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ECG changes in patients with dengue fever: Cross sectional study

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Abstract
Background and Objectives: Dengue mostly spreads in tropical climates. Dengue is known to affect various systems, cardiovascular system is one of them. This study was conducted to observe the presence of electrocardiographic (ECG) changes in patients presenting with dengue fever.
Materials and Methodology: This study was conducted in KVG medical college in the department of general medicine. Cases were selected after taking into account the inclusion and exclusion criteria from serologically confirmed dengue cases. The details of patient's clinical presentation and examination was noted. ECG was carried out to all patients
Results: Out of 100 patients, 51 patients had normal ECG. Abnormal ECG findings like sinus bradycardia, tachycardia, ST-T changes, Bundle branch block were noted among 49 patients. 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 bradycardia and Non-specific ST-T changes. No evidence of myocarditis was seen.

Keywords: dengue, bradycardia

Introduction
Dengue fever is one of the most important viral diseases of the world. It is transmitted by dengue virus infected female Aedes Aegypti mosquito bite. Mainly seen in tropical and subtropical areas. It is a Flavi virus infection. There are mainly 4 strains of dengue virus DENV1, DENV2, DENV3, DENV4. Dengue fever can have various manifestation being mild to Sever forms [1].
It is usually of self-limiting but can go into dengue hemorrhagic fever and as severe as dengue shock syndrome.
Milder forms are usually found with fever and flu like symptoms and later can manifest with leucopenia and thrombocytopenia which can lead to various bleeding manifestations. Along with that various biochemical and radiological derangements are also found including deranged liver enzymes, low serum albumin, decreased cholesterol, pleural effusion and mild ascites are commonly observed. Dengue affects various systems including cardiovascular system [2].
Cardiac complication of dengue fever though uncommon has been reported as burden of disease increased. Most common complication being the myocarditis, followed by conduction defects and arrhythmia. [3] Pathophysiology of cardiac involvement is not yet clearly understood, hypothesis being either direct viral invasion to cardiac muscles or cytokine induced immune damage or both. It can be either focal or diffuse myocarditis [4]. Aim of the present study is to find out the ECG changes occurring in dengue patients.

Materials and Methods
This Cross sectional study was conducted in the Department of Medicine at KVG MEDICAL COLLEGE, SULLIA. A total No. of 100 subjects comprising of 80 male and 20 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 electrocardiogram taken during febrile phase of dengue fever at an interval of 24 hrs for a total of 05 days

Study Design
Prospective, Cross sectional study, Simple random selection

Selection of Patients
Inclusion Criteria
1. High grade fever –For 1 to 5days.
2. Both primary dengue (NS-1 Antigen and dengue IgM positive) and Secondary dengue (IgM and IgG positive)

Exclusion Criteria

1. Pulmonary, cardiac (Rheumatic heart disease, Dilated cardiomyopathy, conduction disorder, patients on pacemaker) thyroid disease
2. Age less than 15 years and more than 60 years.
3. Patients on medication affecting heart rates such as B2 Agonist, B2 Antagonist, Digoxin, Theophylline and its derivative.
4. Electrolyte imbalance-Hypokalemia, Hyperkalemia, Hypocalcemia, Hypercalcemia

Results

This prospective study to evaluate the ECG changes in patients admitted with dengue fever conducted at Department of Medicine at KVG Medical College and Hospital, Sullia was conducted on 100 patients diagnosed to be suffering from dengue fever. Out of that 80 were males and 20 were females. (Fig 1)

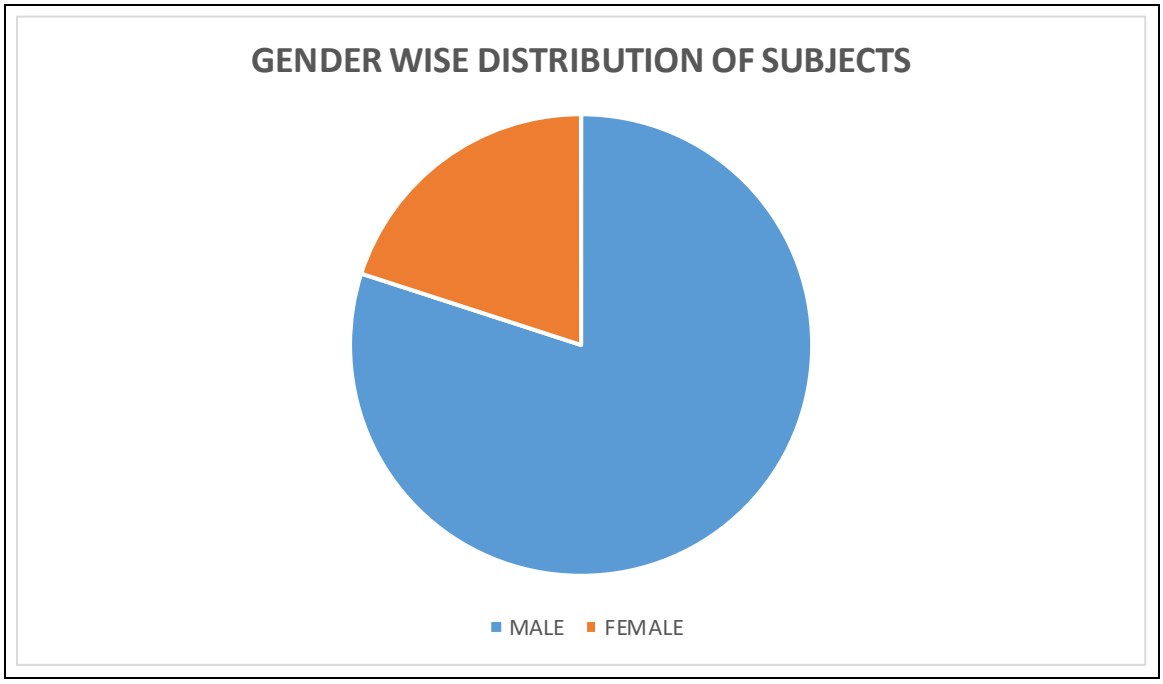

Fig 1

87 patients were diagnosed as dengue fever and dengue hemorrhagic fever (DHF) was diagnosed in 13 patients. None of patients had dengue shock syndrome. (Table 1)

Table 1: Distribution of Subjects According To Type of Fever

Dengue Fever	**87**
Dengue Hemorrhagic Fever	13
Dengue Shock Syndrome	0

Fever (100%) was commonest symptoms, next was myalgia (75%). Other symptoms were headache (53%), diarrhea (37%), rashes (33%), vomiting (29%) and abdominal pain (22%). Hemorrhagic manifestations were present in 13% patients. Arthritis was present in 13 cases. In one case retro orbital pain was found to be there. Regarding primary outcome, all patients were discharged, no death occurred. None of the patient 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, in most of the patients 51 ECG was normal sinus rhythm, 49 patients had abnormal ECG. Out of 87 patients of DF, 46 had normal ECG, 27 patients had sinus bradycardia and 2 had sinus tachycardia which persisted even when patients were afebrile and hemodynamically stable Non-specific ST-T changes were seen in 10 patients, 2 patients had new onset right bundle branch block. No other rhythm disturbance was noted. In 13 cases suffering from DHF, ECG was normal in 5 patients. Bradycardia was noted in 5 patients, 2 had Non-specific ST-T changes and 1 had sinus tachycardia.

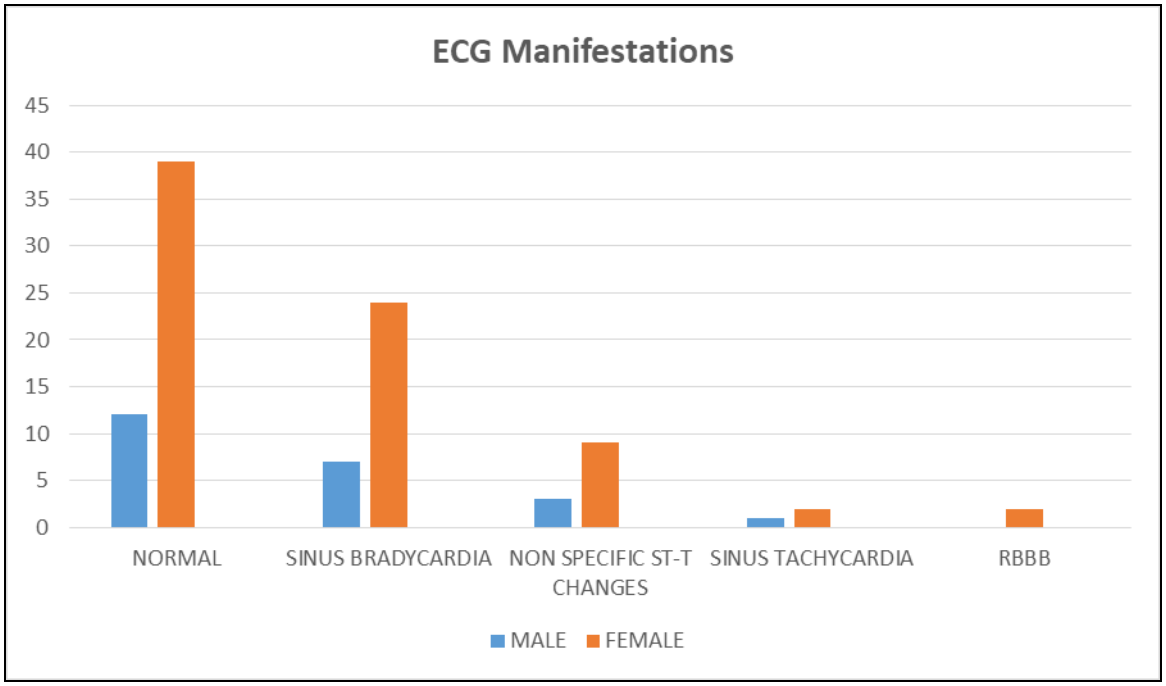

Fig 2

Table 2

Clinical Feature	Percentage
Fever	100
Myalgia	75
Headache	53
Diarrhoea	37
Rash	33
Vomiting	29
Abdominal pain	22
Bleeding manifestation	13
Arthritis	13
Palpitation	5

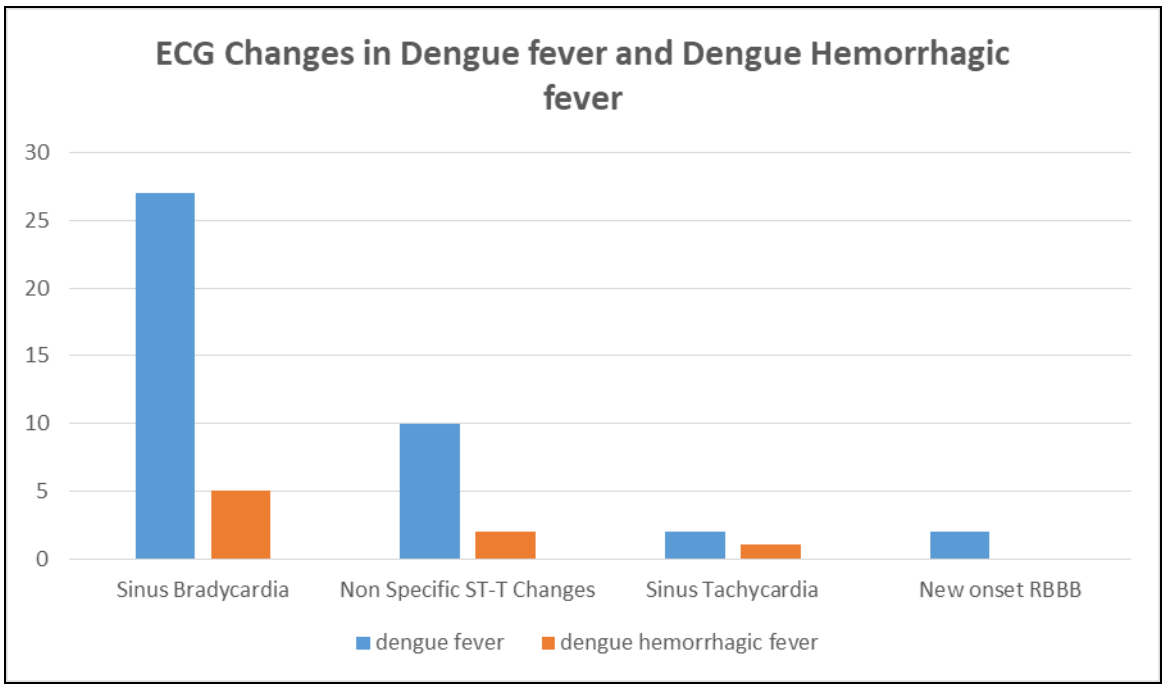

Fig 3

Discussion

Dengue infection is mostly affecting tropical and subtropical climates. In this study various organ involvement have been observed [5]. Dengue viral infection cause myocardial damage either by infection or by an autoimmune reaction resulting in myocardial inflammation [6]. The cardiac abnormalities in dengue fever are benign, transient and self-limiting and attributed to subclinical myocarditis [7]. In our study a total of 100 patients of dengue fever were analyzed. Out of 100 patients, 51% had normal and 49% had abnormal electrocardiography. Abnormal ECG were also noticed in other studies like Tarique *et al*, but incidence was slight higher than our study (62.79%)[8].ECG findings were sinus bradycardia in 31%, non-specific ST-T changes in 12%. Other findings were sinus tachycardia in 3%, Right bundle branch block in 2%, none had ventricle 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% [9]. Lateef *et al* showed sinus bradycardia is commonest rhythm abnormality (32%), similar findings were noted in our study [10]. 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%) [11]. 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 [12]. 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 [13]. 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. [14, 15] In our study, the incidence of ECG abnormalities was higher among DHF as compared to DF, but this difference was statistically insignificant.

Conclusion

We conclude that there is cardiac involvement in dengue infection. ECG changes are noted in both symptomatic and asymptomatic patients. Most of the patient had sinus bradycardia and non-specific ST-T changes, very few had sinus tachycarida and RBBB. 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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