

## ORIGINAL ARTICLE

## Arrhythmias and Conduction Disturbances in Children at the Department of Child Health, School of Medicine University of North Sumatra/Dr. Pirngadi Hospital Medan

by

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### Abstract

A retrospective study on arrhythmias and conduction disturbances was conducted in 1986 in the Division of Pediatric Cardiology of Dr. Pirngadi Hospital, Medan. There were 106 (35.33%) cases with arrhythmias and conduction disturbances out of 300 patients studied. The most common type of arrhythmia among the patients under 5 was intraventricular conduction defects, whilst in the age group of 5-10 were sinus tachycardia and intraventricular conduction defects, and in the age group of 10-15 was first degree A-V block.

Rheumatic heart diseases and VSD were the most common cardiac diseases associated with arrhythmias, where the frequency were 18.86% and 10.37%, respectively. Arrhythmias associated with several extracardiac diseases were found in 60 (56.61%).

Two out of 7 cases who was treated with antiarrhythmic agents died with SVT associated with bronchopneumonia, and atrial fibrillation associated with gastroenteritis, dehydration and malnutrition. Treatment against the main diseases (without antiarrhythmic agents) was done in the remainders. Eventhough the overall mortality rate was 13.20%, it was not due to arrhythmia itself but most of them died of non-arrhythmic origin.

### Introduction

Changes in the regular heart rhythm are called arrhythmias. Arrhythmias will be discussed here divided according to the following classification: arrhythmias with sinus pacemaker, arrhythmias with ectopic pacemaker, and arrhythmias caused by conduction defects (Nadas and Fyler, 1972). Arrhythmias may due to cardiac or extracardiac pathologic manifestation such as hypoxemia, acute blood loss, acid base and electrolyte disturbances, infections and unknown causes (Khan, 1985).

A careful assessment of all patients suspected of suffering from cardiac arrhythmias is essential. The exact diagnosis with electro-cardiography (ECG) must be made

whenever possible, because different arrhythmias frequently have a markedly different clinical and therapeutic significance (Chia, 1986).

It is not necessary to treat all of arrhythmias. The clinical importance ranges from life threatening problems demanding immediate attention to incidental findings not requiring treatment (Alpert and Rippe, 1985).

The aim of this study is to describe the incidence, the underlying or associated diseases and the mortality of patients with arrhythmias at our department during 1986.

### Materials and Methods

All patients admitted or consulted to Subdivision of Pediatric Cardiology, Department of Child Health of Dr. Pirngadi Hospital, Medan, during 1986 were studied retrospectively. Diagnosis of arrhythmias

and conduction disturbances was made by ECG. Changes in the regular heart rhythm were called arrhythmias. The normal value of heart rate was defined according to sex and age (Kaplan, 1975).

### Results

Of 300 total number of patients admitted or consulted to Subdivision of Pediatric Cardiology during 1986, there were 106

cases (35.33%) with arrhythmias and conduction disturbances as listed in table 1.

Table 1 : Frequency of arrhythmias and conduction disturbances

Type of arrhythmias & Conduction disturbances	Number of cases	%
<b>Arrhythmias with sinus pacemaker</b>		
Sinus tachycardia	20	18.87
Sinus arrhythmia	8	7.55
Sinus bradycardia	2	1.88
<b>Arrhythmias with ectopic pacemaker</b>		
Wondering pacemaker	4	3.77
S V T	2	1.88
Atrial fibrillation	1	0.94
A P C	1	0.94
N P C	1	0.94
V P C	2	1.88
<b>Conduction disturbances</b>		
First degree A-V block	22	20.75
Second degree A-V block	2	1.88
Third degree A-V block	1	0.94
I V C D	30	28.30
Combined	10	9.43
<b>T o t a l</b>	<b>106</b>	<b>100.00</b>

SVT = supraventricular tachycardia  
 APC = atrial premature contraction  
 NPC = nodal premature contraction  
 VPC = ventricular premature contraction  
 IVCD = intraventricular conduction defect  
 A-V = atrio-ventricular

Table 2 reveals age distribution of the patients with arrhythmias and conduction disturbances.

Table 2 : Distribution of arrhythmias and conduction defects by age

Arrhythmias and conduction defects	Age group (year)				Number of cases
	0 - 1	1 - 5	5 - 10	10 - 15	
Sinus tachycardia	7	8	4	1	20
Sinus arrhythmia	-	4	4	-	8
Sinus bradycardia	-	-	-	2	2
Wondering pacemaker	-	1	3	-	4
S V T	-	1	-	1	2
Atrial fibrillation	-	1	-	-	1
A P C	-	1	-	-	1
N P C	-	-	-	1	1
V P C	-	1	1	-	2
First degree A-V block	2	5	3	12	22
Second degree A-V block	1	-	-	1	2
Third degree A-V block	-	-	1	-	1
I V C D	9	10	4	7	30
Combined	2	5	1	2	10
<b>T o t a l</b>	<b>21</b>	<b>37</b>	<b>21</b>	<b>27</b>	<b>106</b>

Arrhythmias associated with heart diseases were found in 46 cases (43.39%) as listed in table 3.

Table 3 : Arrhythmias associated with heart disease

Heart diseases	Type of arrhythmias								Number of cases
	S T	W P	A-V block					Combined	
			I	II	III	VPC	IVCD		
V S D	-	-	2	-	-	-	6	-	8
VSD + bronchopneumonia	1	-	-	-	-	-	2	-	3
A S D	-	1	2	-	-	-	3	1	7
R H D	-	-	11	1	-	-	6	2	20
PDA + bronchopneumonia	-	-	-	-	-	-	1	-	1
Tetralogy of Fallot	-	-	-	-	-	-	1	1	2
Dextroposition	-	-	-	1	-	-	1	-	2
Myocarditis + typhoid fever	-	-	-	-	-	-	-	1	1
C O P D	-	-	-	-	-	-	-	1	1
Cyanotic CHD	-	-	-	-	-	-	1	-	1
T o t a l	1	1	15	2	-	1	20	6	46

VSD = ventricular septal defect  
 ASD = atrial septal defect  
 PDA = patent ductus arteriosus  
 RHD = rheumatic heart disease  
 COPD = chronic obstructive pulmonary disease  
 ST = sinus tachycardia  
 WP = wandering pacemaker

Some clinical entities associated with arrhythmias and conduction defects are listed in table 4, 5, 6, 7 and 8.

Table 4 : Clinical entities associated with arrhythmias with sinus pacemaker

Clinical entities	Sinus Arrhythmia	Sinus Tachycardia	Sinus Bradycardia	Number of cases
Gastroenteritis + dehydration	-	4	-	4
Bronchopneumonia	-	4	-	4
Diphtheria + bronchopneumonia	-	1	-	1
VSD + bronchopneumonia	-	1	-	1
Diphtheria (no myocarditis)	1	2	-	3
Primary tuberculosis	1	1	-	2
Febrile illness	1	1	-	2
Typhoid fever	-	-	2	2
Acute glomerulonephritis	-	1	-	1
Fluid overload	-	1	-	1
Electrical injury	-	1	-	1
Arthritis	1	-	-	1
Juvenile rheumatoid arthritis	1	-	-	1
Serous meningitis	-	1	-	1
Convulsive disorder	1	-	-	1
Bronchitis	-	1	-	1
Ascites	-	1	-	1
Pectus excavatum	1	-	-	1
Unknown	1	-	-	1
T o t a l	8	20	2	30

Table 5 : Clinical entities associated with arrhythmias with ectopic pacemaker

Clinical entities	Wondering Pacemaker	SVT	A F	APC	NPC	VPC	Number of cases
Acute glomerulonephritis	1	-	-	-	1	-	2
A S D	1	-	-	-	-	-	1
Typhoid fever	1	-	-	-	-	-	1
Gastroenteritis + dehydration	1	-	-	-	-	-	1
Bronchopneumonia	-	1	-	-	-	-	1
Hematothorax	-	1	-	-	-	-	1
Gastroenteritis + dehydration + bronchitis + malnutrition	-	-	1	-	-	-	1
Febrile illness	-	-	-	1	-	-	1
Cyanotic CHD	-	-	-	-	-	1	1
Upper respiratory tract infection	-	-	-	-	-	1	1
<b>T o t a l</b>	<b>4</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>11</b>

Cyanotic CHD = Cyanotic congenital heart disease  
 AF = atrial fibrillation

Table 6 : Clinical entities associated with atrioventricular block

Clinical entities	Atrioventricular block			Number of cases
	I	II	III	
R H D	11	1	-	12
V S D	2	-	-	2
A S D	2	-	-	2
Typhoid fever (no myocarditis)	2	-	-	2
Diphtheria (no myocarditis)	1	-	-	1
Bronchopneumonia	1	-	-	1
Gastroenteritis + dehydration	1	-	-	1
Serous meningitis	1	-	-	1
Febrile illness	1	-	-	1
Dextroposition	-	1	-	1
Epilepsy + bronchopneumonia	-	-	1	1
<b>T o t a l</b>	<b>22</b>	<b>2</b>	<b>1</b>	<b>25</b>

Table 7 : Clinical entities associated with intraventricular conduction defects

Clinical entities	Intraventricular conduction defects			Number of cases
	Incomplete R B B B	Incomplete L B B B	Indeterminate	
R H D	4	2	-	6
V S D	6	-	-	6
VSD + Sepsis	1	-	-	1
VSD + bronchopneumonia	-	1	-	1
A S D	3	-	-	3
PDA + bronchopneumonia	1	-	-	1
Gastroenteritis + dehydration	3	-	-	3
Dextroposition + COPD	1	-	-	1
Bronchopneumonia	-	-	1	1
Encephalitis	1	-	-	1
Purulent meningitis	1	-	-	1
Primary tuberculosis	-	-	1	1
Tetralogy of Fallot	-	1	-	1
Juvenile rheumatoid arthritis	-	-	1	1
Epilepsy	-	1	-	1
Febrile illness	1	-	-	1
<b>T o t a l</b>	<b>22</b>	<b>5</b>	<b>3</b>	<b>30</b>

RBBB = right bundle branch block  
LBBB = left bundle branch block

Table 8 : Clinical entities associated with combined arrhythmias

Combined arrhythmias	Clinical entities	Number of cases
Bilateral BBB + Sinus tachycardia	Heart failure + bronchopneumonia + malnutrition	1
RBBB + Sinus arrhythmia	Hyperkalemia	1
	Dystrophia musculorum progressiva	1
	Streptococcal infection	1
1st degree A-V block + L B B B	R H D	1
	C O P D	1
1st degree A-V block + R B B B	A S D + malnutrition	1
	Tetralogy of Fallot	1
	Typhoid fever + myocarditis	1
	Rheumatic fever + myocarditis	1
	<b>T o t a l</b>	<b>10</b>

Seven cases were treated by antiarrhythmic agents and correction of associated diseases, 5 cases were lost before treatment had been given, and the 94 remainders were treated for their primary diseases without antiarrhythmic agents. The results of treatment by antiarrhythmic agents are listed in table IX.

Table 9 : Cases who were treated with antiarrhythmic agents

Type of arrhythmias	Recovered	Drop out	Died	Number of cases
S V T	1	-	1	2
A P C	-	1	-	1
Atrial fibrillation	-	-	1	1
V P C	1	1	-	2
3rd degree A-V block	-	1	-	1
<b>T o t a l</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>7</b>

Two out of 7 cases who were treated with anti-arrhythmic agents died with SVT associated with bronchopneumonia, and atrial fibrillation associated with gastroenteritis, dehydration, and malnutrition.

### Discussion

Cardiac arrhythmias can arise in a wide variety of settings and can pose difficult diagnostic and management problems (Alpert and Rippe, 1985). In this study, we found arrhythmias in a wide range of age distribution, from neonatal age period until 15 years of age. Those over 15 were not covered, but referred to The Department of Internal Medicine.

Hohn (1972) reported that the incidence of arrhythmias among the pediatric cardiac patients was 3,04% (76 out of 2496). In his report he only considered significant arrhythmias such as premature contractions, paroxysmal supraventricular tachycardia, complete A-V block, WPW syndrome, second degree A-V block, atrial flutter, atrial fibrillation, ventricular tachycardia, and excluded insignificant arrhythmias such as sinus tachycardia and intraventricular conduction defects. Higher incidence in this study (35.33%) may be caused by the different classification, where conduction defects were also included, and all of patients admitted to Subdivision of Pediatric Cardiology (even though there were no overt cardiac diseases) were included. If we only included arrhythmia as Hohn's report the incidence is only 4.66% (14 out of 300).

Cardiac arrhythmias may occur in either the presence or absence of underlying cardiac disease (Alpert and Rippe, 1985), and rheumatic heart disease (RHD) are the commonest cardiac diseases associated with arrhythmias (Nadas and Fyler, 1969).

Twelve out of 94 cases who were treated for underlying or associated diseases dengue hemorrhagic fever in 1. The remainders were recovered from underlying or associated diseases. The over all mortality were 14 (13.20%).

In this study, arrhythmias associated with cardiac disease were found in 46 (43.39%). In agreement with Nadas and Fyler, we also found that the commonest cardiac disease associated with arrhythmia was RHD in 20 (18,86%). Other overt cardiac diseases associated with arrhythmias were VSD in 11 (10.37%) and ASD in 7 (6.60%). Arrhythmias without overt cardiac diseases but associated with several extracardiac diseases were found in 60 (56.61%).

It can be understood that the commonest arrhythmias found in the age group of 10-15 was first degree A-V block associated with RHD, as was the peak incidence of RHD at our Department (Halim et al., 1981 and Naim et al., 1987). Among children under 5 the commonest arrhythmia was IVCD and in the age group of 5-10 were sinus tachycardia and IVCD.

Sinus tachycardia was more frequently found associated with gastroenteritis due to hypovolemic and acid-base and electrolyte balance disturbances, and also with bronchopneumonia due to fever and hypoxic state; this may conform to high incidences of the two illnesses. IVCD was found in 30 (28.30%) and most of them (22 out of 30) were incomplete RBBB. It was not known whether it due to the concomitant diseases or not, because RBBB may also be found in normal individuals (Goldman, 1982).

Sixty nine out of 94 (60.33%) cases who were not treated with antiarrhythmic agents

recovered from their primary diseases, and most of them had no further arrhythmic monitoring. A continuous 24 hour ECG monitoring (Jordan and Scott, 1985) was not available and so we could not determine whether the main causes of death were arrhythmias or associated diseases.

Although the overall mortality rate was

13,20%, it was not the true mortality of arrhythmias. We believed that most of them died, due to non-arrhythmic causes, because there were no severe ECG changes, except 2 out of 7 cases who treated with antiarrhythmic agents died with SVT and atrial fibrillation. However, in this 2 cases, death might also due to their concomitant diseases.

### Summary

During 1986, the incidence of arrhythmias and conduction disturbances at The Department of Child Health of Dr. Pirngadi Hospital Medan was 35.33%. Among patients under 5, the most common arrhythmias was IVCD, while among the age of 10-15, the most frequent was first degree A-V block.

Cardiac arrhythmias more frequently

associated with various extracardiac diseases, while the most common cardiac diseases associated with arrhythmias was RHD.

Although the overall mortality was 13.20%, we believed that it might due to non-arrhythmic causes, because most of them died without severe ECG changes.

### REFERENCES

- ALPERT, J.S.; RIPPE, J.M.: Manual of cardiovascular diagnosis and therapy; 2nd ed., pp. 23 - 43 (Little Brown, Boston 1985).
- CHIA, B.L.: Cardiac arrhythmias for the family physician, Med. Progr. July, pp. 13 - 21 (1986).
- GOLDMAN, M.J.: Principles of clinical electrocardiography; 11th ed., pp. 113 - 137 (Lange Medical Publications/Maruzen, Tokyo 1982).
- HALIM, S.; SIREGAR, H.; RAFITA RAMAYATI; MELIALA, R.: Gambaran penyakit jantung reumatik pada anak di RS Dr. Pirngadi Medan (Abstract); in kumpulan Abstrak kongres nasional ilmu kesehatan anak - V Medan, p. 397 (1981).
- HOHN, A.R.: Basic pediatric electrocardiography; 1st ed., p. xvi (William & Wilkins, Baltimore 1974).
- JORDAN, S.C.; SCOTT, O.: Heart diseases in pediatrics; 2nd ed., pp. 293 - 313 (Butterworth & Co, London, Boston, Sidney, Wellington, Durban, Toronto 1985).
- KAPLAN, S.: Evaluation of the heart and circulation in health and disease in Vaughan, V.C.; Mc Kay, R.J.: Nelson textbook of pediatrics; 10 th ed., pp. 1.000 - 1.017 (W.B. Saunders Company, Philadelphia, London, Toronto/Igaku Shoin Ltd., Tokyo 1975).
- KHAN, M.I.G.: Manual of cardiac drug and therapy; 2nd ed., pp. 158 - 187 (Bailliere Tindall, London, Philadelphia, Toronto, Mexico City, Rio de Janeiro, Sidney, Tokyo, Hongkong 1985).
- NADAS, A.S.; FYLER, D.C.: Pediatric cardiology; 3rd ed., pp. 191 - 216 (W.B. Saunders/Igaku Shoin, Tokyo 1972).
- NAIM, M.; TJIPTA, G.D.; SIREGAR, A.A.; HALIM, S.: Demam reumatik di laboratorium ilmu kesehatan anak FK-USU/RS Dr. Pirngadi Medan (Abstract); in buku abstrak kongres nasional ilmu kesehatan anak ke VII, Jakarta, p. 308 (1987).