ORIGINAL RESEARCH PAPER

General Medicine

ECG CHANGES IN DENGUE FEVER

KEY WORDS: Dengue, ECG changes, Sinus bradycardia,sinus tachycardia ,ST-T changes, bundle branch block

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ABSTRACT

Background: Dengue is one of the most important viral diseases globally and a majority of symptomatic infections result in a benign course. However, a small number of patients develop severe manifestations, including myocardial impairment, arrhythmias, and fulminant myocarditis. Dengue is known to affect various systems. The cardiovascular system is one of them. This study was conducted to observe the presence of electrocardiographic (ECG) changes in patients presenting with dengue fever. **Material and method:** This was a cross sectional analytical study conducted at Jhalawar medical college and hospital, Jhalawar, Rajasthan. 146 cases were selected after taking into account the inclusion and exclusion criteria from serologically confirmed dengue cases. The details of the patient's clinical presentation and examination was noted. ECG was carried out to all patients. **Results:** Out of 146 patients, 58 patients had normal ECG. Abnormal ECG findings like sinus bradycardia ,tachycardia ,ST-T changes, bundle branch block were noted among 88 patients. **Conclusion:** ECG changes can occur in dengue infection, most common finding were sinus bradycardia. ECG abnormalities were common but all the ECG changes were reversible. There was no evidence of myocarditis in any of the patients.

INTRODUCTION

Dengue fever has recently emerged as one of the most important viral disease in the world. It is transmitted by the bite of female Aedes Aegypti mosquito infected with the dengue virus. It spreads mostly in tropical and subtropical climates. Dengue is Flavivirus infection. There is few known strain of dengue virus (DENV1, DENV2, DENV3, DENV4). The disease can range from mild dengue fever to severe forms. It may be asymptomatic, self limiting fever, classical dengue fever, dengue hemorrhagic fever and in worst cases dengue shock syndrome .(1,2)

Dengue fever is endemic in >100 countries.(3) In recent years, the prevalence of dengue virus (DENV) infection has been on the rise. The vast majority of symptomatic infections have a benign clinical trajectory. Some patients experience severe clinical manifestations such as bleeding, organ failure, and endothelial dysfunction with elevated capillary permeability, resulting in hypovolemic shock and cardiovascular failure. Electrocardiography (ECG) and echocardiography abnormalities are common during dengue infection.(4,5)

Cardiovascular involvement is usually found in dengue infection.(6) Spectrum of cardiovascular manifestation include asymptomatic patient with electrocardiogram (ECG) abnormality up to myocarditis and cardiogenic shock which are life threatening condition.(7,8) These phenomenons are frequently reversible, as proper treatment is performed for dengue infection. But some cases need specific consideration which may cause worse condition if left untreated.(7,9,10)

The dengue virus can affect the heart either directly or indirectly. The dengue virus affects the heart directly by damaging the myocardium of the heart. Indirectly, antibodies against the dengue virus induce inflammation in the cardiac myocardial cells. Proinflammatory cytokines such as IL-10, MMP-2, and MMP-9 will trigger damage to heart cells, thereby impairing their function.(7,11)

Vascular leakage as primary clinical manifestation of dengue hemorrhagic fever worsens this heart function abnormality. Non-specific ST segment abnormalities which were found in our patients are related to myocarditis. But several tests must be performed such as echocardiogram, cardiac biomarker analysis, and histopathology to define diagnosis for myocarditis.(7,12)

Arrhythmia induced by dengue infection is not fully understood. Dengue toxin or dengue antibodies that affects heart electricity and alteration of metabolism are proposed for arrhythmia mechanisms in dengue infection.(13,14)

METHODS

This prospective, unicentric, randomized, evaluation study was conducted in the Department of Medicine at Jhalawar medical college, Jhalawar, Rajasthan. The study was approved by the Institutional Research and Ethical Committee. A total No. of 146 patients comprising 80 male and 66 females were included in this study. Informed and written consent was taken from all the participating subjects prior to the commencement of the study. Randomly selected serologically confirmed cases of dengue fever were evaluated with 12 lead electrocardiograms taken during febrile phase of dengue fever at an interval of 24 hours for a total of 05 days.

Study design: Prospective, Cross sectional study, Unicentric, Simple random selection.

Selection of patient

Inclusion criteria

a)High grade fever –For 1 to 5 days

b)Both primary dengue (NS-1 Antigen and dengue IgM positive),Secondary dengue (IgM and IgG positive)

Exclusion Criteria - Patients with

(1)Pulmonary, cardiac (Rheumatic heart disease,Dilated cardiomyopathy, conduction disorder, patients on pacemaker) thyroid disease

(2)Age < 18 yrs or> 60yrs

(3)Patients on medication affecting heart rates such as B2 Agonist, B2 Antagonist, Digoxin, Theophylline and its derivatives.

(4)Electrolyte imbalance-Hypokalemia, Hyperkalemia,Hypocalcemia,Hypercalcemia etc.
(5)Known cases of DM & HTN 12 lead electrocardiogram will be taken at the time of admission and discharge.

Result

This was a prospective study to evaluate the ECG changes in admitted with dengue fever conducted at Jhalawar medical college, jhalawar, rajasthan. Total 146 patients were taken in this study, in which 80 were male and 66 were female.

Table no. 1 Gender wise distribution of patients

Gender	Total no. of patients	Patients no. with normal ECG	Patients no. with abnormal ECG
Male	80	30	50
female	66	28	38

Fever (98.63%) was the commonest symptom, next was myalgia (90.41%). Other symptoms were headache (70.08%), retro-orbital pain (65.75%), rashes (24.65%), vomiting (20.54%) and abdominal pain (19.86%). Hemorrhagic manifestations were present in 11.64% patients. Arthralgia was present in 12 cases.

Table 2:Clinical features,their number and percentage

Clinical feature	No of patients
Fever	144 (98.63%)
Headache	114 (70.08%)
Retro-orbital pain	96 (65.75%)
Rash	36 (24.65%)
Vomiting	30 (20.54%)
Abdominal pain	29 (19.86%)
Hemorrhagic manifestation	17 (11.64%)
Arthralgia	12 (8.21%)
Myalgia	132 (90.41%)

Regarding primary outcome, all patients were discharged, no death occurred. None of the patients had symptoms of chest pain at the time of presentation and neither they developed it later or any other cardiac complications like angina, myocardial infarction or cardiac failure. ECG was done in all the patients. When we analyzed the ECG of patients with dengue fever and dengue hemorrhagic fever, 58 (39.72%) patients ECG had normal sinus rhythm, 88 (60.27%) patients had abnormal ECG. Out of 146 patients of DF, 58 had normal ECG, 42 patients had sinus bradycardia and 31 had sinus tachycardia.

Non-specific ST-T changes were seen in 12 patients, 3 patients had new onset right bundle branch block. No other rhythm disturbance was noted.

Table no. 3. ECG changes in Dengue fever patients (gender wise distribution)

ECG changes	Male (percentage out of 146)	Female (percentage out of 146)
sinus bradycardia	24 (16.43%)	18 (12.32%)
sinus tachycardia	18 (12.32%)	13 (8.90%)
ST-T changes	6 (4.10%)	6 (4.10%)
Bundle branch block	2 (1.36%)	1 (0.684%)

Discussion

Cardiac function is affected in Dengue Fever in multiple ways; out of which bradycardia is most prominent.(15) Dengue epidemics have been affecting tropical and subtropical climates. Over the time involvement of various organs has been observed.(16) Dengue viral infection cause myocardial damage either by infection or by an autoimmune reaction resulting in myocardial inflammation.(17) The cardiac abnormalities in dengue are invariably benign, transient and self limiting and attributed to subclinical viral myocarditis. (18)

In our study a total of 146 patients of dengue fever were analyzed. Out of 146 patients, 558 (39.72%) had normal and 88 (60.27%) had abnormal electrocardiography. Abnormal ECG were also noticed in other studies like Tarique et al, but incidence was slightly higher than our study (62.79%) (18), Amit Krishna et al, showed low incidence 48.14%.(19)

ECG findings were sinus bradycardia in 28.76%, sinus tachycardia in 21.23%, non-specific ST-T changes in 8.21%. Other finding was right bundle branch block in 2.05%, none had ventricular ectopics or any degree of atrioventricular block. In the study by Gupta V et al, sinus bradycardia was found in 14.28% and sinus tachycardia in 21.29%.(20)

Lateef et al showed sinus bradycardia is the commonest rhythm abnormality(32%), similar findings were noted in our study.(21)
Study done by H Poornima and Juby John showed that out of 341 dengue patients 72 patients had abnormal ECG (21.11%) in which sinus bradycardia was the commonest abnormality and was observed in 30 patients. ST was present in 8 patients (2.3%).(22)

Literature review by Gulati et al reveal that rhythm disturbances such as atrial fibrillation, sinus node dysfunction, AV block and ectopic ventricular beats have been documented in DHF.(23)

In a study done by Yadav RK et al, sinus bradycardia was the commonest ECG changes (60%).Other changes were sinus tachycardia, first degree heart block and ventricular ectopics. (24)

Other studies also revealed that rhythm disturbance such as sinus node dysfunction, atrioventricular block, ventricular ectopic beats and atrial fibrillation have been documented in dengue hemorrhagic fever.(25,26)

Conclusion

We conclude that cardiac involvement may occur in dengue infection. ECG changes are noted in both symptomatic and asymptomatic patients. Commonly noted findings were sinus bradycardia and sinus tachycardia. There was no evidence of myocarditis. In present study ECG abnormalities were common but all the ECG changes were reversible and no patient died in our study. Transient cardiac abnormality can be an important presentation and this should guide the treating physician to look for cardiac involvement.

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Ethical approval: The study was approved by the institutional ethics committee

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