Dengue is an arthropod borne infection caused by RNA virus of the Flaviridae family. The pooled estimate of dengue seroprevalence in the Indian population and case fatality rate among laboratory confirmed dengue patients are 56.9% and 2.6% respectively. Infection with dengue virus is asymptomatic in majority of the cases. Symptomatic dengue infection may be in the form of mild, moderate or severe dengue. Expanded dengue syndrome is an entity added to incorporate a wide spectrum of unusual manifestations of dengue infection affecting various organ systems including the heart.

Cardiac involvement in dengue was thought to be a rare occurrence. Studies about cardiovascular manifestations of dengue have been published as early as 1973 when what was referred as “arboviral heart disease” was described from USA. From the Indian subcontinent cases of dengue myocarditis and pericarditis were reported from Srilanka around the same time.

Cardiac manifestations in dengue fever range from asymptomatic bradycardia, heart blocks, tachyarrhythmias to severe myocarditis and pericardial effusion. The pathogenic mechanisms underlying this is not clear. Direct viral invasion, immune mechanisms, electrolyte imbalance, derangement of intracellular calcium ion storage, lactic acidosis, and ischemia due to hypotension all play a role. Striated muscle is the target of dengue infection. Alterations in calcium homeostasis is associated with myocardial dysfunction. The interaction between the NS1 and the glycocalyx layer of the vascular endothelium is thought to increase capillary permeability. The resulting plasma leakage can contribute to the cardiac dysfunction in the form of reduced preload, altered coronary microcirculation, and myocardial interstitial oedema. Fulminant dengue myocarditis is postulated to involve host genetics or increased viral cardiotropic allowing widespread myocyte damage.

Classic myocarditis refers to inflammation of the heart muscle occurring as a result of exposure to either discrete external antigens such as viruses or internal triggers. The signs of myocarditis can vary from a subclinical rise in cardiac biomarkers or detection of asymptomatic electrocardiogram (ECG) abnormalities, through to the more severe clinical manifestations of dyspnoea, chest pain, palpitation, syncope and sudden death.

ECG alterations in dengue are mostly transient and nonspecific, including sinus bradycardia, atioventricular block, T wave, and ST-segment abnormalities. These were thought to occur mainly in recovery phase but ECG abnormalities are now known to occur during any phase of the disease. These arrhythmias tend to be self-limiting and benign, and might be the only sign of cardiac involvement, with normal biomarker levels and echocardiograms often documented.

In the Srilankan outbreak of 2005, high proportion of patients (62%) admitted with dengue had ECG abnormalities, predominantly bradyarythmias, and T wave and ST-segment changes. These patients were more likely to develop hypotension than those with a normal ECG. Bradyarythmia, the commonest arrhythmia is significant when it occurs in the critical phase as hypovolaemia is also coexisting. Inability to mount an appropriate heart rate response to maintain cardiac output adds to haemodynamic instability. Cardiac biomarkers (troponin I and pro-B-type natriuretic peptide) have been found to be elevated. Echocardiography may show depressed LVEF. An Indian study of children hospitalized with dengue demonstrated evidence of left ventricular systolic dysfunction in 17%. Patients with LV dysfunction required more fluids and had more complications of fluid overload than those without. As LVEF is preload dependent, whether this dysfunction reflected intravascular hypovolaemia, is unknown. Endomyocardial biopsy is confirmatory. Myocardial involvement can also be confirmed using cardiac MRI findings including a hyperintense signal on T2-weighted images, as well as early and late gadolinium enhancement. Pericardial involvement is less common.

Management of cardiac involvement in dengue is mainly supportive. Cautious fluid resuscitation, aiming to give enough intravenous fluid therapy to maintain adequate tissue perfusion during the critical period of capillary leakage. No cardiac-specific treatments for dengue myocarditis exist. Standard treatment for cardiac failure with β-blockers, angiotensin-convertingenzyme inhibitors, and diuretics has been used successfully in these patients.

A prospective observational study published in this issue was conducted at a tertiary centre in Kolkata to study the incidence of different cardiac manifestations of dengue fever from Jan 2016 to Dec 2017. These patients were followed up for a period of 6 months to 2 years. The incidence of cardiovascular involvement in this study was 12.5%. Bradyarythmias were commonest cardiac manifestations. Out of eight patients (6.6%) having bradyarythmias, four had sinus bradycardia. Three patients had junctional bradycardia. Orciprenaline was used in severe bradycardia. Single patient had 2:1 AV block requiring temporary pacemaker and recovered in two weeks. Others had complete recovery within a week. Four patients (3.3%) had left ventricular systolic dysfunction with global hypokinesia and recovered.

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within 3 months. None of them had abnormal cardiac biomarkers which was unlike other studies. Moderate pericardial effusion was observed in two patients (1.6%) which resolved within 3 weeks. One patient had atrial fibrillation requiring pharmacologic cardioversion with amiodarone. In this study cardiac MRI or endomyocardial biopsy considered as confirmatory for myocardial involvement were not done in any patient. The authors could not find any association between severity of dengue fever and cardiac manifestations. The overall incidence of cardiac involvement was similar to other recent studies. In a large study of 1782 patients by Yingling Li et al during the 2014 outbreak in China the prevalence of myocarditis was 11.28%. Myocarditis increased with severity of Dengue. Shock was also increased significantly. In a study previously published in this journal, the incidence of myocarditis was 37.5%, bradycardia being the most common finding. Rhythm disturbance was noted in 5% of the patients with AV block being the most common (66.67%). In a recently published study by Papalkar et al also bradycardia was commonest arrhythmia seen in 9 (15%) patients, followed by sinus tachycardia in 6 (10%) and ST-T changes in 5 (8.33%), systolic dysfunction in 4 (6.67%) patients, and pericardial effusion was found in 2 (3.33%) patients. Eight (13.33%) patients had elevated CKMB levels.

Thus cardiac involvement is an important and neglected complication of dengue infection and a part of expanded dengue syndrome. The spectrum of cardiovascular manifestations in dengue is broad. Electrocardiogram should be done in patients of dengue fever with inappropriate bradycardia or tachycardia for clinical setting or age, cardiac specific symptoms, high-risk groups such as elderly and those with underlying heart disease. If abnormal these patients should undergo cardiac enzymes estimation and echocardiographic imaging. Echocardiography should also be considered in patients with shock unresponsive to adequate fluid therapy. As the management is mainly supportive early diagnosis is key.

References