Acta Cardiologia Indonesiana
pISSN:2460-5700
eISSN:2579-4345
Web page: jurnal.ugm.ac.id/v3/jaci

Cardiac Manifestation in Dengue Infection: Case Report and Review from Literature

Achnes Pangaribuan*, Nolly Rantung[2], Ella Risa Marbun[3]
[1] Department of Internal Medicine, Faculty of Medicine Universitas Kristen Indonesia, Universitas Kristen Indonesia Hospital, Jakarta, Indonesia
[2] Department of Cardiovascular, Faculty of Medicine Universitas Kristen Indonesia, Universitas Kristen Indonesia Hospital, Jakarta, Indonesia
[3] Faculty of Medicine Universitas Kristen Indonesia, Jakarta, Indonesia

ARTICLE INFO

*Corresponding author
Email: pangaribuan2002@gmail.com

Address:
Jl. Mayor Jendral Sutoyo No.2, Cawang, Kec. Kramat jati, Kota Jakarta Timur, Daerah Khusus Ibukota Jakarta 13630

Manuscript submitted: 22 Des 2023
Revised and accepted: 20 Jun 2024

Keywords: bradycardia; dengue infection; myocarditis; NS1

ABSTRACT

Introduction: Dengue infection rarely affects the heart, but clinical symptoms of cardiac involvement may range greatly from a silent illness to severe myocarditis resulting in death. With the increasing incidence of dengue fever, reports of atypical manifestations are on the rise, these may be underreported because of a lack of awareness and underdiagnosed

Cases: A 40-year-old man presents with acute fever for three days with positive non-structural protein 1 (NS1) and asymptomatic bradycardia. ECG revealed sinus rhythm (40 bpm) with an absence of ST-segment elevation. His laboratory examination showed a rise in NT-Pro BNP and CKMB levels. Echocardiography showed hyperechogenic myocardium suspicious for myocarditis, with a left ventricle ejection fraction (LVEF) of 73% and no systolic, diastolic, or valve abnormalities. The patient recovered without further complications and was discharged home.

Conclusion: Cardiac involvement is uncommon and encountered in centres which handle large numbers of patients with dengue infection. Clinical manifestations of cardiac involvement in dengue infection can vary widely, from an incidental finding to severe cardiac failure resulting in death.

INTISARI

Latar Belakang: Infeksi dengue jarang berdampak pada jantung, namun gejala klinis dengan keterlibatan jantung akibat dengue sangat bervariasi, mulai dari tidak menunjukkan gejala hingga miokarditis berat yang berakibat kepada kematian. Dengan meningkatnya kejadian demam berdarah, laporan mengenai manifestasi atipikal pun meningkat; hal ini mungkin tidak dilaporkan karena kurangnya kesadaran dan tidak terdiagnosis.

Kasus: Seorang pria berusia 40 tahun datang dengan keluhan demam akut selama tiga hari dengan pemeriksaan NS1 positif dan bradikardia asimtomatis. EKG menunjukkan irama sinus (40 kali/menit) tanpa adanya elevasi segmen ST. Pemeriksaan laboratorium menunjukkan peningkatan kadar NT-Pro BNP dan CKMB. Ekokardiografi menunjukkan hiperekogenik pada miokardium yang mengarah kepada miokarditis, dengan fraksi ejeksi ventrikel kiri 73% dan tidak ada kelainan sistolik, diastolik, maupun katup. Pasien sembuh tanpa komplikasi lebih lanjut dan diperbolehkan pulang.

Kesimpulan: Keterlibatan jantung jarang terjadi dan umumnya ditemukan pada pusat kesehatan yang menangani sejumlah besar pasien dengan infeksi dengue. Manifestasi klinis keterlibatan jantung pada infeksi dengue dapat sangat bervariasi, mulai dari temuan insidental hingga gagal jantung berat yang berujung pada kematian.

INTRODUCTION

Cardiac compromise in dengue was first reported in 1943 by Hyman, in American soldiers fighting in the South Pacific during World War II. However, a great deal remains unknown about this disease, and articles in the global literature on the subject are scarce.[1] The incidence of cardiac impairment in the general population with dengue infection reported in articles is highly variable, ranging from 11.4% to 62.5%, bradyarrhythmias are the most common rhythm disorders.[2] With increasing incidence of dengue fever, reports of atypical manifestations are on the rise; these may be under reported because of lack of awareness and under-diagnosis. Cardiac involvement is not uncommon and is encountered in centre handling large numbers of patients with dengue infection. We reported a case of myocarditis associated with dengue infection in adult male without history of cardiovascular disease and non-risk cardiovascular event.

CASE PRESENTATION

A 40-year-old male patient came to the emergency department with acute febrile illness for three days accompanied by chills and rigours. The patients also complained of headaches and no spontaneous bleeding. The patient denied history of typical cardiac chest pain and palpitation during fever. History of hypertension, diabetes mellitus and cardiovascular disease was denied. History of smoking, excessive alcohol intake and regularly taking medicine was denied. Upon arrival, his temperature was 38,6 0C, pulse rate (PR) 40 bpm regularly, respiratory rate (RR) 20 rate/min, and blood pressure (BP) 105/56 mmHg; body mass index (BMI) 23.67 kg/m2. Complete blood count (CBC) showed leukopenia (white blood cell count 3.5 x 109/L), thrombocytopenia (platelet count 120.000/mm3), anaemia (Hb 10.3 g/dL) and haematocrit 31.8 %. NS1 antigen was positive.

Blood chemistry showed a slightly increased liver function test: AST 63 U/l (normal value <37 U/l), alanine aminotransferase 49 U/l (normal value <41 U/l). Kidney Function and electrolyte in normal limit. A chest x-ray was unremarkable. Electrocardiography (ECG) revealed sinus bradycardia, heart rate of 40 bpm, no PR prolongation, normal P and QRS morphology, no ST-T changes (Figure 1). From the physical examination, we found no liver enlargement, no ascites and the cardiovascular examination revealed no audible murmur or other cardiac abnormality.

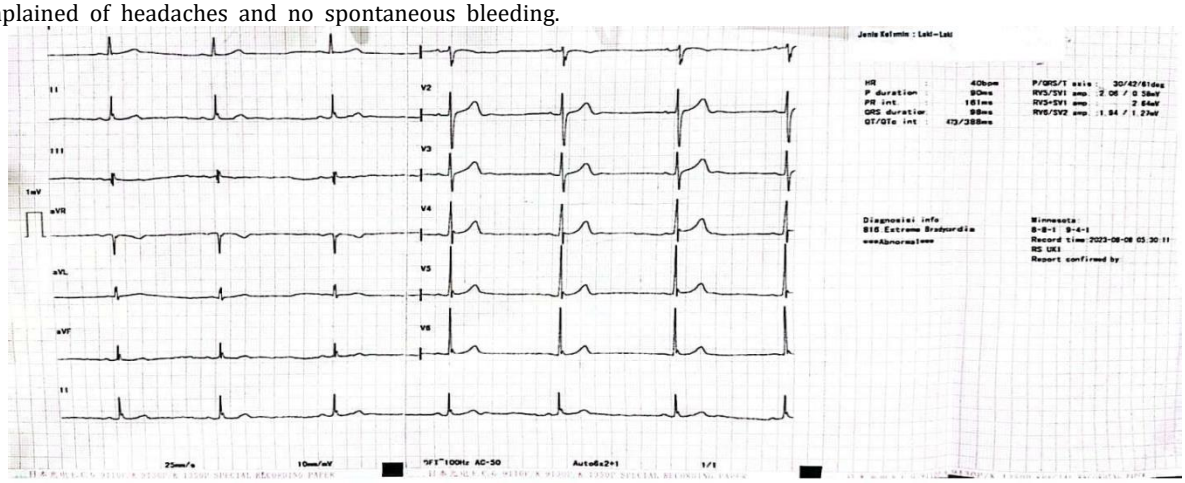

Figure 1. Patient's electrocardiography. ECG showed sinus bradycardia, heart rate of 40 bpm, no PR prolongation, normal P and QRS morphology, no ST-T changes.

During the examination, a diagnosis of acute myocardial injury was made based on electrocardiographic findings, elevated cardiac biomarkers and echocardiography findings. Patient's NT-Pro BNP significantly raised: 457 pg/mL (normal value: < 300 pg/mL); CKMB level elevated: 38 IU/L (normal reference values: 5-25 U/L). Echocardiography showed hyperechogenic on myocardial suspicious a myocarditis (Figure 2), with no systolic or diastolic disturbances (E/e' 7.95, no dilatation of the left atrium, tricuspid regurgitation undetected), absence of valve abnormalities with LVEF 73% (Figure 3).

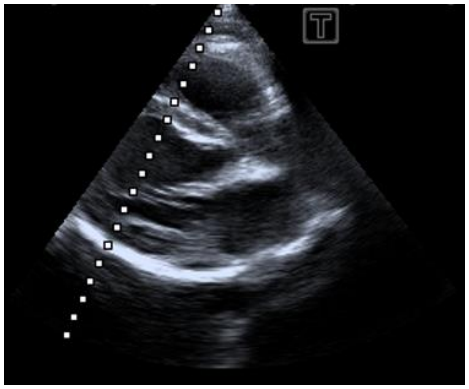

Figure 2. Patient's echocardiography. Hyperechogenicity (yellow arrow) is evident in regions that appear brighter and denser than surrounding structures, suspicious of myocarditis.

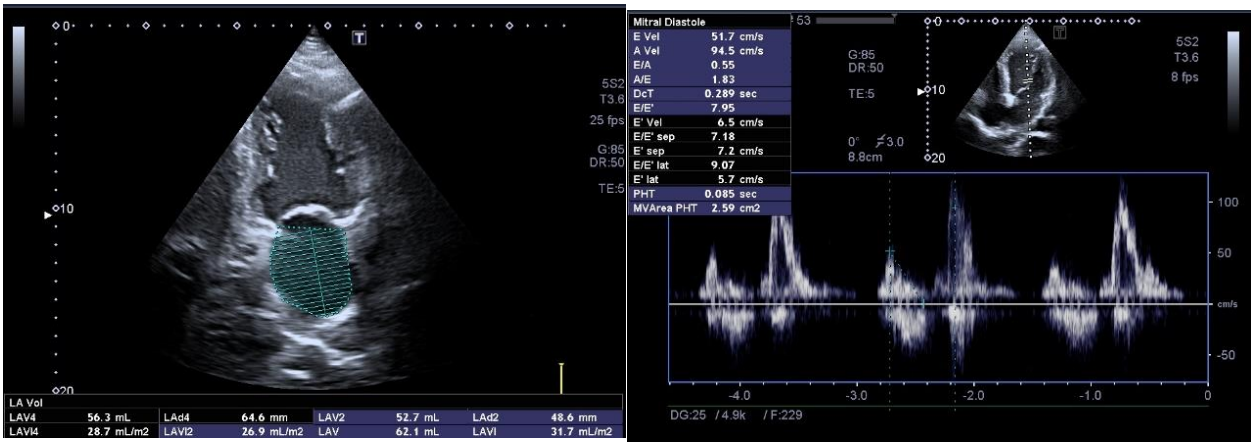

Figure 3. Echocardiography showed no systolic or diastolic disturbances (E/e' 7.95, no dilatation of the left atrium, tricuspid regurgitation undetected), absence of valve abnormalities with LVEF 73%.

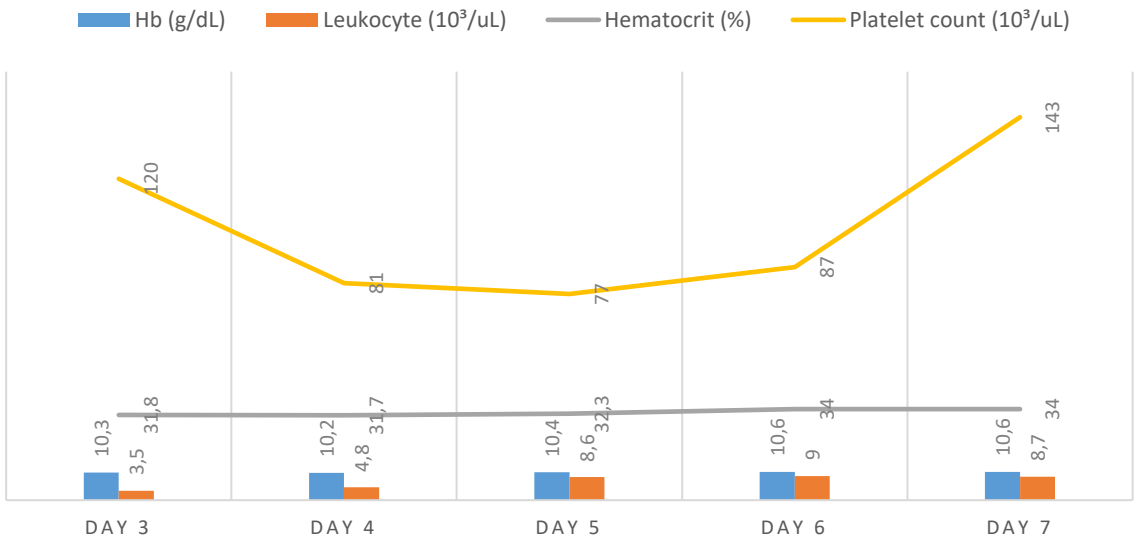

Figure 4. Patient's serial complete blood count during admission based on the day of fever. Serial complete blood counts showed there were no hemoconcentration events and platelet levels decreased in the critical phase and back to normal in the convalescence phase.

The patient's serial complete blood count and haemodynamic were shown in Figure 4 and Figure 5. A clinical diagnosis of expanded dengue syndrome with myocarditis dengue was made. Intravenous fluid supplementation with 0.9% normal saline infused at a rate of 3 ml/kg body weight/hour was started. Patient was also given steroids with methylprednisolone 31,25 mg every 12 hours intravenously and colchicine as anti-inflammation. On day-4 admission, defervescence occurred and the patient's symptoms started resolving. Blood pressure, respiratory rate, and body temperature are all within normal limits. Nevertheless, the heart rate remains bradycardia without any accompanying symptoms/asymptomatic, indicating the absence of hypotension, unchanged mental status, no signs of shock, and no chest discomfort. On day-5, follow-up laboratory data showed increased leucocytes (white cell count 8.700/uL) and thrombocytes (platelet count 143.000/uL). The patient recovered without further complications and was discharged home. The heart rate seems to rise slowly due to the gradual reabsorption of extravascular fluid during the convalescent phase. One week post-discharge from the hospital, the patient's heart rate was measured at 60 beats per minute, and it rose to 75 beats per minute after a month.

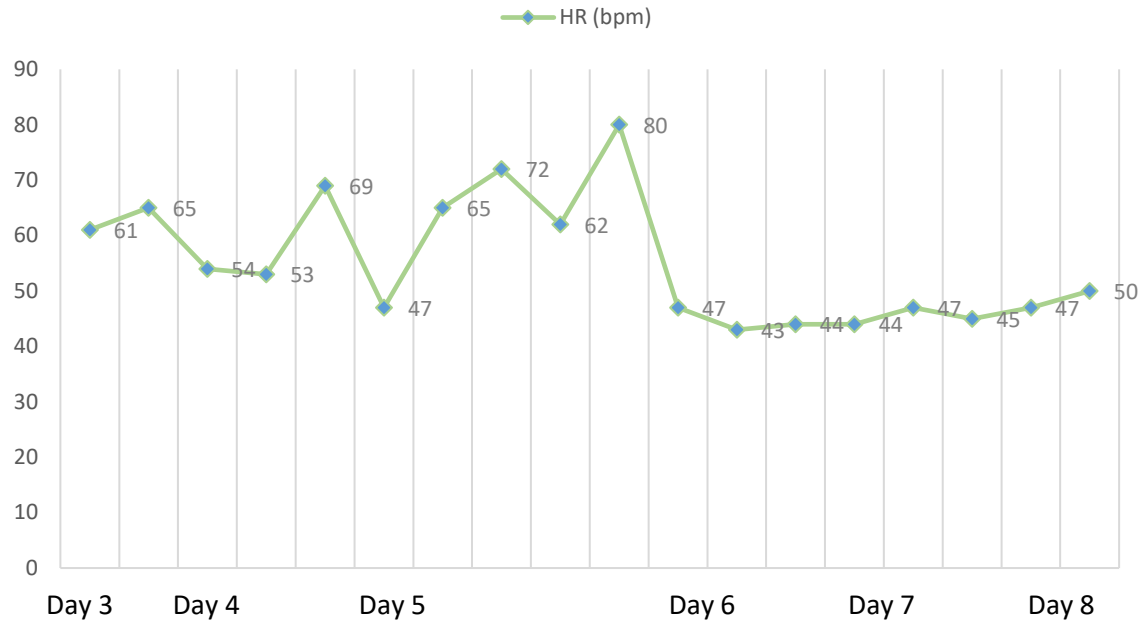

Figure 5. Patient's heart rate during admission according to day of fever. Bradycardia in convalescence phase marked.

DISCUSSION

Dengue nonstructural 1 protein (NS1) is secreted by cells infected with dengue virus (DENV). This glycoprotein is highly conserved for all DENV serotypes and is strongly immunogenic. It has been suggested that high plasma levels of NS1 could help identify patients at risk for plasma leakage.[3,4] Non-structural protein 1 (NS1), which plays a crucial role in severe dengue, may have a role in CV involvement, accordingly.[5] Dengue myocarditis can be found both in primary and secondary dengue infection and cardiac involvement was not more prevalent in dengue patients with secondary infection.[6,7] In this case, NS1-positive patients correlated with high plasma virus loads and patients likely to develop severe outcomes during the so-called critical phase of dengue.

Clinical manifestations of cardiac involvement can vary widely, from an incidental finding to severe cardiac failure resulting in death. Dengue fever affecting the heart can lead to cardiac arrhythmias and left ventricular dysfunction. ECG changes are the frequent cardiac abnormalities reported in earlier studies of patients with dengue infection. The most common abnormal finding in the ECG is sinus bradycardia.[8]

Pathophysiology of cardiac disease in dengue infection is poorly understood. Myocardial injury in dengue may result either from direct viral invasion of cardiac muscles or cytokine-induced immune damage, or both.[5]

The definitive diagnosis of myocarditis depends on an endomyocardial biopsy. However, the clinically suspected diagnosis is based on history, clinical examination, and biochemical and radiological profile. The European Society of Cardiology (ESC) 2013 consensus statement suggested the presence of at least one clinical and one diagnostic criterion for the diagnosis of clinically suspected myocarditis. Clinical criteria include acute new-onset, or worsening dyspnea, palpitations, and/or unexplained shock. The diagnostic criteria include ECG or Holter changes, raised cardiac biomarkers, functional and structural abnormalities on cardiac imaging, and tissue characterization on cardiac magnetic resonance (CMR) imaging.[9] In this case, patient confirmed with dengue infection comes with asymptomatic bradycardia during the critical phase of dengue infection. ECG recorded sinus bradycardia without ST-T segment abnormal. ECHO showed hyperechogenic myocardial suspicious myocarditis than confirmed with raised of cardiac biomarkers (NT-proBNP and CKMB).

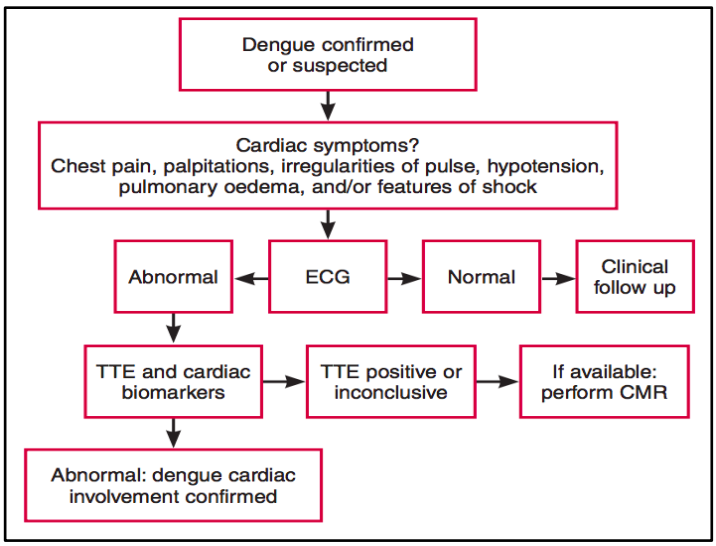

Figure 6. Diagnosis of dengue and its cardiac involvement. ECG: electrocardiogram, TTE: transthoracic echocardiogram, CMR: cardiac magnetic resonance.[5]

CONCLUSION

Cardiac involvement is common, and myocarditis is asymptomatic in most patients with dengue. However, other manifestations such as arrhythmias, and cardiogenic shock, could lead to congestive heart failure even death cannot be ignored. Dengue myocarditis may result from direct viral invasion of cardiac muscles, cytokine-induced immune damage, or both. Some pro-inflammatory cytokines could enhance vagal activity, leading to a reduction in heart rate. The presence of a positive NS1 test indicates an increased risk of developing a form with warning signs or severe dengue in primary cases and thus may be an indicator of increased vigilance in primary care physicians. The definitive diagnosis of myocarditis depends on an endomyocardial biopsy, however, even so, the presence of ECG abnormalities, increased cardiac biomarkers, and functional and structural abnormalities on cardiac imaging can support the diagnosis of myocarditis.

ACKNOWLEDGEMENTS

We express our gratitude to Dr Rachel and Prema for their assistance in finding review resources and for composing this case report's abstract.

REFERENCES

1. Yacoub S, Wertheim H, Simmons CP, Screaton G, Wills B. Cardiovascular manifestations of the emerging dengue pandemic. Nat Rev Cardiol. 2014;11(6):335-45.
2. Cabrera-Rego JO, Rojas-Quiroz AF, Vidal-Turruelles Y, Yanes-Quintana AA. Cardiovascular disorders in hospitalized patients with dengue infection. Enferm Infecc Microbiol Clin (Engl Ed). 2021;39(3):115-8.
3. Epstein A, Hlavinka T, Novicki DE. Computerized tomography of spontaneous forniceal extravasation. Urology. 1989;33(4):344-5.
4. Thomas L, Najioullah F, Verlaeten O, Martial J, Brichler S, Kaidomar S, et al. Relationship between nonstructural protein 1 detection and plasma virus load in Dengue patients. Am J Trop Med Hyg. 2010;83(3):696-9.
5. Araiza-Garaygordobil D, Garcia-Martinez CE, Burgos LM, Saldarriaga C, Liblik K, Mendoza I, et al. Dengue and the heart. Cardiovasc J Afr. 2021;32(5):276-83.
6. Miranda CH, Borges Mde C, Matsuno AK, Vilar FC, Gali LG, Volpe GJ, et al. Evaluation of cardiac involvement during dengue viral infection. Clin Infect Dis. 2013;57(6):812-9.
7. Sane S, Saulova A, McLaren R, White H. A fatal case of primary dengue infection with myocarditis and cerebral oedema. Australas Med J. 2015;8(9):299-303.
8. Shah C, Vijayaraghavan G, Kartha CC. Spectrum of cardiac involvement in patients with dengue fever. Int J Cardiol. 2021;324:180-5.
9. Caforio AL, Pankuweit S, Arbustini E, Basso C, Gimeno-Blanes J, Felix SB, et al. Current state of knowledge on aetiology, diagnosis, management, and therapy of myocarditis: a position statement of the European Society of Cardiology Working Group on Myocardial and Pericardial Diseases. Eur Heart J. 2013;34(33):2636-48, 48a-48d.