

## Study of Cardiac Symptoms in Dengue Infection Patients Visiting a Tertiary Hospital

Lal Babu Prasad<sup>1</sup>, Ajay Abel Mall<sup>2</sup>

<sup>1</sup>Assistant Professor Dept. of General Medicine Venkateshwara Institute of Medical Sciences Gajraula U.P. India

<sup>2</sup>Assistant Professor Dept. of General Medicine Venkateshwara Institute of Medical Sciences Gajraula U.P. India

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Received: 10-12-2021 / Revised: 15-01-2022 / Accepted: 28-02-2022

Corresponding author: Dr. Ajay Abel Mall

Conflict of interest: Nil

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### Abstract

**Background:** One of the most significant viral diseases that is linked to mortality is dengue fever. Clinical signs of cardiac involvement might range greatly, from a quiet illness to a fatal myocarditis. Aims & objectives: The goal of the current investigation was to evaluate the cardiac effects of dengue fever and find any subclinical or latent cardiac involvement.

**Material and Methods:** Patients who were above the age of 18, of either gender, were admitted with a diagnosis of dengue fever (confirmed by a serological test) and were willing to participate in the study.

**Results:** 284 patients who met the inclusion and exclusion criteria for the study were evaluated. The age range of 31–40 years represented the largest percentage of patients (28%) followed by that of 41–50 years (12%). (23 percent). In this study, men made up the majority (57%) of the patients. According to serology results, the majority of patients were IgG (+20%), IgM (+20%), and NS1 (+48%) positive (13 percent). In the current study, 15% of participants tested positive for troponin T, and 18% had high CK-MB values (> 25). Sixty percent of patients had normal electrocardiograms; noteworthy findings included broad QRS complex (11%), diffuse T wave inversion (10%), non-specific ST segment changes (10%), sinus bradycardia (9%), and low voltage QRS complex (0.70 percent). Significant 2D ECHO findings were anterior wall hypokinesia (3%) minor PAH + mild TR + hypokinesia anterior wall (1%) mild PAH + mild TR (0.70%), LVH (0.70%), DCM secondary to dengue myocarditis (0.70%), and mild AML prolapse. In 93 percent of patients, the 2D ECHO was normal (0.70 percent).

**Conclusion:** Patients with dengue fever who have transient cardiac abnormality—as indicated by changes in heart rate, rhythm, and elevated CK MB and troponin I levels—should continue extensive assessment and follow-up even after being discharged.

**Keywords:** Cardiac manifestation; Dengue; NS1 antigen / IgM antibody, myocarditis

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## Introduction

One of the most significant viral diseases that is linked to mortality is dengue fever. In the majority of instances, dengue fever has a self-limiting course, although in the acute phase, it can manifest with multi-organ involvement [1]. A variety of clinical illnesses, including silent, undifferentiated febrile sickness (viral syndrome), dengue fever (DF), dengue hemorrhagic fever (DHF), and dengue shock syndrome, can result from infection with a dengue virus serotype (DSS) [2-4]. When endothelial dysfunction and increased capillary permeability combine to cause hypovolemic shock, which can result in circulatory collapse, some patients experience severe clinical symptoms such as hemorrhage, organ damage, and endothelial dysfunction. Due to the low threshold of clinical suspicion and its overlapping clinical presentations, cardiac involvement in dengue fever is frequently underdiagnosed [5]. Clinical signs of cardiac involvement might range greatly, from a quiet illness to a fatal myocarditis. There have also been reports of pericarditis, myocarditis, myocardial depression with symptoms of heart failure and shock, hypotension, arrhythmias, irregular rhythms, and myocarditis [6,7]. Clinicians must concentrate on both the sub-clinical and clinical cardiac symptoms of dengue fever through clinical examination, laboratory, ECG, and 2 D-ECHO findings due to the rising incidence of dengue fever and associated morbidity as well as mortality [8].

**Aims & objectives:** The goal of the current investigation was to evaluate the cardiac effects of dengue fever and find any subclinical or latent cardiac involvement.

## Material and Methods

In central India's Department of Medicine, this study was carried out. The current study was based in a hospital and was an 18-month prospective observational study. The

institutional ethical committee granted study approval.

Patients must be over the age of 18, be of either gender, have a confirmed diagnosis of dengue fever, and be willing to participate in the study in order to meet the inclusion criteria.

Patients treated on an outpatient basis, hospital stays of less than one day, those with a history of cardiac disease, those using medications for that condition, and those whose electrocardiograms (ECGs) show recognized abnormalities on a 2-dimensional echocardiogram are all excluded. Known cases of diabetes or hypertension lasting longer than five years. Uncertain diagnosis. Patient refuses to take part.

Patients provided written, fully informed consent. Patient information was recorded in the case record proforma, including demographic information, clinical history, physical exam findings, laboratory results (including rapid tests for non-structural protein1 and dengue IgM and IgG), complete blood count, liver function tests, including aspartate aminotransferase and alanine aminotransferase, renal function tests, and coagulation studies), ECG, chest X-ray, and abdominal ultrasonography. When necessary, specialized tests like 2 D echocardiography and cardiac enzymes (troponin, CPKMB) were performed. Patients were monitored for 15 days following discharge. Microsoft Excel was used to gather and compile the data, and SPSS 23.0 was used to analyze it. Descriptive statistics were used in the statistical analysis.

## Results

284 patients who met the inclusion and exclusion criteria for the study were evaluated. The age range of 31–40 years represented the largest percentage of patients (28%) followed by that of 41–50 years (12%).

(23 percent ). In this study, men made up the majority (58%) of the patients.

**Table 1: Age and gender distribution of patients studied**

Age in years	Gender		Total
	Male	Female	
19-30	32 (11.27%)	22 (7.75%)	54 (19.01%)
31-40	46(16.2%)	34(11.97%)	80 (28.17%)
41-50	36(12.68%)	30(10.56%)	66 (23.24%)
51-60	30(10.56%)	18 (6.34%)	48 (16.9%)
>60	20 (7.04%)	16 (5.63%)	36 (12.68%)
<b>Total</b>	<b>164 (57.75%)</b>	<b>120 (42.25%)</b>	<b>284 (100%)</b>

According to serology results, the majority of patients had NS1 positivity (47.89%), IgM positivity (19.72%), and IgG positivity (13.38 percent).

**Table 2: Dengue serology**

Dengue Test	No. of Patients (n=284)	Percentage
NS1 Positive	136	47.89%
IgM positive	56	19.72%
IgG Positive	38	13.38%
IgM and IgG positive	28	9.86%
IgM and NS1 Positive	22	7.75%
NS1 and IgG Positive	4	1.41%

In the current study, 17.61 percent of participants had significant CK-MB levels (> 25) and 14.79 percent tested positive for troponin T.

**Table 3: cardiac enzymes**

Characteristics	No. of Patients (n=284)	Percentage
Troponin		
Positive (>0.017)	42	14.79%
Negative (<0.017)	242	85.21%
CK-MB		
<25	50	17.61%
>25	234	82.39%

Significant ECG abnormalities were Broad 'QRS' Complex (10.56%), Diffuse 'T' Wave Inversion (9.86%), Non-Specific 'ST' Segment Changes (9.86%), Sinus Bradycardia (9.15%), and Low Voltage 'QRS' Complex. Of the patients, 59.86 percent had normal ECGs (0.70 percent).

**Table 4: ECG Findings**

ECG Findings	No. of Patients (n=284)	Percentage
Normal ECG	170	59.86%
Broad 'QRS' Complex	30	10.56%
Diffuse 'T' Wave Inversion	28	9.86%
Non-Specific 'ST' Segment Changes	28	9.86%
Sinus Bradycardia	26	9.15%
Low Voltage 'QRS' Complex	2	0.70%

Significant 2D ECHO findings were anterior wall hypokinesia (2.82%), moderate PAH + mild TR + hypokinesia anterior wall (1.41%), mild PAH + mild TR (0.70%), LVH (0.70%), DCM secondary to dengue myocarditis (0.70%), and minor AML prolapse. In 92.96 percent of patients, 2D ECHO was normal (0.70 percent ).

**Table 5: 2D ECHO findings**

ECHO Findings	No. of Patients (n=284)	%
Normal	264	92.96%
Anterior Wall Hypokinesia	8	2.82%
Mild PAH + Mild TR + Hypokinesia Anterior wall	4	1.41%
Mild PAH + Mild TR	2	0.70%
LVH	2	0.70%
DCM Secondary to Dengue Myocarditis	2	0.70%
Mild AML Prolapse	2	0.70%

## Discussion

In endemic areas, the virus that causes dengue is spread by mosquitoes and results in severe morbidity. Its incidence has expanded along with the geographic and demographic dispersion of the disease as a result of globalization, increased air travel, ineffective mosquito control methods, and unplanned urbanization [9,10]. Increased hepatic enzyme levels, leukopenia, and thrombocytopenia—abnormalities that are consistent with but not specific to dengue fever—may be found in laboratory tests. Acute pulmonary edema or cardiogenic shock may occur in patients who have a dengue infection, along with transitory atrioventricular block, relative bradycardia, and myocarditis. Although serious cardiac problems like myocarditis have been documented in the literature, it is still unknown how frequently they occur [11,12].

Although the precise mechanism of the heart injury caused by dengue fever is yet unknown, it is suggested that the key mechanisms of the cardiac manifestations are the direct viral invasion of the cardiac myocyte and damage to the cardiac cells caused by continuous inflammatory damage. A few recent investigations have suggested that shock in DHF/DSS may be caused by

cardiac involvement, despite the fact that it has typically been attributed to decreased intravascular volume caused by capillary leakage of plasma into the interstitial space [13].

The incidence of cardiac manifestation in different studies ranged from 16.7% to 71.0%, with cardiac failure, electrocardiogram (ECG) changes (sinus bradycardia, sinus tachycardia, and T wave inversion), 2D echocardiography (2DEcho) changes (reduced ejection fraction), and elevated cardiac enzymes all being common (Troponin T, CK MB). 84.5 percent of the 58 patients Sukhwani N investigated did not exhibit any cardiac abnormalities, and 15.5 percent had abnormal readings but they were not statistically significant. Cardiac symptoms were more frequent in DHF and dengue shock syndrome, where they occurred at rates of 15.5% and 3.4%, respectively. Retro orbital pain (85%) and fever were the two most prevalent clinical presentations in a study of 60 individuals, according to Gururaj VG et al. The mean age was 36.8 years (76.6 percent) [14]. Troponin I was high in 2 cases (3.3%) while CK-MB was elevated in 2 cases (3.3 percent ). Sinus bradycardia, which was transitory and reported in 53.33 percent of cases, was the most prevalent cardiac abnormality observed. Two cases of

myocarditis, one total heart block, one LBBB, one case of atrial fibrillation, one case of first-degree AV block, and two cases of myocarditis were present. CKMB and Troponin I levels were higher upon admission in 18% and 72% of cases, respectively, according to Arati K et al. On the ECG, 56% of the patients had a normal rhythm, 15% had sinus Bradycardia, 9% had sinus tachycardia, 10% had T wave changes, 3% had ST changes, 2% had sinus bradycardia with T wave changes, 2% had sinus tachycardia with T wave changes, 1% had LVH, and 2% had abnormal rhythm. In the current investigation, similar results were seen. Mohit Arora examined 120 dengue fever patients, of whom 33.33 percent had petechia and only nine had acute bleeding symptoms at the time of presentation. In 33.3 percent and 26.7 percent of patients, respectively, elevated CK-MB and Troponin I levels were noted. 15.8% of people with abnormal heart rates had abnormal ECG results. Five percent of the patients had rhythm disturbances, with AV block being the most prevalent (66.67 percent). In 37.50 percent of the patients, myocarditis, a cardiac symptom, was seen. The patients in the study by Papalkar PV et al. had a mean age of 38 16.69 years. There were 51, 7, and 2 patients with dengue fever, DHF, and dengue shock syndrome, respectively. Sinus bradycardia, which was present in 9 (15%) individuals, was the most frequent ECG abnormality, followed by sinus tachycardia in 6 (10%) and ST T changes in 5. (8.33 percent). 54 (90%) of the patients had normal echocardiograms, while 2 (3.33%) of the patients had pericardial effusion and 4 (6.67%) had systolic dysfunction. There were eight (13.33%) patients with abnormal CK MB levels [15,16]. A mechanism comparable to those responsible for viral myocarditis may contribute to the development of dengue virus-related myocarditis. It is generally accepted that dengue hemorrhagic fever is an immunologically mediated disease. The key aspect of myocarditis management is that it is

typically conservative. [17] Almost generally benign, temporary, and related to myocarditis, ST-T alterations seen in dengue do not require special treatment.

### Conclusion

Patients with dengue fever who have transient cardiac abnormality—as indicated by changes in heart rate, rhythm, and elevated CK MB and troponin I levels—should continue extensive assessment and follow-up even after being discharged. The increases in vascular permeability and aberrant leakage of plasma that results in pericardial effusion are caused by increased production of cytokines such as tumor necrosis factor alpha and interferon alpha as well as the release of other chemical mediators. The majority of electrocardiographic abnormalities are temporary and go away after three weeks without any help. Patients with symptoms and rhythm irregularities that are persistent or getting worse require a complete assessment.

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