ECG Manifestations in Dengue Infection

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ABSTRACT

OBJECTIVE
To determine the frequency of ECG changes in patients with dengue fever and dengue hemorrhagic fever.

PLACE OF STUDY
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DURATION OF STUDY
September to November 2011

STUDY DESIGN
Cross sectional analytical study

PATIENTS AND METHODS
116 patients with dengue infection were enrolled in the study. Their clinical presentation and examination was duly noted. Each patient had baseline and then regular monitoring of blood counts, metabolic profile and fluid status. Patients with Dengue Hemorrhagic fever underwent radiological examination in form of chest radiograph and ultrasound abdomen. ECG was carried out in all patients.

RESULTS
Out of 116 patients, 61(52.6%) suffered from Dengue Fever and 55(47.4%) had Dengue Hemorrhagic Fever. Overall 78 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.

KEY WORDS: Dengue fever, Dengue Hemorrhagic fever

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% die¹. Pakistan had a dengue epidemic in 2011. Thousands of people suffered due to this infection.

Dengue virus has four serotypes and its vector is Aedes mosquito. 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, decreased serum albumin, decreased serum cholesterol, pleural effusion and ascites 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. 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.

PATIENTS AND METHODS:
One hundred and sixteen patients fulfilling the WHO criteria for Dengue fever and Dengue Hemorrhagic fever were enrolled between September to November 2011. The criteria for dengue fever included high grade fever for three to five days along with leucopenia( white blood cell count < 4000/cmm), thrombocytopenia(platelet count< 100,000/cmm) with or without bleeding from any site. Patient was diagnosed with Dengue hemorrhagic fever if they developed abdominal pain with pleural effusion and/ or ascites which indicated the critical phase. Presence or absence of warning signs like low blood pressure, narrow pulse pressure, decreased capillary refilling test were also recorded All cases were confirmed by investigating for Dengue IgM. Demographic profile like age, gender were recorded. Occurrence of symptoms like fever, bleeding, and abdominal pain were noted. Cardiac symptoms like chest pain, dyspnea and palpitations were identified. All patients had hematological investigations i.e. complete blood count including hematocrit, liver and renal function tests. Chest radiograph and ultrasound abdomen were performed in patients suspected to have DHF. Patients were followed during admission by daily vitals monitoring, pulse pressure measurement, evidence of fluid leak in form of pleural effusion or ascites and intake output monitoring. Complete blood count, renal profile and other essential biochemical tests like liver functions, clotting profile, serum electrolytes were regularly monitored. WHO guidelines for fluid management and monitoring were followed. Once patient was afebrile and out of critical phase with stable vitals and clinical status, they were discharged. 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.

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.

RESULTS:
One hundred and sixteen patients diagnosed to be suffering from dengue fever were enrolled. 94(81%) were male and 22(19%) were female. Mean age was 32.88±14.6 years. Clinical features are presented in Table (1). Sixty one (52.6%) patients were diagnosed as dengue fever and dengue hemorrhagic fever (DHF) was diagnosed in 55(47.4%) patients. ECG was carried out in all the patients. In most of the patients (n=78) ECG was normal. When we analyzed the ECGs of patients with Dengue fever and Dengue Hemorrhagic fever, out of 61 patients of DF, 39 had normal ECG. 13 patients had bradycardia and 2 had tachycardia which persisted even when patient was afebrile and hemodynamically stable. ST depression was
seen in 3 patients. One patient each had new onset left bundle branch block, supraventricular tachycardia and poor progression of R wave.

In 55 cases suffering from DHF, ECG was normal in 39 patients. Bradycardia and tachycardia were noted in 5 patients each, 2 had left bundle branch block, 4 had ST depression and poor progression of R wave was noted in 1 patient. None of the ECG finding was significantly related to DHF, though bradycardia was found to be related with p value of 0.069.

In DHF, on ultrasound ascites was present in 28(24.1%) patients. 29(20.7%) had gall bladder edema, 9(7.8%) patients had hepatomegaly, 8(6.9%) had splenomegaly and pleural effusion was noted in 16(13.8%) 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 discharged and no death was occurred. None of the patients had symptom of chest pain at presentation and neither developed chest pain or any other cardiac complication like angina, myocardial infarction or cardiac failure.

### TABLE: 2

<table>
<thead>
<tr>
<th>ECG changes</th>
<th>No of patients</th>
<th>Palpitations</th>
<th>Shortness of breath</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bradycardia</td>
<td>18</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Tachycardia</td>
<td>7</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Bundle branch block</td>
<td>3</td>
<td>1</td>
<td>None</td>
</tr>
<tr>
<td>Supraventricular tachycardia</td>
<td>1</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Poor R wave progression</td>
<td>2</td>
<td>None</td>
<td>1</td>
</tr>
<tr>
<td>ST depression</td>
<td>7</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

### DISCUSSION

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. 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. 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. Atrial fibrillation along with low voltage QRS and diffuse ST segment elevation was recorded in a fatal case of myocarditis. 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, similar findings were noted in our patients. In an Indian study by Wali et al 5/17 (29%) patients of DHF had ECG changes. In our study out of 55 patients of DHF ECG abnormalities were noted in 13 patients (7.15%). 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. In our study we found two 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 \(^\text{12}\). 

**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.

**REFERENCES**