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Original Research Paper

Dengue Fever and Renal Function Abnormality: A Study and Literature Review

Medical Science

KEYWORDS : Dengue, acute kidney injury, hemorrhagic fever, shock

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ABSTRACT

Dengue fever is the most common arthropod borne viral illness in humans. Globally 2.5-3 billion individuals live in approx.. 112 countries that experience dengue transmission. Antigenic characteristics allow the classification of four serotypes of dengue virus: DEN-1, DEN-2, DEN-3 and DEN-4. . Dengue fever is characterised by rapid onset of high fever, headache, retro orbital pain, nausea, vomiting , myalgia and rash. More severe manifestation is known as dengue haemorrhagic fever (DHF) which manifests as fever with bleeding manifestations. Still more severe is when shock ensues known as Dengue Shock syndrome. Renal involvement is an important complication of the condition and in this study we look in to the incidence of renal involvement in dengue fever

INTRODUCTION: Dengue fever is the most common arthropod borne viral illness in humans. Globally 2.5-3 billion individuals live in approx.. 112 countries that experience dengue transmission. Annually approx. 50-100 million individuals are infected. Dengue has 4 serotypes from type 1 to type 4.Dengue is transmitted by mosquitoes of the genus Aedes in subtropical and tropical areas of the World.

Dengue is a major health problem in our country. The first confirmed case of dengue in India was reported way back in 1940s and since then dengue is striking in epidemic proportions in different states of India. Several fatal cases of dengue in the form of Dengue haemorrhagic fever and Dengue shock syndrome have been reported in India from time to time. All the 4 serotypes are responsible for causing the outbreaks, though infection with a particular serotype gives lifelong immunity to that serotype.

The initial dengue infection may be asymptomatic or may result in nonspecific febrile illness or may produce classical dengue fever with rapid onset high fever, headache, retro orbital pain, diffuse body ache, weakness, vomitting & centrifugal maculopapular rash. Many patients are also observed to present with lower abdominal pain. Blood counts specifically platelet counts has been a matter of concern in dengue fever cases but here in this study we intend to look at the kidney injury in patients of dengue fever.

MATERIALS AND METHODS: The study was undertaken in J L N Medical College, Bhagalpur. Patients with fever positive for dengue IgM ELISA, attending the medicine OPD as well as admitted in Indoor medicine department were enrolled in the study.

SAMPLE SIZE: 100 Patients IgM +ve Dengue Fever.

After obtaining informed consent all dengue suspected fever patients were examined and then those positive for IgM dengue screen were enrolled in the study. We subjected the patients to basic laboratory investigations like CBC, ESR, Liver Function tests, blood urea and serum creatinine etc. We also did USG whole abdomen, chest X-Ray and ECG in each case.

Those patients who had other documented cause of fever were excluded from the study.

Patients were given a questionnaire including name, sex, history of contact, history of present illness etc & thorough clinical examination and relevant investigations as stated above were concluded on each patient. We then observed the case carefully and results were analysed by standard statistical methods.

Kidney injury in our study was based on raised serum creatinine >1.6 and blood urea >40.

The patients who were having previous renal damage were excluded from the study.

RESULTS: Out of the 100 patients enrolled in the study 21 patients had an increased blood urea and serum creatinine. Moreover it was also found that those patients having a lower platelet count were having the derangement of kidney function.

TABLE 1. PLATELET COUNTS IN STUDY GROUP

PLATELET COUNT	<20000	20000-50000	50000-100000	>100000
NO. OF PATIENT	15	18	29	38

TABLE 2. RENAL FUNCTION TEST IN STUDY GROUP

	BLOOD UREA AND SERUM CREATININE	
TOTAL NO. OF PATIENTS	RAISED	NORMAL
100	21	79

In our study it was found that in all the patients having platelet count <20000, the kidney function was altered and 5 patients with platelet in the range of 20000-50000 were having a derangement of kidney function and only 1 patient with platelet >50000 was having renal damage.

DISCUSSION: Dengue and Dengue haemorrhagic fever is endemic in more than 100 countries in the WHO regions of Africa, the Americas, the Eastern Mediterrinian, South East Asia region and the Western Pacific. Dengue is a systemic acute febrile disease transmitted by mosquitoes of the genus *Aedes* (*aegypti* and *albopictus*), with *Aedes aegypti* as the main vector. The vector mosquito first appeared in Africa, then disseminated together with the slave trade from the fifteenth to nineteenth centuries. In the eighteenth and nineteenth centuries, it spread across Asia through commercial exchanges and finally emerged globally in the past

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50 years as a result of the expansion of travel and trade [2]. Global trade and tourism transported the dengue virus from endemic areas to other parts of the world, where dengue became a global pandemic affecting not only tropical countries but also some regions of Europe and North America [3–6]. Cases of dengue have been detected among travelers to endemic areas upon their return home to disease-free regions, often with a late diagnosis followed by severe systemic complications. Antigenic characteristics allow the classification of four serotypes of dengue virus: DEN-1, DEN-2, DEN-3 and DEN-4. More recently, a new serotype, DEN-5, was identified in serum samples collected during an epidemic of dengue in Malaysia in 2007. Dengue fever is characterised by rapid onset of high fever, headache, retro orbital pain, nausea, vomitting , myalgia and rash. More severe manifestation is known as dengue haemorrhagic fever (DHF) which manifests as fever with bleeding manifestations. Still more severe is when shock ensues known as Dengue Shock syndrome. Dengue may also present with atypical manifestations called the Expanded dengue syndrome. In expanded dengue syndrome patient may present with neurological manifestations as well as renal, hepatic and gastrointestinal, cardiac, respiratory, musculoskeletal and lymphoreticular manifestations. In our study we looked in to the renal function abnormalities in 100 patients of dengue fever

Dengue may involve renal function in many ways, including elevation of the serum creatinine level, Acute Kidney Injury(AKI), acute tubular necrosis, hemolytic uremic syndrome, proteinuria, glomerulopathy and nephrotic syndrome.

In a study by Laoprasopwattana *et al.* reported an incidence of 0.9% of acute kidney injury among children in Thailand, and Lee *et al.* reported an incidence of 3.3% among adults in Taiwan. In a Brazilian intensive care unit for infectious diseases, dengue was the cause of 4% of the cases of AKI diagnosed using the risk, injury, failure, loss of kidney function and end-stage acute kidney disease (RIFLE) criteria. In a more recent study that employed the Acute Kidney Injury Network (AKIN) criteria for diagnosis, the incidence of AKI was 10.8%. Using the AKIN criteria in a retrospective analysis, Khalil *et al.* identified AKI in 13.3% of a series of patients with dengue confirmed by the presence of IgM antibodies, independent of the severity of disease; 64.8% of the patients were in Stage 1, 18.3% Stage 2 and 16.9% Stage 3 of the disease. In another study, the RIFLE classification was used to investigate the occurrence of AKI in patients with tropical acute febrile disease. The results showed that the incidence of AKI among patients with dengue upon admission to the hospital was 35.7%.

Several mechanisms have been proposed to account for the etiopathogenesis of dengue fever-induced AKI, including direct action by the virus, hemodynamic instability, rhabdomyolysis, hemolysis and acute glomerular injury. Though all of these factors can cause kidney damage but in most cases it is a combination of multiple factors which is responsible for the deranged renal function tests.

A thorough assessment of the patient with careful insight to volume replacement is the key to treat a dengue fever induced kidney damage. Fluid replacement is to be started with crystalloids and in cases of shock which is not responsive to crystalloids, colloids can be used. The amount of infused fluid should be the minimum needed to stably maintain the hemodynamic conditions until the increased vascular permeability is reversed. Role of corticosteroids in patients of dengue fever induced kidney injury is controversial and should be discouraged. Renal replacement therapy with dialysis can be used in severe cases.

SUMMARY: Renal function abnormality is a common complication in patients of dengue fever. In our study 21% of the dengue patients were found to have a renal damage. Moreover it is seen that patients who are having renal damage are having platelet count below 50000(mostly below 20000). The cause is multi factorial including direct effect by the virus, hemodynamic instability, rhabdomyolysis and glomerular injury. A close watch is very important in this case as it increases the hospital stay as well as increased mortality in dengue patients.

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