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Study on Cardiac Manifestations of Dengue Fever

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Abstract
Introduction-
Dengue is one of the most common vector born disease in India. Cardiac manifestations of dengue fever can range from more-commonfunctional myocardial impairment and arrhythmias to rare fulminant myocarditis. This study was done with the objective of finding actuaul incidence of various cardiac manifestations in dengue fever.
Methods-
This was a prospective observational study conducted at Koppal institute of medical sciences, Koppal, Karnataka, India from July 2019 to December 2019. 100 patients aged 18 years or more with positive dengue serology were studied.
Results-
Among 100 patients, 42% were in the 20-29 age group. The mean age of the patients was 28.50± 10.65 years. 72% were males and 28% were females. 64% had normal ECG, 15% had Sinus Bradycardia, 7% had Sinus Tachycardia, 10% had T wave changes, 4% had ST Changes. 91% had normal echocardiography, 6% had depressed LV ejection fraction ranging from 35 to 45%. Two patient had DCM with severly depressed ejection fraction of 28%. Troponin I was positive in 15% of patients and negative in 82% of patients. 43% had CK-MB <25 and 57% had CK-MB >25. Mean CK-MB was 85.99 ± 75.73.
Conclusion-
Cardiac manifestations range from transient rhythm abnormalities like sinus bradycardia to left ventricular dysfunction. Therefore dengue fever patients require close cardiac monitoring.
Key words –
Dengue Fever, Dengue Hemorrhagic Fever, ECG, ECHO

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I. Introduction:

Dengue virus infections may be asymptomatic or may lead to dengue fever(DF) or dengue hemorrhagic fever (DHF) or with plasma leakage that may lead to hypovolumic shock (dengue shock syndrome,DSS). The increase in capillary permeability that occurs in some patients, and can cause intravascular hypovolaemia and shock, is the best known cardiovascular complication associated with dengue. Additionally, various specific cardiac manifestations have been described, ranging from rare fulminant myocarditis to more-common associations with functional myocardial impairment and arrhythmias.[1,2] Myocarditis has now been included in the definition of severe dengue adopted in the 2009 WHO revised classification3, but the true incidence of myocarditis remains unknown owing to the lack of screening in most countries where Dengue fever is endemic. This study was done with the objective of finding actual incidence of various cardiac manifestations in dengue fever.

II. Methods:

This was a prospective observational study conducted at Koppal institute of medical sciences, Koppal, Karnataka, India from July 2019 to December 2019. The local ethical committee approval was taken. A Total 150 patients admitted with suspected dengue fever were selected for the study. Out of them, 110 ELISA confirmed NS1/IgM dengue sero-positive cases were satisfying WHO criteria. Out of this 100 were selected after exclusion.

Inclusion criteria:

- Dengue fever cases aged more than 18 years admitted at KIMS Hospital, Koppal.
- Dengue fever cases confirmed by NS1Ag test or both NS1Ag and IgM, IgG positive cases.

Exclusion criteria:

- Patients with previous history of any cardiac illness.
- Medication affecting the heart rate.
- Patients with electrolyte abnormalities.

Informed consent was taken and clinical history and signs were recorded in predesigned performa. Diagnosis and management were done according to WHO guidelines. Serological tests for detection of IgM dengue antibodies and NS1 antigen was done. Admission time plasma glucose, complete blood count including hematocrit, liver and renal function tests, serum electrolytes were estimated. ECG was done daily to monitor changes during illness. 2D-ECHO, cardiac enzymes (CPK-MB, TROPONIN-T) and 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. Cardiac symptoms like chest pain, dyspnea and palpitations were identified.

WHO case definition of different terminologies are explained in the below table1 :

Table 1: WHO case Definition of Dengue Fever[3]

Clinical features of Dengue
An acute febrile illness of 2-7 days duration with two or more of the following manifestations: Headache, retro-orbital pain, myalgia, arthralgia, rash or haemorrhagic manifestations.
Dengue Haemorrhagic Fever (DHF)
a) A case with clinical criteria of Dengue fever **PLUS** b) Haemorrhagic tendencies evidenced by one or more of the following, 1. Positive tourniquet test 2. Petechiae, ecchymoses or purpura 3. Bleeding from mucosa, gastro intestinal tract, injection sites or other sites **PLUS** c) Thrombocytopenia (<100000 cells per cumm) **PLUS** d) Evidence of plasma leakage due to increased vascular permeability, manifested by one or more of the following: 1. A rise in average haematocrit for age and sex >20% 2. A more than 20% drop in haematocrit following volume replacement treatment compared to baseline 3. Signs of plasma leakage (pleural effusion, ascites, hypoproteinemia)<20%
Dengue Shock Syndrome (DSS)
All the above criteria for DHF with evidence of circulatory failure manifested rapid and weak pulse and narrow pulse pressure (<20mm Hg) or hypotension for age, cold and clammy skin and restlessness.
CASE DEFINITION
Probable DF / DHF
A case compatible with clinical description of Dengue fever during outbreak, **OR** Non- ELISA based NS1 antigen/ IgM positive. (A positive test by RDT will be considered as probable due to poor sensitivity and specificity of currently available RDTs.)
Confirmed Dengue Fever
A case compatible with clinical description of Dengue fever with atleast one of the following : a) Isolation of Dengue virus (Virus Culture positive) from serum, plasma, leucocytes. b) Demonstration of IgM antibody titre by ELISA positive in single serum sample c) Demonstration of Dengue virus antigen in serum sample by NS1-ELISA d) IgG seroconversion in paired sera after 2 weeks with four fold increase in IgG titre e) Detection of viral nucleic acid by polymerase chain reaction (PCR)

III. Results:

Total of 100 dengue feve patients were studied. In the present study majority (42%) were in the age group 20 to 29 years . Mean age of subjects was 28.50± 10.65 years. Majority 72% were males and 28% were females.

Clinical manifestations includes fever(88%), Myalgia(60%), Headache(30%), Vomiting(18%), Abdominal pain(8%), Altered sensorium(4%), and other symptoms like arthralgia, back pain, chest pain, giddiness, coryaza. Among 100 patients 18% had Petechial rashes, 4% had Ecchymosis, 2% had Gum Bleeding. 16% patient had bradycardia and 7% had hypotension at the time of admission. CVS examination findings include S3 in 4 patients, systolic murmur in 2 patients.

In the study 22% had Total count <4000 and 12% had Total count >11000. 18% had platelet count <20000, 22% had 20000 to 50000, 41% had 51000to 100000 and 19% had platelet count >100000. Hematocrit was elevated in 18% of patients.

Table 2: ECG findings among subjects.

ECG finding	Number of subjects (n=100)
Normal	59
Sinus Bradycardia	15
Sinus Tachycardia	7
T wave changes	10
ST Changes	4
AV blocks	5

Table 2 shows ECG changes in our study. 64% had normal ECG, 15% had Sinus Bradycardia, 7% had Sinus Tachycardia, 10% had T wave changes, 4% had ST Changes.

Table 3: 2D ECHO findings among subjects

2D ECHO findings	Number of patients(n=100)
Normal	91
LV dysfunction	6
DCM	2
LVH	1

Table 3 shows 2D echo findings in this study. 91% had normal echocardiography, 6% had depressed LV ejection fraction ranging from 35 to 45%. Two patient had DCM with severly depressed ejection fraction of 28%.

Table 4 : Troponin I among subjects.

		n=100	%
Troponin	Positive	15	15.0%
	Negative	85	85.0%
	Total	100	100.0%

Table 4 shows Troponin I changes in this study. Troponin I was positive in 15% of patients and negative in 82% of patients.

Table 5: CK-MB Distribution among subjects.

		n=100	%
CK-MB	<25	43	43.0%
	>25	57	57.0%

Table 5 shows CK-MB changes is subjects. 43% had CK-MB <25 and 57% had CK-MB >25. Mean CK-MB was 85.99 ± 75.73.

IV. Discussion:

Dengue is one of the most important emerging viral diseases globally. The incidence of dengue viral infection has seen an increasing trend in recent years in India. The majority of symptomatic infections result in a relatively benign disease course. Some patients develop severe clinical manifestations, including bleeding, organ impairment, and endothelial dysfunction with increased capillary permeability causing hypovolemic shock that can lead to cardiovascular collapse

Cardiac manifestations in dengue virus infection can range from asymptomatic Bradycardia to life threatening myocarditis. Myocardial involvement may be the direct result of dengue virus infection in susceptible individuals or may be due to effects of cytokines / cellular mediators of immune response.

In the present study majority (42%) were in the age group 20 to 29 years. Mean age of subjects was 28.50± 10.65 years. Majority 72% were males and 28% were females.

Vishal Kumar Gupta et al[4] where the mean age was 30.4 years and gender distributionwas comparable with the present study i.e. majority were males**.** Similarly in Mohit Arora[5] et al study 71% were male and 29% females.

Among 100 patients studied 59% had normal ECG, 15% had Sinus Bradycardia, 7% had Sinus Tachycardia, 10% had T wave changes, 4% had ST Changes and 5% had AV blocks.

Similarly in the study conducted by Prakash et.al.[6] 5% of the patients had first degree heart block, 20% had sinus bradycardia. 9% had sinus tachycardia , 5% had ST segmaent changes, 2% had T wave changes. In the study Yadav RK et al[7] Sinus bradycardia was present in 60% of patients and first degree heart block in 11% of patints.

Upon 2D Echo examination 91% had normal echocardiography, 6% had depressed LV ejection fraction ranging from 35 to 45%. Two patient had DCM with severly depressed ejection fraction of 28%. Similarly in the study conducted by Papalkar, et al.[6] echocardiography was normal in 54 (90%) patients. The most common 2D echocardiographic abnormality was systolic dysfunction seen in 4 (6.67%) patients, followed by pericardial effusion seen in 2 (3.33%) patients.

Biomarkers were significantly abnormal indicating involvement of myocardium. Troponin I was positive in 15% of patients and CK-MB being elevated in 43% of patients showing its non specific enzyme. This was comparable to Papalkar et al[6] study, where 51% had positive CK – MB levels of more than 4.3NG/ML. 11% had Troponin I values positive.

V. Conclusion:

Cardiac manifestations range from transient rhythm abnormalities like sinus bradycardia to left ventricular dysfunction. Therefore dengue fever patients require close cardiac monitoring.

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