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ECG Manifestations in Dengue Infection

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Abstract: ***Background and Objectives: Dengue is endemic in the tropics, and complications involving organ systems are seen with varying incidence. The present study was conducted to find out the proportion of dengue fever cases with ECG changes. Materials and Methods: This is a descriptive study. 232 successive dengue fever cases were selected for the study. Patients with Dengue Hemorrhagic fever underwent radiological examination in form of chest radiograph and ultrasound abdomen. ECG was carried out in all patients. Appropriate investigations were done. Results: Out of 232 patients, 122(52.58%) suffered from Dengue Fever and 110(47.42%) had Dengue Hemorrhagic Fever. Overall 156 patients had normal ECG. Abnormal ECG findings like tachycardia, bradycardia, supraventricular tachycardia, left bundle branch block, ST depression, poor progression of R wave were noted. There was no significant relationship of ECG findings with the disease. Conclusion: ECG changes can occur in dengue infection with or without cardiac symptoms. Commonly noted findings were ST depression and bradycardia.***

Keywords: Dengue fever, Dengue Hemorrhagic fever

1. Introduction

Dengue is a viral infection. It spreads mostly in tropical and subtropical climates. Nearly half of the world population is at risk. According to WHO 2012 fact sheet there may be 50-100 million dengue cases per year. About 500,000 people require hospitalization and around 2.5% die[1].

Dengue is one of the most important mosquito-borne illnesses worldwide [2]. It is a caused by a flavivirus with four distinct serotypes (DENV1, DENV2, DENV3, and DENV4). Current estimates project that 390 million infections occur annually, in over 100 countries, of which 96 million result in clinical disease with a case fatality rate of around 1% [3].

The disease manifests as dengue fever (DF), and in more severe form as dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS). Initial manifestation is with fever and flu like symptoms. Patient develops leucopenia and thrombocytopenia. The latter may lead to bleeding from different sites. DHF is characterized by critical period. Patient can recover fully with strict monitoring and fluid management. In severe cases patient can develop shock and multi organ failure.
A number of biochemical and radiological findings are found to be associated with dengue infection; deranged liver enzymes[4], decreased serum albumin, decreased serum cholesterol[5], pleural effusion and ascites[6]are commonly observed findings.

Dengue is known to affect various systems. Cardiovascular system is one of them. There are studies which have reported myocarditis, mostly asymptomatic or with arrhythmias. One such study reported cases in Srilanka.[7]

As dengue fever is relatively new to our country, so different aspects of disease needs to be explored. One of them is cardiovascular involvement and electrophysiological changes.

Objective of our study is to determine the presence of Electrocardiographic (ECG) changes in patients reporting with dengue infection and to see whether there were any related clinical cardiac manifestations.

2. Materials & Methods

This study was conducted in the Jagadguru Jayadeva Murugurajendera Medical College & Hospital, Davangere . It was a hospital based observational descriptive study and was carried out from April 2017 to September 2017.232 eligible dengue fever cases were included on first come first basis after beginning of the study.

Inclusion Criteria

a) All patients coming with history of fever with one or more of the following symptoms (1) vomiting, (2) joint pain, (3) diarrhea, (4) abdominal pain, (5) headache, amongst others.
b) Both primary dengue (NS-1 antigen or IgM or both positive) and secondary (NS-1 antigen or IgM and IgG antibody positive) dengue cases were included.

Exclusion Criteria

a) All patients with fever who are Dengue IgM/NS1 Ag negative.
b) Patients who had any known cardiac disease, chronic kidney disease, diabetes mellitus, hypertension were excluded.

The following parameters were considered and/or measured in all patients: Age, gender, Pulse/Heart rate, Blood Pressure, Respiratory rate, Temperature, JVP, Icterus, Hepatosplenomegaly, Heart sounds, Breath sounds, Petechial rash. All patients underwent the following investigations: ECG, Chest X-ray USG Abdomen, Serial Platelet counts, Total counts, Blood urea, Serum Creatinine,2D Echocardiography, Dengue IgM/NS1 testing.

ECG and cardiac enzymes were checked in all patients within 24 hours of admission. Patients having abnormality in ECG or cardiac enzymes were monitored regularly Primary outcome measure of our study was death or discharge in stable condition. Secondary outcome variables were symptoms like dyspnea, chest pain, evidence of cardiac failure and arrhythmias noted clinically or on ECG.

3. Statistical Analysis

Statistical analysis was carried out on SPSS version 18. Categorical data like gender and clinical features were expressed as frequencies. Numerical data was expressed as mean ± standard deviation (SD).Cross tabulation was done between DF and DHF with different ECG findings. Chi square was applied to test the significance of various ECG findings with DHF.

4. Results

232 patients diagnosed to be suffering from dengue fever were enrolled. 187(80.6%) were male and 45(19.4%) were female. Mean age was 31.84±14.4years. Clinical features are presented in Table (1).

122 (52.58%) patients were diagnosed as dengue fever and dengue hemorrhagic fever (DHF) was diagnosed in 110 (47.42%) patients.

ECG was carried out in all the patients. In most of the patients (n=156) ECG was normal. When we analyzed the ECGs of patients with Dengue fever and Dengue Hemorrhagic fever, out of 122 patients of DF, 80 had normal ECG.26 patients had bradycardia and 4 had tachycardia which persisted even when patient was a febrile and hemodynamically stable. ST depression was seen in 6 patients. Two patients each had new onset left bundle branch block, supraventricular tachycardia and poor progression of R wave.

In 110 cases suffering from DHF, ECG was normal in 76 patients. Bradycardia and tachycardia were noted in 10 patients each, 4 had left bundle branch block, 8 had ST depression and poor progression of R wave was noted in 2 patients. None of the ECG finding was significantly related to DHF, though bradycardia was found to be related with p value of 0.067.

In DHF, on ultrasound as cites was present in 55(23.7%) patients. 48(20.6%) had gall bladder edema, 18(7.7%) patients had hepatomegaly, 16(6.8%) had splenomegaly and pleural effusion was noted in 32(13.7%) patients. We also noted the relationship of cardiac symptoms like palpitations and shortness of breath with different ECG findings in DHF. Observations are shown in table (2). It was observed that occurrence of dyspnea had no relationship with presence or absence of pleural effusion (p value 0.55).

Regarding the primary outcome, all patients were stable and discharged and no death was occurred.

Table 1

Clinical Features	*Number of Patients*	*Percentage %*
Fever	232	100
Abdominal pain	108	46.5
Epistaxis	23	9.9
Gum bleed	34	14.6
Upper GI bleed	55	23.7
Hematuria	4	1.7
Per rectal bleed	6	2.5
Per viginal bleed	4	1.7
Palpitation	2	0.8
Shortness of breath	20	8.62
Altered consciousness	22	9.4
Arthritis	4	1.7
Encephalitis	8	3.4
Hepatic failure	2	0.8

Table 2

ECG Changes	No. of Patients	Palpitations	Shortness of Breath
Bradycardia	36	6	4
Tachycardia	14	2	2
Bundle branch block	6	2	none
Supraventricular tachycardia	2	1	none
Poor R wave progression	4	None	1
ST depression	14	2	4

5. Discussion

Dengue virus infection was first reported in India from Chennai in 1780. Today dengue virus and all its clinical forms are documented in almost all parts of India.Dengue epidemics have been affecting the tropics and our country has also seen a major outbreak over last couple of years . Over the time, involvement of various organs has been observed. In the present study, a total of 232 patients of Dengue fever were analyzed. The most common age group affected in our study was 20-39 years (53%).

Table 3

SI.No.	Author	Year	Place	Age (yrs)
1.	Baruah J	2002	MANIPAL	5-20
2.	Dash PK et al	2003	Gwalior	<15
3.	Neeraja M	2004	Hyderabad	20-39
4.	Present study	2017	J.J.M medical college. Davangere	20-39

This is comparable to the study done by Neeraja et al in 2004, in Hyderabad.[8]

The mean age in the present study is 30.45 years. This is comparable to the study done by Gupta et al (30.15 years) in 2008, in New Delhi.[9] In our study, the incidence among males is more than females . This is comparable to the study done by Neeraja et al in 2004, in Hyderabad.[8]

Table 4

SI.No.	Author	Year	Place	M:F Ratio
1.	Dash PK et al	2003	Gwalior	1.28:1
2.	Neeraja M	2004	Hyderabad	2:1
3.	Gupta et al	2008	New Delhi	1.8:1
4.	Present study	2017	J.J.M medical college. Davangere	4.1:1

Cardiac involvement in the form myocarditis has been documented. It is even considered to be one of the causes of severe illness or mortality in a dengue infection in a study by Satarasinghe et al, and the major finding was T wave inversion in this study[10]. Our study showed that T wave inversion was not the sole manifestation. Masilza et al reported atrial fibrillation in a patient with structurally normal heart[11]

Atrial fibrillation along with low voltage QRS and diffuse ST segment elevation was recorded in a fatal case of myocarditis[12]. Our patients had other arrhythmias like bundle branch block but no atrial fibrillation was noted. During Dengue outbreak in Srilanka in 2005, ECG manifestations such as T wave inversion, bundle branch block, tachycardia and bradycardia were noted[13] similar findings were noted in our patients. Wali et al 5/17 (29%) patients of DHF had ECG changes[14]. In our study out of 110 patients of DHF ECG abnormalities were noted in 34 patients (30%). Literature review by Gulati revealed that rhythm disturbances such as atrial fibrillation, sinus node dysfunction, atrioventricular blocks and ectopic ventricular beats have been documented in DHF[15]. In our study we found four patients with left bundle branch block. No other rhythm disturbance was noted in DHF. Our patients had cardiac symptoms such as dyspnea and palpitations which is in contrary to another study by Gupta and Gadpayle, in which no patient had any cardiac symptoms though they had ECG changes like tachycardia and bradycardia[9].

6. Conclusion

We conclude that cardiac involvement may occur in dengue infection. ECG changes are noted in both symptomatic and asymptomatic patients. Commonly noted finding were ST depression and bradycardia.

7. Acknowledgment

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