

SURVEY OF ELEVATED BLOOD PRESSURE IN CHILDREN

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ABSTRACT

Background: Hypertension is one of the leading risk factors for death, one of the main risks of cardiovascular disease. Clinical characteristics of hypertension are diverse, the early detection of symptoms of hypertension contributes significantly to early diagnosis and treatment. In Can Tho, there is little research on hypertension in children. **Objectives:** Describe the clinical and subclinical characteristics of hypertensive children being treated at the Cardiology Department, Can Tho Children's Hospital. **Materials and methods:** Analytical descriptive cross-sectional study on 96 pediatric patients diagnosed with hypertension at Can Tho Pediatrics Hospital. Research subjects: Pediatric patients (<16 years old) being treated at the department who are expected to have hypertension over a period of time. Sample selection criteria: Pediatric patients are expected to have hypertension determined according to the standards of the new Guidelines in Clinical Practice of the American Academy of Pediatrics (AAP) 2017. Exclusion criteria: Family members do not agree to allow the patient to participate in the study. Children are not appropriate for measuring BP due to congenital anomalies: Ventricular septal defect, Atrial septal defect, Patent ductus arteriosus, Tetralogy of Fallot. **Results:** The common age group is under 13 years old (60.4%). The male and female gender ratio is approximately 2.1/1. The stage 2 hypertension classification is the most common (49.8%). The rate of neurological, gastrointestinal and cardiovascular symptoms was 59.4%, respectively; 19.8%; 24%. And there is no association between gastrointestinal, cardiovascular clinical symptoms and the grade of hypertension ($p > 0.05$). Hyperlipidemia, HbA1C in children with hypertension accounted for a high rate of 47.1% and 50%. While in BUN disorder, proteinuria accounted for a low rate of 5.3% and 26.3%. No abnormalities were noted on renal Doppler ultrasound. The rate of abnormal results on echocardiography, chest X-ray and ECG was 53.3%; 23.3%; 13.7% respectively.

Keywords: hypertension, general characteristics, clinical, subclinical.

I. INTRODUCTION

Hypertension is one of the leading risk factors for death, one of the main risks of cardiovascular disease. Clinical characteristics of hypertension are diverse, the early detection of symptoms of hypertension contributes significantly to early diagnosis and treatment [1], [2], [3]. In Can Tho, there is little research on hypertension in children. To have a understanding the situation of children with hypertension in Can Tho, we conducted a project with two objectives. These were to describe the clinical and subclinical characteristics of hypertensive children being treated at the Cardiology Department of Can Tho Pediatrics Hospital.

II. MATERIALS AND METHODS

2.1. Study location, material and duration

Locations: Cardiology Department - Can Tho pediatrics hospital.

Durations: From January 2020 to April 2022.

Materials: Pediatric patients (<16 years old) undergoing treatment in the cardiology department was diagnosed with hypertension during the study duration.

Selection criteria: Pediatric patients with confirmed diagnosis of hypertension according to the New Clinical Practice Guideline of the American Academy of Pediatrics (AAP) 2017 [4], [5].

Exclusion criteria

Family members do not agree to allow the patient to participate in the study.

The patient does not cooperate with healthcare staff to measure blood pressure.

There are accompanying congenital anomalies: Ventricular septal defect, Atrial septal defect, Patent ductus arteriosus, Tetralogy of Fallot.

2.2. Research methods

Study design: It is an analytical descriptive cross-sectional study.

Sample size: Estimate sample size according to the formula

$$n = Z_{1-\frac{\alpha}{2}}^2 \cdot \frac{p(1-p)}{d^2}$$

In which:

n: research sample size

$Z_{1-\frac{\alpha}{2}}$: with a statistical significance level of 0.05, $Z=1.96$

p: choose ratio 0.831 according to Huynh Thi Vu Huynh's research

d: expected error, choose $d=0.075$

We conducted the study and recruited 96 patients.

Sampling method: Convenience sampling.

Data collection method: We directly explore and examine all pediatric patients, evaluate clinical symptoms, test results, X-rays, treatment effectiveness and record them on the form. private medical record.

Data processing: Data processing using Excel 2016, SPSS 20 software.

III. RESULTS

3.1. General characteristics

Table 1. Personal characteristics of pediatric hypertensive patients (n=96)

Characteristics		n	%
Age group	<13 years old	58	60.4
	13-16 years old	38	39.6
Gender	Male	65	67.7
	Female	31	32.3

The most common age group is < 13 years old (60.4%). Hypertension is more common in male patients (67.7%) than in female patients (32.3%) and the male/female ratio is 2.1.

3.2. Clinical characteristics

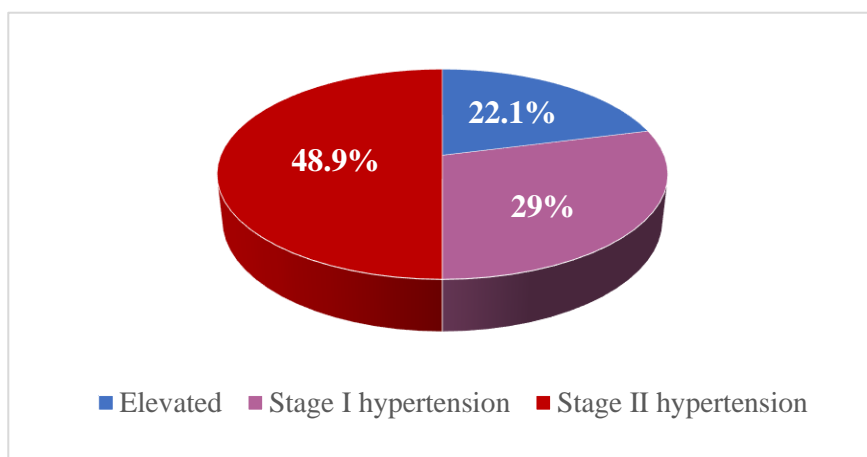


Figure 1. Distribution of hypertension according to AAP (n=96)

Stage II hypertension is the most common (50%).

Table 2. Clinical symptoms of hypertension

Clinical symptoms		Number	Rate	n=96
Neurological symptoms	Headache	44	45.8	57 (59.4%)
	Dizziness	24	28.1	
	Blurred vision	2	2.1	
Gastrointestinal symptoms	Nausea	10	10.4	19 (19.8%)
	Vomiting	16	16.7	
Cardiovascular symptoms	Chest pain	9	9.4	23 (24%)
	Tachycardia	2	2.1	
	Systolic murmurs	13	13.5	

The rate of neurological, digestive and cardiovascular symptoms is 59.4% 19.8%; 24% respectively. Headache accounts for 45.8% of neurological symptoms. Vomiting accounts for 16.7% of gastrointestinal symptoms. Systolic murmurs accounts for 13.5% of cardiovascular symptoms.

Table 3. Association between clinical symptoms and the grade of hypertension

Clinical symptoms		The grade of hypertension				p
		Hypertension		Severe hypertension		
		Number	Rate	Number	Rate	
Neurological symptoms	Yes	31	54.4%	26	45.6%	0.428
	No	18	46.1%	21	53.9%	
Gastrointestinal symptoms	Yes	13	68.4%	6	31.6%	0.091
	No	36	46.8%	41	53.2%	
Cardiovascular symptoms	Yes	9	39.1%	14	60.9%	0.19
	No	40	54.8%	33	45.2%	

There was no association between gastrointestinal symptoms as well as cardiovascular symptoms with the grade of hypertension ($p > 0.05$).

3.3 Subclinical characteristics

Table 4. Tests results in pediatric hypertensive patients

Subclinical	Result	Rate
Triglyceride	Increase	47.1%
Hemoglobin A1c	Increase	50%
Blood Urea Nitrogen	Increase	5.3%
Proteinurina	Positive	26.3%

Increase Triglyceride, Hemoglobin A1c in hypertensive children accounted for high rates of 47.1% and 50%. While Blood Urea Nitrogen disorders, proteinuria accounted for low rates of 5.3% and 26.3%.

Table 5. Imaging diagnostic results in pediatric hypertensive patients

Subclinical	Result	Rate
Renal doppler ultrasound	Normal	100%
Echocardiography	Normal	46.7%
	Ventricular hypertrophy	3.2%
	Valvular regurgitation	42.7%
	Both ventricle hypertrophy and valvular regurgitation	7,4%
Chest X-ray	Normal	76.7%
	Abnormal: Cardiomegaly	23.3%
Electrocardiogram	Normal	86.3%
	Left ventricular hypertrophy	6.3%
	Extrasystoles	4.2%
	Sinus tachycardia	3.2%

No abnormalities was noted on renal doppler ultrasound. Proportion of valvular 42.7%. Cardiomegaly on chest X-ray was 23.3%. left ventricular hypertrophy regurgitation in echocardiography is on electrocardiogram was 6.3%.

IV. DISCUSSION

4.1 General characteristics

Among 96 pediatric hypertensive patients, there were 58 pediatric patients in the <13 year old group (60.4%). Our results are similar to Huynh Thi Vu Quynh's study with the rate of pediatric hypertensive patients <10 years being 50.8% [6]. The ratio of male patients to female patients is 2.1/1.

4.2 Clinical characteristics

In our study, the rate of stage II hypertension accounted for the most (48.9%), the rate of stage I hypertension accounted for 29%, and the lowest was recorded in the rate of elevated (22.1%). Research by author Dang Duc Tri noted that children with grade 2 of hypertension are 3 times higher than children with grade 1 of hypertension [7], [8]. Compared to the results of a study conducted on 2600 pediatric patients at 4 primary health care clinics in the US, the opposite rate was recorded, the rate of elevated only accounted for 5.2% [9], [10]. This rate was also shown in a screening study at schools in the US within the framework of the Houston Pediatrics and Hypertension program at the University of Texas Health Science Center - Houston (McGovern) on 22,224 pediatric patients. The group

of stage II hypertension accounts for the lowest rate, only 2.3% [11]. The results of our study are different from the two studies conducted in the US because the implementation and data collection process took place in a short time and the COVID-19 epidemic occurred, leading to a large number of patients. Children coming for examination and treatment at the hospital decreased, so the sample size was quite small. At the same time, data collection in this study only focused on pediatric patients with hypertension as the main pathology, different from the collection of screening data on all pediatric patients in two studies in the US.

Regarding the clinical symptoms recorded in pediatric hypertensive patients, research results showed that neurological symptoms accounted for 59.4%, gastrointestinal symptoms accounted for 19.8%. Cardiovascular symptoms account for 24%. Specifically, headache is the most common neurological symptom (45.8%), followed by dizziness 28.1%, vomiting 16.7% and nausea 10.4%. This result is quite similar to the research results of Huynh Thi Vu Quynh and Nguyen Thi Thanh Lan, who noted that the most common symptom is headache, accounting for the highest proportion (18.5% of the total 41.5% of cases). Hypertension has clinical symptoms [6]; the most common gastrointestinal symptom is vomiting (61.5%); cardiovascular symptoms are systolic murmurs (54.2%).

With the new classification of AAP [4], we divided pediatric patients into 2 groups of elevated and hypertension and found that there is a relationship between gastrointestinal symptoms and cardiovascular symptoms for elevated and hypertension. ($p < 0.05$).

4.3. Subclinical characteristics

The rate of dyslipidemia in our study was 47.1%, higher than the study by Huynh Thi Vu Quynh, Nguyen Thi Thanh Lan which was 30.2%. Research by author Dang Duc Tri recorded more than a quarter of cases (26.7%) with hyperlipidemia [7]. This may be explained by the fact that the rate of overweight (14.6%), obese pediatric patients (31.2%) in our study is higher than in the study of Huynh Thi Vu Huynh, Nguyen Thi Lan (8%). The rate of HbA1C which increases is quite high, accounting for 50% [6].

Abnormalities on echocardiography recorded valvular regurgitation accounting for 42.7%, and ventricular hypertrophy comorbidity with valvular regurgitation accounting for 6.6%. Our study differs from the research of Huynh Thi Vu Huynh and Nguyen Thi Lan, left ventricular hypertrophy accounted for 23.1%, valvular regurgitation accounted for 6.1%. The rate of enlarged heart shadow recorded on X-ray was 23.3%, higher than the study by Huynh Thi Vu Huynh and Nguyen Thi Lan, which was 13.8%. Abnormalities on ECG recorded left ventricular hypertrophy were 6.3%, lower than in the study of Huynh Thi Vu Huynh and Nguyen Thi Lan, which was 18.5%. The difference between our study and that of authors Huynh Thi Vu Huynh and Nguyen Thi Lan may be due to the sample size of the two studies not being large enough, so the study results cannot represent all pediatric hypertensive patients nationwide. It is only specific to each specific region, as the conditions for diagnosing and caring for pediatric patients in each geographical area are different [6].

V. CONCLUSION

Common age group is < 13 years old (60.4%); The ratio of boys to girls is 2.1:1. The most common grade of hypertension is stage II hypertension. The rate of neurological, digestive and cardiovascular symptoms is 72.9%; 27.1%; 25% respectively. There is no relationship between gastrointestinal and cardiovascular clinical symptoms and the grade of hypertension ($p > 0.05$). Hyperlipidemia and HbA1C in hypertensive children account for a

high rate of 47.1%; 50%. No abnormalities were noted on renal Doppler ultrasound. The rate of abnormal heart failure, chest X-ray, and ECG was 53.3%, respectively; 23.3%; 13.7%.

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