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Asymptomatic cardiac rhythm abnormality in children with dengue virus infection



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ABSTRACT

Background: Dengue fever cases in Indonesia were 90.245 at 2012, with a mortality rate reached 0.88%. Cardiac complications are uncommon but it can occur in some cases. Myocarditis is the most common cardiac complication reported worldwide.

Case: We report 10 cases of dengue virus infections with ECG abnormalities in normal heart structure. Based on ECG test during the coalescent stage, sinus arrhythmias were present in 3 patients, sinus bradycardia in 3 patients, sinus tachycardia without fever in 1 patient, first-degree AV block in 2 patients and mobitz type I second-degree

AV block in 1 patient. ECG abnormalities in all cases did not cause any clinical symptoms, then no medication was needed. Continues clinical monitoring was done in all of our cases, and ECG evaluation showed improvement after several days.

Conclusions: Myocarditis following dengue infection was clinically diagnosed in some asymptomatic children and need a ECG evaluation. Continues monitoring needed in patient who develop cardiac rhythm abnormalities and all the patient completely recovered.

Keywords: Dengue infection, cardiac rhythm abnormality, children

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INTRODUCTION

Dengue virus, which is member of the *Flavivirus* genus in the *Flaviviridae* family, is a single-stranded, enveloped RNA virus. There are four serotypes of dengue virus, such as DENV1, DENV2, DENV3, and DENV4. Dengue virus infection transmitted by *Aedes aegypti* mosquito.¹ About 2.5 billion people (2/5 of the world population) are at risk for dengue virus infection and it was reported to occur in more than 100 countries.² The incidence of this disease increased in the last three decades. In 2012, the reported number of dengue fever cases in Indonesia were 90.245, with a mortality rate reached 0.88%.¹

Clinical manifestations of dengue virus infection are very wide, it can asymptomatic. Most of the dengue virus infections are asymptomatic or cause mild clinical symptoms, but about 1-5% of dengue infection patients come to the hospital with complications, including organ disorders, bleeding, and leakage of plasma.^{1,3} Cardiac complications are uncommon in dengue virus infection. Myocarditis is the most common cardiac complication reported worldwide.

Clinical manifestations were varying from asymptomatic such as dysrhythmia, myocardial ischemia, or cardiogenic shock. Electrocardiographic (ECG) can be use to asses the cardiac complication of DHF. The incidence of ECG abnormalities in DHF patient were reported 28% in India, 29% in Thailand, and

62.5% in Sri Langka.^{2,3,4} Various ECG abnormalities in patients with DHF have been reported previously, such as ST-segment abnormalities, sinus bradycardia, sino atrial (SA) blockade, atrioventricular (AV) blockade, premature atrial contractions and premature ventricular contractions.^{5,6}

The abnormalities in the heart's conduction system will increase the morbidity and mortality of patients with DHF, so the monitoring of this complication need to be done. We will report several cases of dengue virus infections with ECG abnormalities in normal heart structure.

CASES

We reported 10 cases of dengue infection according WHO criteria with subclinical cardiac involvement in Sanglah Hospital, Denpasar-Bali. There were 7 male and 3 female with mean age were 8,7 years. Demographic and clinical data in thus case were summarised in Table 1. Hemoconcentration were present in 8 patients. Four cases were classified as Dengue Shock Syndrome (DSS). All patients with shock had good respond and no mortality occurred in all cases (Table 2).

Based on ECG test during the coalescent stage in 10 cases, sinus arrhythmias were present in 3 patients, sinus bradycardia in 3 patients, sinus tachycardia without fever in 1 patient, first-degree AV block in 2 patients and mobitz type I

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Table 1 Demographic and clinical findings in 10 patients with dengue infection

Age	Sex	Torniquet test	Mucosal Bleeding	Rash convalescent
8	M	Absent	Present	Present
5	M	Present	Absent	Present
7	M	Absent	Absent	Present
9	M	Present	Present	Present
9	F	Present	Absent	Present
10	M	Absent	Absent	Present
7	M	Absent	Absent	Present
12	M	Present	Absent	Present
12	F	Present	Absent	Present
8	F	Present	Absent	Present

Table 2 Laboratories study and outcome in 10 patients with dengue infection

Diagnosis	Dengue Serology	HCT	PLT (admission)	Outcome
DHF grade III	Ig M (-) Ig G (+)	21 %	68.1	survive
DHF grade III	Ig M (+) Ig G (+)	27 %	36.8	survive
DHF grade III	Ig M (+) Ig G (+)	27.2 %	39	survive
DHF grade II	Ig M (+) Ig G (+)	25 %	60	survive
DHF grade IV	Ig M (-) Ig G (+)	43 %	23	survive
DHF grade I	Ig M (-) Ig G (+)	20 %	31	survive
DHF grade IV	Ig M (-) Ig G (+)	35 %	28.6	survive
Dengue Fever	Ig M (+) Ig G (+)	11 %	99	survive
Dengue Fever	Ig M (-) Ig G (+)	9.6 %	75	survive
DHF grade II	Ig M (-) Ig G (+)	25 %	59	survive

second-degree AV block in 1 patient. Examination of cardiac enzymes such as creatine phosphokinase (CPK), creatine kinase-myocardial band (CK-MB) were not performed in all patients. Table 3 showed electrocardiography and cardiovascular involvement in 10 patients with dengue infection. None of patients had clinical features of myocarditis nor any chest discomfort or dyspnea.

DISCUSSIONS

Cardiac manifestations of dengue fever may play a role in the pathogenesis of shock and could influence the outcome of the disease. However,

the cardiac manifestations in dengue are invariably benign, transient and self-limited, and are attributed to subclinical viral myocarditis. Approximately 90% of patients with viral myocarditis recover completely, and only few patients develop long term sequelae.^{5,7} Electrocardiogram abnormalities have been observed in as many as 44-75% of patients with DHF.^{6,8,9} A diverse range of ECG abnormalities have been reported with dengue, including rate and rhythm abnormalities, heart block, wave form abnormalities, and voltage abnormalities.⁵ Although sinus bradycardia and prolongation of the PR interval were commonly observed, atrio-ventricular block beyond first degree appeared to be rare in these disease.⁸⁻¹⁰

Kumar et al. have reported in India, DHF patients 22.42% had sinus bradycardia, had 1.86% conduction abnormalities, 1.86% had pericardial effusion and 6.54% had non-specific ST changes.³ Prospective study in Thailand reported from 35 children at least 24 hours after defervescence, 10 patients (29%) had abnormalities of rhythm (sinus pause [n = 1], first-degree AV block [n = 2], Mobitz type I second-degree AV block [n = 3], atrial ectopics [n = 4], ventricular ectopics [n = 5]).⁶ In our case series, of the 10 patients with DHF who have obtained ECG abnormalities, 3 patients showed sinus arrhythmias, 3 patients showed sinus bradycardia, 1 patient showed sinus tachycardia with out fever, 2 patients showed a first-degree AV block and 1 patient showed a second-degree AV block Mobitz type I.

The clinical relevance of ECG changes in dengue infection is still speculative, but bradyarrhythmia which are begins in the critical phase when a the present of hypovolemia is a clear concern, such as the inability to mount an appropriate response to the heart rate to maintain cardiac output potential will increase hemodynamic instability. Attention is extremely careful to balance fluid and hemodynamic monitoring warranted in these patients. The mechanism of sinus bradyarrhythmia with stable hemodynamics in patients with DHF are still not certainty known. A case study had reported that in patients with DHF may change in heart. Changes that occur in the form of congestion, edema, hemorrhage and necrotic phenomena, interstitial inflammatory changes, and interstitial myocarditis. These changes can cause rhythm disturbances and cardiac conduction.^{4,5}

Other literature states that mechanism of cardiac dysfunction can be influenced by the role of autonomic tone changes and prolong hypotension. In addition, cardiac dysfunction can be caused by the presence of adenosine metabolism abnormalities or other abnormalities in cells which use calcium to depolarization, or little bleeding at the nodes.

Table 3 Electrocardiography and cardiovascular involvement in 10 patients with dengue infection

Electrocardiography				Cardiovascular involvement	Day of Abnormal ECG	Day of Normal ECG
Heart Rate	PR Interval	QRS	ST			
84	0.16 sec (N = 0.17)	N	N	Sinus Arrhythmia	7	12
95	0.12 sec (N = 0.155)	N	N	Sinus Arrhythmia	7	12
77	0.12 sec (N = 0.17)	N	N	Sinus Arrhythmia	7	14
50	0.12 sec (N = 0.18)	N	N	Sinus Bradycardia	6	11
62	0.16 sec (N = 0.18)	N	N	Sinus Bradycardia	6	12
64	0.16 sec (N = 0.18)	N	N	Sinus Bradycardia	7	13
118	0.12 sec (N = 0.15)	N	N	Sinus Tachycardia	7	10
96	Prolong (0.28 sec) (N = 0.16)	N	N	First Degree AV Blok	6	11
88	Prolong (0.20 sec) (N = 0.16)	N	N	First Degree AV Blok	6	13
54	progressive lengthening, one P wave not followed by QRS (N = 0.18)	N	N	Mobitz tipe I Second Degree AV Blok	6	13

Bleeding localized to the AV node allows the emergence of a blockade AV happens for a while anyway.^{4,11} Other mechanism of cardiac dysfunction are the virus it self can invade the myocardium directly and cause damage to the heart muscle fibers. This damage of heart muscle fibers can also occur through increased hypersensitivity reactions or through an autoimmune mechanism.⁵ In our ten cases with cardiac conduction disorder, none of them showed cardiac dysfunction, and none of them had cardiac structure abnormalities which had been proved by normal ECG for all cases.

Blockade conduction can occur anywhere on the cardiac conduction system. At this abnormality, a blockade is increasing on each occurrence impulse. In ECG will present a progressive lengthening of the PR interval cycle to cycle and then one P wave is not followed by a QRS complex (the "dropped beat").¹² In our cases, there were had 2 patients showed a first-degree AV block with prolonged PR interval (0.28 sec and 0.20 sec) and 1 patient showed a second-degree AV block Mobitz type I with progressive lengthening of the PR interval and then suddenly one P wave is not followed by a QRS complex. Blockade of the heart that occur in acute viral infections can be signs of serious pathology, such as acute myocarditis. Although in patients with DHF can occur myocarditis, cardiac blockade that occurred in our patient are likely not an acute myocarditis. This are due to the blockade that occurs only temporary, absence of cardiac dysfunction, and no signs of heart muscle damage. Similar cases had been reported previously.^{4,7,12}

Until now, there is no guidelines for ECG evaluation in patients with DHF. This case series

showed the cardiac conduction abnormalities in DHF patients without cardiac structure abnormalities. Base on case series, myocarditis following dengue infection was clinically diagnosed in some asymptomatic children and need a ECG evaluation. Continues monitoring needed in patient who develop cardiac rhythm abnormalities and all the patient completely recovery after several days.

CONCLUSIONS

Myocarditis following dengue infection was clinically diagnosed in some asymptomatic children and need a ECG evaluation. Continues monitoring needed in patient who develop cardiac rhythm abnormalities and all the patient completely recovered.

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