, the most common presentation was seizures and chronic cardiac failure (CCF). Etiology of hypertension in children was also studied by Mohammad A et al. where he reports 61.2% males and 38.8% females where obesity was the significant factor associated with renal pathology.[17] However, in our study, 60% males and 40% females while route cause was renal disease including acute glomerulonephritis (AGN), chronic kidney disease (CKD), chronic pyelonephritis and nephrotic syndrome which similar to other studies also.[18] In our research, most of the patient were acute glomerulonephritis (AGN) (52.2%) which in contrast resemblance to some other study showed the acute kidney injury was the most common cause of renal disease among children in Srilanka.[19-20]

Essential hypertension versus secondary hypertension in children was studied in USA by Malhotra MG et al., reported secondary hypertension was higher (57%) than essential hypertension and there was history of familial hypertension in 68% of patients.[21] In contrast, only 15.5% of the patients in our study had a positive family history of hypertension, and all of them had secondary hypertension. In Turkey, Komur M et al. studied on acute hypertension and posterior reversible encephalopathy syndrome (PRES) and reported 81.6% patients presented with history of seizures, 79.6% presented with decrease sensorium, 73.5% had headache with 44.7% males and 55.3% females and the most common underlying pathology was CKD in 76.3%, nephrotic syndrome 10.5% and AGN in 5.3% cases.[22] In contrast, in our study, CKD accounted for 32.2% patients, nephrotic syndrome 6.6% cases and AGN accounted for 52.2% cases, which is quite high as compared to Komur M et al study.

According to another study by Bhatti et al. on causes of hypertension in children, 98% cases were secondary hypertensive and among them 92% were having renal pathology which is quite comparable with our study excluding 01 case of Wilm's tumor remaining all with renal disease.[23] Study in pediatric intensive care about the clinical and etiological profile of malignant hypertension was carried out by Batouche DD et al. reported that age ranged from 1 year to 16 years with renal disease was the common under lying pathology while in 7% of patients, the presenting feature was headache and in 33.3% patients, seizures were observed.[24] In contrast, in our study, 32.2% of patients presented with headache, 38.8% with seizures, and all of them had renal pathology as the underlying cause.

According to the study conducted by Bhookya et al. in paediatric hypertension and its clincical profile and etiology, was summarized with the conclusion that 28 (22.5%) patients with clinical feature of headache and 9 (39.1%) patients with oedema as the most common clinical feature found in children with hypertension. Yang et al. also conducted a study of hypertension in children in the emergency department, and their findings were that dizziness and headache were the most common presenting symptoms in adolescent age. On contrast to that, our study showed the symptoms of 32.2% of children with headache while 38.8% with seizures.[25]

CONCLUSION

In our study, we identified secondary hypertension is predominant among children and the most common identified clinical pathology is renal disease. In turbat region, the majority of children frequently presented with headaches and seizures as clinical signs of high blood pressure.

As this study is consider being the initiative in our region, the limitations of this study include multiple things like not taking into account the obesity and any weight changes. Additionally, the changes observed in eye were not studied. We did not give an emphasis on the outcomes of treatment or the use of various medications to control hypertension. Also, we didn't archive treatment safe hypertension.

RECOMMENDATIONS

Blood pressure monitoring should be routinely included in children's regular checkups. Since this is a single-centered study, multicenter research studies are required to be conducted in future.

ETHICAL APPROVAL:

Ethical approval was taken from the Review Broad of the Mekran Medical College, turbat.

PATIENT'S CONSENT:

Informed written consent was taken from each patients for participating in the study, and publication of study results.

CONFLICT OF INTEREST:

The study has no conflict of interest to declare by any author.

AUTHOR'S CONTRIBUTION:

1. MWS: Literature search, conduct of study and editing.
2. YG: Literature search, ethical approval and manuscript writing.
3. ASG: Sampling and results writing.
4. MAK: Statistics writing.
5. SH: Literature review and discussion editing.
6. SF: Review and editing.

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