

CLINICAL AND SUBCLINICAL CHARACTERISTICS OF CARDIAC ARRHYTHMIAS IN CHILDREN AT CAN THO CHILDREN'S HOSPITAL

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ABSTRACT

Introduction: Cardiac arrhythmia is a common cardiovascular emergency with diverse clinical and paraclinical characteristics. Arrhythmias can be harmless, asymptomatic, or have mild symptoms. However, some arrhythmias can cause discomfort with aggressive clinical and paraclinical manifestations, sometimes threatening the patient's life. This disease has very different clinical and paraclinical symptoms between types of arrhythmia. **Objectives:** Describe the clinical and paraclinical characteristics of arrhythmias in children at the Cardiovascular Department of Can Tho Children's Hospital. **Subjects and Methods:** A case series study was conducted on 45 children with arrhythmias at the Cardiovascular Department of Can Tho Children's Hospital, with consent obtained from their parents or caregivers to provide accurate information. All children 0 - 15 years old were diagnosed with arrhythmia based on ECG criteria or other investigation methods at the time of first examination or discovered during research at the Department of Cardiology in Can Tho Children's Hospital, whose parents or caregivers agree to provide accurate and clear information. **Results:** The ratio of men to women was equal (1.1/1), with the ≥ 60 months age group having a higher rate compared to the < 60 months group. Rapid pulse accounted for the highest rate (64.4%) among children with arrhythmias, while chest pain and palpitations accounted for the lowest rates at 11% and 13%, respectively. Most of the electrolytes did not have many disturbances. There was 1 case of hypernatremia (accounting for 2.2%) and 1 case of hypokalemia (accounting for 2.2%). There were no cases of chloride disorders. Echocardiograms mostly had abnormal results in pediatric patients with arrhythmias. The most common kind of abnormal result was mitral incompetence (26.7%). Sinus tachycardia accounted for the highest proportion (64.4%) of electrocardiography. **Conclusion:** The majority of children with arrhythmia were in the age group ≥ 60 months. Rapid pulse accounted for the highest rate among children with arrhythmias. Most of the electrolytes did not have many disturbances. Cardiac morphological and functional testing mostly had abnormal results in pediatric patients with arrhythmias.

Keywords: Clinical characteristics, Paraclinical characteristics, Pediatric arrhythmia.

I. INTRODUCTION

Cardiac arrhythmia is a common disease; the mechanism is complex, and the causes are diverse. The rate of arrhythmia among the total number of hospitalized patients and cardiovascular patients hospitalized at Children's Hospital 2 at the same time was 0.115% and 5.67% [1]. Arrhythmias can be harmless, asymptomatic, or have mild symptoms. However, some arrhythmias can cause discomfort with aggressive clinical and paraclinical manifestations, sometimes threatening the patient's life. This disease has very different clinical and paraclinical symptoms between types of arrhythmia. Specifically, circulatory failure is 18.3% in supraventricular tachycardia and 55.6% in ventricular tachycardia. Irritation and crying are 62% in supraventricular tachycardia and 55.6% in ventricular

tachycardia [2]. As for subclinical, in cases of supraventricular tachycardia, 18.3% had reduced left ventricular ejection fraction LVEF; this rate was 44.4% in cases of ventricular tachycardia [2]. In addition, in the same type of arrhythmia, clinical and paraclinical manifestations are different. In the form of supraventricular tachycardia, the most common symptoms are palpitations (42%), followed by fatigue (36%), chest pain, irritability, crying, poor appetite (34%), and so on, followed by nausea and vomiting (30%), pale skin (24%) [3]. Determining the clinical and paraclinical characteristics of patients with arrhythmia is very important because it contributes to creating the most comprehensive and complete overview of this disease. This is especially useful so that doctors can quickly make an accurate diagnosis and find many causes and mechanisms of disease, thereby providing the most effective, thorough, and superior treatment method for patients. Thanks to that, the physical, material, and mental burden of patients and their families is reduced. Based on the development of science and technology, especially in the field of medical research, there have been many domestic and foreign studies on clinical and paraclinical characteristics of arrhythmias in the community, but not so much for children. Specifically, in the country, studies can include research by authors Bui Xuan Vu Hoang Trong Kim (2001): "Characteristics of cardiac arrhythmias at Children's Hospital 1", research by author Authors Trinh Huu Tung, Nguyen Thi Thanh Lan (2006): "Characteristics of cardiac arrhythmias at Children's Hospital 2". However, neither study guarantees novelty, and the problems recorded in the two studies have not been updated according to the current development of medicine. In recent years, many studies have been conducted on this issue. Although recent studies have presented many different aspects related to arrhythmias in children, they mostly focus on one or a few types of arrhythmias, not showing a comprehensive view of the problem. Therefore, we conducted the study "Survey of clinical and paraclinical characteristics in pediatric arrhythmia at the Cardiovascular Department of Can Tho Children's hospital" with the following objectives:

Describe the clinical and paraclinical characteristics of arrhythmia in children at the Cardiovascular Department of Can Tho Children's Hospital.

II. MATERIALS AND METHODS

2.1. Subjects

All children 0 - 15 years old were diagnosed with arrhythmia based on ECG criteria or other investigation methods at the time of first examination or discovered during research at the Department of Cardiology in Can Tho Children's Hospital, whose parents or caregivers agree to provide accurate and clear information.

Exclusion criteria:

Children with a confirmed diagnosis of arrhythmia whose parents or caregivers refuse to cooperate in research.

Children diagnosed with arrhythmia by other hospitals but lacking clinical and electrocardiographic evidence upon examination at the Can Tho Children's Hospital and with arrhythmia detectable by the hospital's diagnostic tools during the research period.

2.2. Methods

Study design: Case series study

Location and time: Cardiovascular Department of Can Tho Children's Hospital., from June 2022 to June 2023.

Sampling method: Convenience sampling, taking all patients who meet research criteria.

Study content: Clinical and paraclinical characteristics of arrhythmia in children at the Cardiovascular Department of Can Tho Children's Hospital.

Data collection method: All eligible children underwent medical history interviews, clinical examinations, and laboratory testing. Data collected on the survey form were standardized.

Data processing: Data was analyzed using SPSS 18.0 software. The main analysis method included descriptive analysis of frequencies and percentages. Associations were determined using frequency, percentages, odds ratio (OR), 95% confidence interval (CI) OR, and the Chi-square test with significance level $\alpha= 0.05$.

2.3. Ethics in research:

Approved by the Ethics Committee in Biomedical Research at Can Tho University of Medicine and Pharmacy with Research Ethics Approval Certificate number 22.074.SV/PCT-HĐĐĐ.

III. RESULTS

From 06/2022 to 06/2023, our study investigated 45 cases of pediatric arrhythmia with the results below:

3.1. General characteristics of the study subjects

Table 1. General characteristics of the study subjects (n=45)

Characteristics		Frequency (n)	Percentage (%)
Gender	Male	24	53.4
	Female	21	46.6
Age group	<60 months	16	35.5
	≥60 months	29	64.5

Comment: The ratio of men to women was equal (1.1/1), with the ≥60 months age group having a higher rate compared to the <60 months group.

3.2. Clinical characteristics

Table 2. Clinical characteristics

Characteristics		Frequency (n)	Percentage (%)
Pulse	Rapid	29	64.44
	Normal	10	22.22
	Slow	6	13.34
Respiratory	Tachypnea	14	31.1
	Normal	31	68.9
Fatigue		13	28
Chest pain		5	11
Palpitation		6	13
Dyspnea		10	22

Comment: Rapid pulse accounted for the highest rate (64.4%) among children with arrhythmias, while chest pain and palpitations accounted for the lowest rates at 11% and 13%, respectively.

3.3. Paraclinical characteristics

Table 3. Electrolytes

Characteristics		Frequency (n)	Percentage (%)
Na+	Hypernatremia	1	2.2
	Normal	44	97.8
	Hyponatremia	0	0
K+	Hyperkalemia	0	0
	Normal	44	97.8
	Hypokalemia	1	2.2
Cl-	Hyperchloremia	0	0
	Normal	45	100
	Hypochloremia	0	0

Comment: Most of the electrolytes did not have many disturbances. There was 1 case of hypernatremia (accounting for 2.2%) 1 case of hypokalemia (accounting for 2.2%). There were no cases of chloride disorders.

Table 4. Blood sample

Characteristics	Frequency (n)	Percentage (%)
Anemia	19	42%

Comment: The rate of anemia in children with arrhythmia was 42% (19 children).

Table 5. Cardiac morphological and functional testing

Characteristics		Frequency (n)	Percentage (%)
Echocardiography	Ostium secundum atrial septal defect (ASD - os)	3	6.7%
	Ventricular septal defect (VSD)	2	4.4%
	Patent ductus arteriosus (PDA)	4	8.9%
Echocardiography	Pulmonic stenosis	3	6.7%
	Mitral incompetence	12	26.7%
	Tricuspid incompetence	4	8.9%
	Left ventricular hypertrophy	4	8.9%
	Other abnormal results	9	20%
ECG	Tachyarrhythmias	31	68.8%
	Bradyarrhythmias	14	31.2%
	Sinus tachycardia	29	64.4%
	Sinus bradycardia	4	8.9%

Characteristics		Frequency (n)	Percentage (%)
	Atrioventricular nodal reentry tachycardia	2	4.4%
	Right bundle branch block	13	28.9%
	Other abnormal results	8	17.8%

Comment: Echocardiograms mostly had abnormal results in pediatric patients with arrhythmias. The most common kind of abnormal result was mitral incompetence (26.7%). Sinus tachycardia accounted for the highest proportion (64.4%) of electrocardiography.

IV. DISCUSSION

4.1. General characteristics

During the study period, we enrolled a total of 45 patients, including an equal ratio of men to women (1.1/1 male/female), with the ratio of men at 53.4% and women at 46.6%. Unlike the study by author Hoang Van Toan, where the ratio of men and women was different (male/female 2.08/1), with the ratio of men comprising 67.4% and women 32.6% [2]. This difference can be explained by the fact that our study had a short research period and a small sample size, so there was a gender difference. Regarding age groups, 64.5% belonged to the ≥ 60 months group, while 35.5% belonged to the < 60 months group. Our results show that the group ≥ 60 months had a lower rate of arrhythmia compared to Pham Van Cuong's study on children with acute myocarditis, where the rate was 81.9%. This variance can be explained by differences in research subjects [4].

4.2. Clinical characteristics

In our study, there are 2 groups: the group related to vital signs and the group related to functional symptoms. In the group related to vital signs, a fast pulse accounts for the highest proportion, with 29/45 patients accounting for 64.4%. A normal pulse accounts for 10/45 patients with a rate of 22.2%, while a slow pulse was observed in 6/45 patients, accounting for 13.3%. These results are different from Doniger SJ's study, which reported a fast pulse rate of approximately 94% [5]. Signs of tachypnea were recorded in 14/45 patients, accounting for 31.1%, which is similar to the findings of Amanda Quattrocelli's study, with a rate of 43%. The group of physical symptoms showed that patients with symptoms of fatigue and shortness of breath accounted for the highest proportion of 28% and 22%, respectively; Symptoms of palpitations and chest pain accounted for 13% and 11%. According to author Amanda Quattrocelli, the proportion of patients with palpitations is the highest at 100%, followed by dizziness at 62% and difficulty breathing at 53% [6]. According to Ngo Anh Vinh, the rate of palpitations is 42%, fatigue is 36%, nausea is 30%, and pale skin is 24% [3]. However, according to Bui Gio An, the symptoms of skin reappearing account for the highest rate (58%) and poor appetite (48%) [7]. This shows that the functional symptoms of patients with arrhythmia are very diverse and have no specific symptoms.

4.3. Paraclinical characteristics

In our study, we found that the rate of electrolyte disorders in patients with arrhythmia was low, with hypernatremia and hypokalemia both being 1/45 patients, accounting for 2.2%. There is a difference between our study and Pham Van Cuong's study, which was 17.5% due to sample size and research time issues [4]. The study noted anemia

in patients with arrhythmia in 19/45 cases, accounting for 42%. There is a difference between our study and Putri Amelia's study (27%) because in anemia, there is compensation by increasing heart rate to help the body respond to anemia [8]. In our study, 29/45 patients, accounting for 64.4% of patients, had abnormalities on echocardiography. The most common type of abnormal results is mitral incompetence (26.7%). In Hoang Van Toan's study, the rate of abnormalities in echocardiography was about 23.6%. This difference is due to the fact that in our study, we studied patients with congenital heart disease and those who did not have congenital heart disease. Except for patients who have previously undergone intervention for cardiovascular disease [2]. On the surface electrocardiogram of the study, the rate of tachyarrhythmias was 31/45 patients, accounting for 68.8%, and the rate of bradyarrhythmias was 14/45 patients, accounting for 31.2%. In Amanda Quattrocelli's study, the rate of tachyarrhythmias was 94%, and the rate of slow arrhythmias was 6%, with differences due to study time and the patient's comorbid medical condition [6]. In our study, sinus tachycardia accounted for the highest rate (64.4%).

V. CONCLUSION

The ratio of men to women was equal; the age group ≥ 60 months had a higher rate than the group < 60 months. Rapid pulse accounted for the highest rate among children with arrhythmias. Most of the electrolytes did not have many disturbances; there was 1 case of hypernatremia and 1 case of hypokalemia. No chloride disorders were recorded. Cardiac morphological and functional testing mostly had abnormal results in pediatric patients with arrhythmias.

REFERENCES

1. Trinh Huu Tung. *Characteristics of Cardiac Arrhythmias at Children's Hospital 2*. 2010.
2. Hoang Van Toan, Dang Thi Hai Van, Nguyen Thanh Hai. Clinical and paraclinical characteristics of tachycardia in children at the National Children's Hospital. *Pediatrics Journal*. 2021.14(1), 43-49, <https://doi.org/10.52724/tcnk.v14i1.20>
3. Ngo Anh Vinh, Nguyen Thi Hue Linh, Le Ngoc Duy. Some clinical and paraclinical characteristics of ventricular tachycardia in children at the Emergency and Toxicology Department, National Children's Hospital, during the period of 2021-2022.. *Vietnam Medical Journal*. 2023.526(1A), 103-108, <https://doi.org/10.51298/vmj.v526i1A.5300>
4. Pham Van Cuong, Nguyen Thanh Hai, Nguyen Thi Hai Anh, Tran Quoc Hoan, Dang Thi Hai Van. Some factors related to cardiac arrhythmias in acute myocarditis in children. *The Medical Research Journal*. 2023.172(11), 183-194. <https://doi.org/10.52852/tencyh.v172i11.2113>
5. Doniger SJ, Sharieff GQ. Pediatric dysrhythmias. *Pediatric clinics of North America*. 2006.53(1),85-105, <https://doi.org/10.1016/j.pcl.2005.10.004>
6. Quattrocelli A, Lang J, Davis A, Pflaumer A. Age makes a difference: Symptoms in pediatric supraventricular tachycardia. *Journal of arrhythmia*. 2018.34(5), 565-571, <https://doi.org/10.1002/joa3.12103>
7. Bui Gio An, Vu Cong Dong. Diagnosis and emergency treatment characteristics of tachycardia in hospitalized children at the Emergency Department of Children's Hospital 2. *The Ho Chi Minh City Medical Journal*. 2009.13(1), 114-120.
8. Amelia P, Lubis B, Adriansyah R. Correlation Between Anemia (Hemoglobin Level) and Cardiomegaly Based On Chest Radiograph and Echocardiography. *Acta informatica medica : AIM : journal of the Society for Medical Informatics of Bosnia & Herzegovina : casopis Društva za medicinsku informatiku BiH*. 2023.31(3), 191-194. <https://doi.org/10.5455/aim.2023.31.191-194>.