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Letter to Editor

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Electrocardiographic changes in dengue fever

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Dengue fever (DF) is one of the most commonly prevalent viral diseases in the world, primarily affecting tropical countries. It is transmitted by the bite of female *Aedes (Ae.) aegypti* mainly and *Ae. albopictus* mosquito infected with the virus. Dengue virus is a flavivirus, arbovirus. There are four strains of dengue virus (DENV1, DENV2, DENV3, DENV4). The clinical spectrum of the disease ranges from mild to severe forms with complications. It may be asymptomatic or symptomatic. Most of the symptomatic infections present as self-limiting fever, whereas few cases may progress to dengue haemorrhagic fever (DHF) and dengue shock syndrome[1–3]. Of the various systems known to be affected by DF, cardiovascular system is one of them. Cardiac complications of DF though uncommon, are being increasingly reported in various studies. A variety of cardiac complications have been reported, the most common being myocarditis, though conduction defect and arrhythmia have also been reported[4]. The pathophysiology of cardiac involvement in dengue, though not fully understood, is postulated to be caused either by direct viral invasion of cardiac muscle cells-myocytes or cytokine induced immune damage or both. It may be either focal or diffuse myocarditis[5].

Keeping this in view, a cross-sectional study tried to explore the changes in electrocardiogram (ECG) in dengue patients in an outpatient and inpatient set-up of a tertiary care centre in eastern India over a period of 12 months. The study included adult DF cases of either sex, diagnosed by NS1Ag or Dengue IgM reactive (by MAC ELISA). Known cases of cardiac, pulmonary and thyroid complications were excluded. Patients on medications affecting heart rate/rhythm and those showing electrolyte imbalances at the time of admission that may affect ECG, were excluded. Included patients were interviewed for basic demographics and detailed medical history, and subjected to physical examination and laboratory investigations including hemogram, liver function, urea, creatinine, electrolytes like sodium, potassium, lactate dehydrogenase (LDH).

Each patient was subjected to 12 lead ECG. For selected cases, 2D echocardiography, troponin T, creatinine phosphokinase (CPK) were done. Thyroid screening was done in symptomatic cases.

With a prevalence of 50% and 10% marginal error, a minimum sample size of 97 was estimated. For the 100 patients finally included in the study, the mean age of study population was (31.88 ± 8.85) years, with 53% male representation and rest females. Of the 100 cases, 82 were classified as DF and 18 were DHF according to the World Health Organization (WHO) staging. Of the total DHF cases, only one was of dengue shock syndrome. Most common clinical manifestations included fever (97%), followed by myalgia (89%), headache (88%), retro-orbital pain (76%), skin rash (74%), nausea (45%), vomiting (35%), abdominal pain (28%), haemorrhagic manifestations (18%), shortness of breath (7%) and palpitation (6%).

ECG was done in all cases, which revealed abnormalities in 71% of the total cases. A total of 68.3% of the DF cases had ECG changes, while 83.3% of DHF cases revealed ECG abnormalities. Three most common ECG changes were sinus tachycardia (noted in 28.04% DF cases and 22.22% DHF cases), sinus bradycardia (noted in 10.97% DF cases), non-specific ST & T changes (noted in 20.73% DF and 11.11% DHF cases). The 1st degree heart block was seen in 3.66% DF cases and 11.11% DHF cases, Mobitz Type 1 2nd degree block (Wenckebach phenomenon) was seen in 1.22% DF and 5.55% DHF

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cases. Right bundle branch block was noted in 5.55% DHF cases. ST segment elevation suggestive of pericarditis was also seen in 1.22% DF cases and 11.11% of DHF cases. Low voltage complex was seen in 1.22% DF and 11.11% DHF cases.

Raised CPK could be documented in 3 cases. LDH was found to be raised in 23 cases with values more than 1000 U/L noted in 5 cases. However, troponin T was not found to be positive in any case with arrhythmia or ST segment changes. None of the patients developed any cardiac complications like angina, myocardial infarction during the course of the disease. The rhythm abnormalities as noted in 12 lead ECG, developed during the course of illness in febrile and convalescent phases and they reverted back to normal as the patients became afebrile. Follow-up ECG was normal in all the cases of rhythm disturbances.

Various studies have reported cardiac abnormalities and ECG changes in dengue patients. A study in eastern India by Dutta *et al.* reported 12.5% patients to have cardiac involvement. Bradyarrhythmia and asymptomatic sinus bradycardia were the most common manifestations seen in 6.6% and 3.3% of study subjects[6]. Out of 116 patients in the study by Tarique *et al.*, 61 patients were diagnosed as DF and 55 were diagnosed as DHF. Out of the 61 cases of DF, 13 had bradycardia, 2 had tachycardia, 3 had ST depression and 1 patient each had new onset left bundle branch block, supraventricular tachycardia and poor progression of R wave. Out of the 55 DHF cases, bradycardia and tachycardia were recorded in 5 patients each. Four cases had ST depression, 2 left bundle branch block and 1 case poor progression of R wave[7]. Poornima *et al.* reported abnormal ECG in 21.11% study population in which sinus bradycardia was the commonest abnormality and was observed in 30 patients[8]. Yadav *et al.* cited sinus bradycardia as the commonest ECG changes in over 60% study population, while other notable changes were sinus tachycardia, first degree heart block and ventricular ectopics[8].

The present study reinstates the fact that there are obvious cardiac changes in dengue patients; however, its spectrum and incidence may vary as per severity of the disease. Use of ECG and echocardiography in the dengue patients can help with timely assessment of the cardiac function for appropriate therapy. Awareness regarding cardiac complication of DF both at level of clinicians and patients can help with early recognition and prompt treatment.

Conflict of interest statement

The authors declare that there are no conflicts of interest.

Ethical considerations

The study conduct was approved by the institutional ethics committee (vide CREC-STM/2022-AS09).

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Authors' contributions

R.C., D.M., K.S. developed the theoretical formalism, performed the analytic calculations and performed the numerical simulations. S.M. and R.C. drafted the manuscript. All authors contributed to the final version of the manuscript. N.P. and B.S. supervised the project.

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