

Original research article**The clinical and echocardiographical profile of dengue fever patients admitted in a tertiary care centre**

¹Dr. Koot Snehal Rajkumar, ²Dr. Devadas Rai, ³Dr. Hanumanthakari Prudhviraajana, ⁴Dr. Y Praneeth Charan Reddy, ⁵Dr. KA Ateeb Ahmed, ⁶Dr. Mohammad Bilal Hussain
^{1,3,4,5,6}Junior Resident 3rd Year, Department of General Medicine, Kanachur Institute of Medical Sciences, Mangalore, Karnataka, India
²Head of the Department, Department of General Medicine, Kanachur Institute of Medical Sciences, Mangalore, Karnataka, India

Corresponding Author:Dr. Koot Snehal Rajkumar

Abstract

Background: The mechanism of myocardial damage in dengue could be the release of inflammatory mediators or the direct action of the dengue virus on myocytes leading to myocarditis. The release of inflammatory mediators is more in a severe form of the disease that correlates to the higher incidence of cardiac manifestations in patients with severe dengue.

Aim: To estimate the proportion of cardiac involvement among patients with dengue fever admitted in Kanachur Medical College, Mangaluru based on clinical, serological, electrocardiographical and echocardiographical evaluation.

Materials and Methods: A hospital based cross sectional study was conducted at Kanachur Medical College, Mangaluru during duration of 1 year (March, 2022-March, 2023). 185 patients were recruited in this study. A detailed history and clinical examination was recorded on structured proforma. Hematological and biochemical investigations were done at the time of admission. Study variables included Systemic hypertension, Dyslipidemia, symptoms of cardiac involvement such as palpitations and chest discomfort.

Results: Out of 185 patients, 14.6% were less than 30 years, 20.5% were 31-40 years old, 30.8% were 41-50 years old, 22.2% were 51-60 years old, and 11.9% were >60 years old. 51% patients were females and 49% were males. According to distribution of cardiac symptoms, 72.9% were normal, 11.9% had bradycardia, 4.3% had tachycardia, 4.3% had ischaemic type chest pain, 3.8% had palpitations, and 2.7% had dyspnoea. 76.2% patients had normal ECG findings, 10.8% had sinus bradycardia, 6.7% had sinus tachycardia, 1.7% had heart block, 1.4% had dynamic ST-T, and 0.6% had atrial fibrillation. 87.5% patients had normal ECHO findings, 9.1% had wall motion abnormalities, 2.2% had LV systolic dysfunction, and 1.1% had Valvular regurgitant lesion.

Conclusion: From present study, we can say that the most accurate test for detecting myocarditis is ECG. The most frequent ECG abnormality was sinus bradycardia. The most common ECHO abnormality was wall motion abnormalities with global hypokinesia.

Keywords: ECG, hypokinesia, ECHO, dengue fever

Introduction

Dengue fever is a prevalent acute illness that occurs seasonally in poor countries such as India. It is caused by the dengue virus, which belongs to the flavivirus genus in the Flaviviridae family. This virus is a single stranded enveloped Ribonucleic acid (RNA) virus ^[1]. Dengue infection may affect people of all ages, but the paediatric age group is particularly vulnerable to severe illness and death if the disease is not promptly and accurately diagnosed and treated ^[2]. Dengue fever commonly manifests with a sudden beginning of a prolonged period of elevated body temperature, typically lasting between 2 and 7 days. Dengue is an illness that may present with a variety of symptoms, ranging from mild viral symptoms to more serious conditions including dengue hemorrhagic fever and dengue shock syndrome ^[3].

Dengue transmission is more prevalent during the monsoon and post-monsoon seasons ^[4]. Over the last decade, India has had significant outbreaks and fatalities across all regions ^[5, 6]. Dengue infection may vary in intensity, ranging from a flu-like sickness (DF) to a potentially lethal condition known as dengue hemorrhagic fever (DHF)/dengue shock syndrome (DSS) if not treated ^[7-9].

Dengue has also been associated with a wide variety of electrocardiogram (ECG) abnormalities. A 2D echocardiogram is a dependable diagnostic tool. The echocardiogram result indicated the presence of

systolic dysfunction characterized by a low ejection fraction (EF), diastolic dysfunction characterized by an irregular E/A ratio, and pericardial effusion [9]. Previous research has shown a clear association between the collapsibility of the inferior vena cava (IVC) and hematocrit levels [10]. Regions that have had endemic dengue for many years frequently have higher rates of mortality and morbidity [11]. Despite the complexity of its symptoms, managing this condition is straightforward, cost-effective, and highly efficient in preserving lives as long as prompt therapies are implemented. Dengue has the distinct ability to intensify its onslaught on a secondary illness. When combined with its strong partner in a persistent carrier, prevention becomes the most effective approach to control Dengue [12]. Hence the aim of this research is to study the association between severe thrombocytopenia and cardiac involvement among dengue fever patients.

Methodology

A hospital based cross sectional study was conducted at of 1 year (March, 2022- March, 2023). 185 patients were recruited in this study.

Inclusion Criteria

Patients with epidemiological history and clinical manifestations of dengue diagnosed with positive specific serum IgM antibody and/or NS1 antigen admitted in Kanachur Medical College, Mangaluru.

Exclusion Criteria

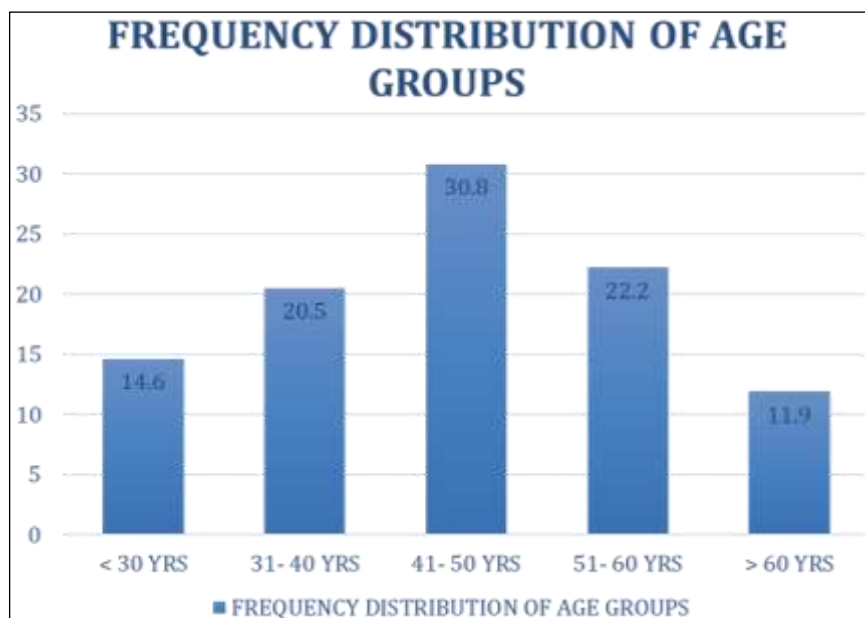
Patients with prior cardiac disease and patients not giving consent were excluded from the study.

Methodology

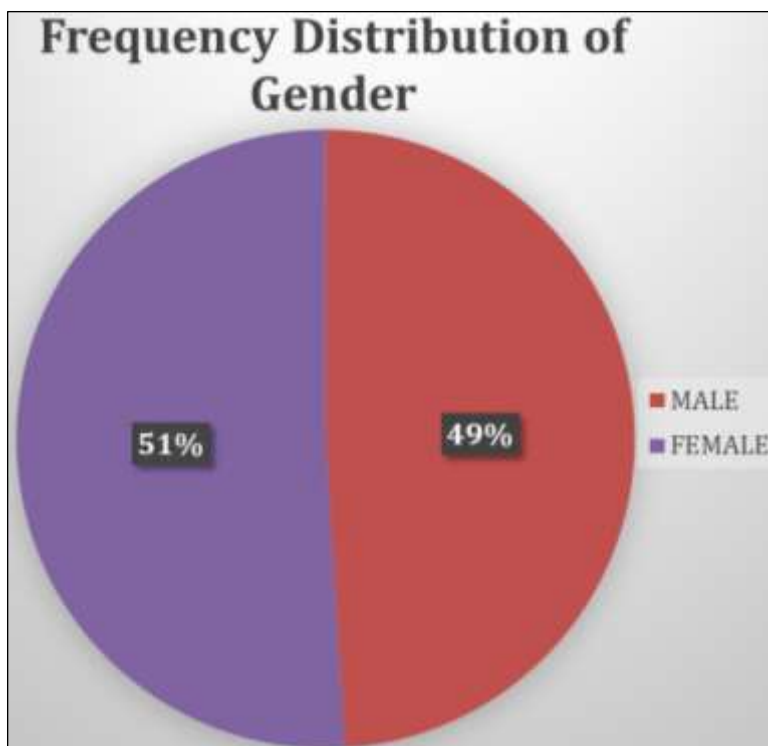
A detailed history and clinical examination was recorded on structured proforma. Hematological and biochemical investigations were done at the time of admission. Study variables included Systemic hypertension, Dyslipidemia, symptoms of cardiac involvement such as palpitations and chest discomfort. Cardiovascular system examination was done in detail such as Electrocardiography changes, Cardiac biomarkers- Troponin, CKMB, and Echocardiography changes. Pearson chi square test was used for data analysis.

Results

Out of 185 patients, 14.6% were less than 30 years, 20.5% were 31-40 years old, 30.8% were 41-50 years old, 22.2% were 51-60 years old, and 11.9% were >60 years old. 51% patients were females and 49% were males.



Graph 1: Frequency distribution of age groups



Graph 2: Frequency distribution of gender

According to distribution of cardiac symptoms, 72.9% were normal, 11.9% had bradycardia, 4.3% had tachycardia, 4.3% had ischaemic type chest pain, 3.8% had palpitations, and 2.7% had dyspnoea. 76.2% patients had normal ECG findings, 10.8% had sinus bradycardia, 6.7% had sinus tachycardia, 1.7% had heart block, 1.4% had dynamic ST-T, and 0.6% had atrial fibrillation. 87.5% patients had normal ECHO findings, 9.1% had wall motion abnormalities, 2.2% had LV systolic dysfunction, and 1.1% had Valvular regurgitant lesion.

Table 1: Frequency distribution of cardiac, ECG, and ECHO findings

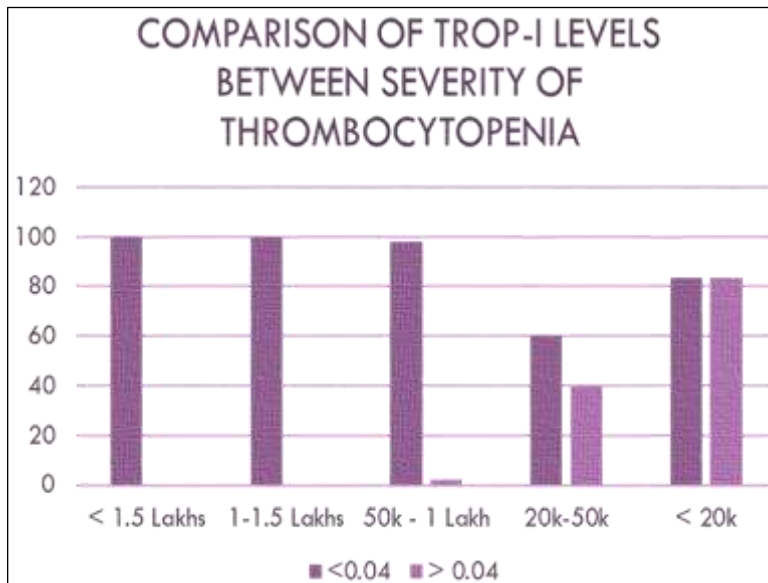
Variables		%
Cardiac symptoms	Normal	72.9%
	Ischaemic type of chest pain	4.3%
	Palpitations	3.8%
	Dyspnoea	2.7%
	Tachycardia	4.3%
	Bradycardia	11.9%
ECG findings	Normal	76.2%
	Atrial fibrillation	0.6%
	Dynamic ST-T	1.4%
	Heart Block	1.7%
	Sinus bradycardia	10.8%
	Sinus tachycardia	6.7%
ECHO findings	Normal	87.5%
	Valvular regurgitant lesion	1.1%
	Wall motion abnormalities	9.1%
	LV systolic dysfunction	2.2%

84% patients had trop-I levels <0.04 and 16% had >0.04. According to thrombocytopenia distribution, 56.7% had 50,000-1 lakh, 31.3% had 20k-50k, 7.1% had 1-1.5 lakhs, 3.3% had <20k, and 1.1% had >1.5 lakh.

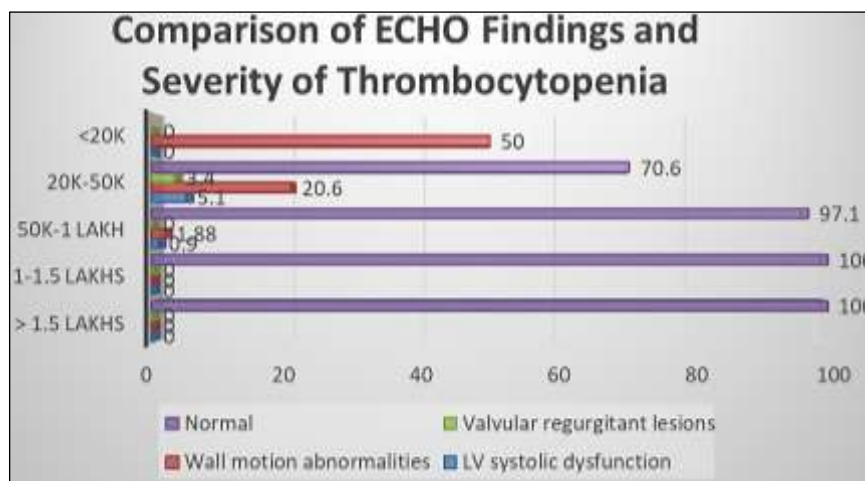
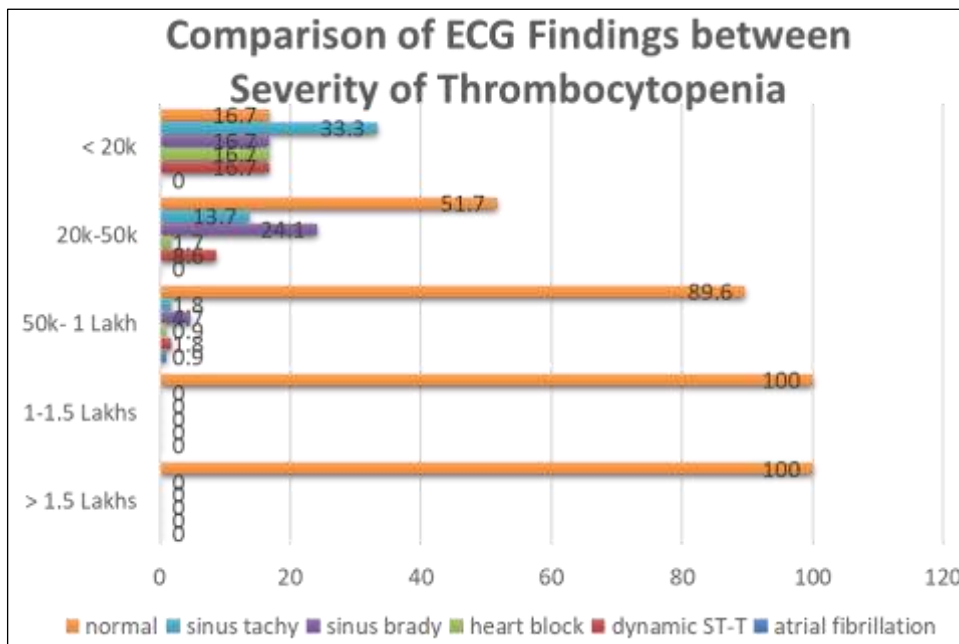
Table 2: Frequency distribution of Trop-I levels and severity of thrombocytopenia

Frequency distribution	Values	%
Trop-I levels	<0.04	84%
	>0.04	16%
Severity of thrombocytopenia	>1.5 lakhs	1.1%
	1-1.5 lakhs	7.1%
	50k-1 lakh	56.7%

	20k-50k	31.3%
	<20k	3.3%



Graph 3: Comparison of Trop-I levels between severities of thrombocytopenia



Discussion

Myocardial function depression is common in cases of dengue hemorrhagic fever and dengue shock syndrome. The cause of dengue-related shock syndrome is the heightened permeability of blood vessels and reduced blood volume^[13-15].

The distribution of cardiac symptoms in the current research is as follows: 72.9% of the participants were classified as normal, 11.9% had bradycardia, 4.3% had tachycardia, 4.3% had ischemic type chest pain, 3.8% had palpitations, and 2.7% reported dyspnoea. In their research, Menwal U, *et al.*^[16] found that tachycardia was the most prevalent finding on electrocardiogram (ECG), occurring in 45% of cases, followed by bradycardia, which was seen in 10% of cases.

Dengue has been associated with a wide variety of ECG abnormalities, such as irregular heart rate and rhythm, heart block, aberrant waveforms, and abnormal voltage levels. The current investigation has shown that 23.8% of individuals with dengue have Electrocardiogram abnormalities. Among the patients, 10.8% had sinus bradycardia, 6.7% experienced sinus tachycardia, 1.7% experienced heart block, 1.4% experienced dynamic ST-T, and 0.6% experienced atrial fibrillation.

Kumar AS, *et al.*^[17] also observed similar findings. In their research, Shandana Tarique *et al.*^[18] discovered that out of 116 cases, 7 (6%) had ST segment depression. Specifically, 4.9% of the cases were associated with dengue fever, whereas 7.2% were linked to dengue hemorrhagic fever (DHF). Kularatne *et al.*^[19] reported that 2.5% of the 120 individuals with dengue illness had ST segment depression. In their research, Wali JP, *et al.*^[20] shown that 29.4% of the 17 patients had ST and T wave abnormalities. Research conducted by Siddappa FD, *et al.*^[21] shown that 5% of the patients had low voltage QRS (Ventricular activation complex) complexes.

The findings of our investigation are consistent with the research conducted by Kirawittaya T, *et al.*^[22], which revealed cardiac functional abnormalities in 40% of their patients. Yacoub *et al.*^[23] demonstrated a 45% reduction in systolic cardiac function and a 42% reduction in diastolic cardiac function. In their investigation, Gupta VK, *et al.*^[24] observed moderate diastolic dysfunction in 14.2% of the patients, which is a higher prevalence compared to our study. In their research, Khongphatthanayothin *et al.*^[25] discovered that 6.7% of patients with dengue fever (DF) had an ejection fraction (EF) of less than 50%. Additionally, they observed that 13.8% of patients with dengue hemorrhagic fever (DHF) and 36% of patients with dengue shock syndrome (DSS) had an EF below 50%. According to Sheetal S, *et al.*^[26], 3% of dengue patients had pericardial effusion.

The alterations in the electrocardiogram (ECG) indicate cardiac involvement and provide indications of potential worsening. Therefore, promptly referring the patient to a more advanced medical facility may lead to improved results. Fluid overload and pulmonary edoema are significant contributors to mortality in dengue, particularly during the shift from the critical to the convalescence phase. During this period, it is crucial to limit fluid intake and provide stable blood flow using inotropic medications. Echocardiography should be used to accurately adjust the dosage of these medications, rather than only relying on clinical observations.

Conclusion

Based on the current research, it can be concluded that the electrocardiogram (ECG) is the most precise diagnostic technique for identifying myocarditis. Sinus bradycardia was the most common ECG abnormalities. The prevailing ECHO anomaly seen was the presence of wall motion abnormalities characterized by global hypokinesia. Severe thrombocytopenia is often associated with myocarditis. Cardiac signs and symptoms were detected in 27% of patients, despite their lack of specificity. The primary clinical manifestations of dengue myocarditis were arrhythmias and heart failure, both of which can lead to severe outcomes such as shock and mortality.

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