

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

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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 enzymes², decreased serum albumin, decreased serum cholesterol³, pleural effusion and ascites⁴ 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.⁵

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 $< 4000/\text{cmm}$), thrombocytopenia (platelet count $< 100,000/\text{cmm}$) 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 \pm 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: 1

CLINICAL FEATURES	NUMBER OF PATIENTS	PERCENT AGE
Fever	116	100
Abdominal pain	54	46.6
Epistaxis	12	10.3
Gum bleed	17	14.7
Upper GI bleed	28	24.1
Hematuria	2	1.7
Per rectal bleed	3	2.6
Per vaginal bleed	2	1.7
Palpitations	10	8.6
Shortness of breath	10	8.6
Altered consciousness	11	9.5
Arthritis	2	1.7
Encephalitis	4	3.4
Hepatic failure	1	0.9

TABLE: 2

ECG changes	No of patients	Palpitations	Shortness of breath
Bradycardia	18	3	2
Tachycardia	7	1	1
Bundle branch block	3	1	None
Supraventricular tachycardia	1	None	None
Poor R wave progression	2	None	1
ST depression	7	1	2

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 study⁶. Our study showed that T wave inversion was not the sole manifestation. Masilza et al reported atrial fibrillation in a patient with structurally normal heart⁷. Atrial fibrillation along with low voltage QRS and diffuse ST segment elevation was recorded in a fatal case of myocarditis⁸. 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 noted⁹ similar findings were noted in our patients. In an Indian study by Wali et al 5/17 (29%) patients of DHF had ECG changes¹⁰. 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 DHF¹¹. 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 bradycardia¹².

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

1. Dengue and severe dengue. www.who.int/mediacentre/factsheet. Jan 2012.
2. Ali K. Ageep, Abu elgasim S. A correlation study between clinical manifestations of dengue fever and the degree of liver injury. *Journal of Microbiology and Antimicrobials*. 2012; Vol. 4(2): 45-48.
3. Suvarna JC, Rane PP. Serum lipid profile: a predictor of clinical outcome in dengue infection. *Tropical Med Int Health*. 2009 May; 14(5): 576-85.
4. Venket Sai P, M, Dev B, Krishnan R. Role of ultrasound in Dengue fever. *The British Journal of Radiology*. 2005; 78: 416-18.
5. Satarasinghe RL, Arulnithy K, Amerasena NL, Bulugahapitiya U, Sahayam DV. Asymptomatic myocardial involvement in acute dengue virus infection in a cohort of adult SriLankans admitted to a tertiary referral centre. *Br J Cardiol*. 2007; 14:171-3.
6. Kosala GAD Weerakoon, Senanayake AM Kularatne, Deepthika H Edussuriya, Sarachchandra KA Kodikara, Laxman PG Gunatilake, Vasanti G Pinto et al Histopathological diagnosis of myocarditis in a dengue outbreak in Sri Lanka, 2009. *BMC Research Notes*. 2011; 4:268.
7. Masilza Mahmood, Noor Darinah Mohd Darul, Ibtisam Mokhtar, Norazirah Md Nor, Fauzi Md Ansher, Oteh Maskon Atrial fibrillation as a complication of dengue hemorrhagic fever: non- self- limiting manifestation. *International Journal of Infectious diseases*. 2009; 13(5): 316-8
8. Carlos H M, Marcos de Carvalho B, Andre Schmidt, Antonio PF, Marcos A R, Simone G R et al. A case presentation of a fatal dengue myocarditis showing evidence for dengue virus- induced lesion. *European Heart Journal: Acute Cardiovascular Care*. June 2013; 2:127-130.
9. S.A.M. Kularatne, M.M.K. Pathirage, P.V.R. Kumarasiri, S. Gunasena, S.I. Mahindawanse Cardiac complications of a dengue fever outbreak in Sri Lanka, 2005. *Trans R Soc Trop Med Hyg*. 2007; 101(8): 804-808.
10. Wali JP, Biswas A, Chandra S et al. Cardiac involvement in Dengue Hemorrhagic fever. *Int J Cardiol* 1998; 64:31-6.
11. Gulati S, Maheshwari A. Atypical manifestations of Dengue. *Trop Med Int Health*. 2007(Sep); 12(9):1087-95.
12. Vishal Kumar Gupta, AK Gadpayle. Subclinical cardiac involvement in Dengue Hemorrhagic fever. *JACM*. 2010; 11(2): 107-11.