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Hematological & biochemical parameters of dengue and its prevalence in North India: A hospital based study

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Abstract
Introduction: We undertook this prospective study to assess the clinical profile of dengue infection in hospitalized patients as well as to observe rare manifestations of dengue fever in the current outbreak.
Materials and Methods: Blood samples collected in vaccutainers for Hb, Haematocrit, Platelets, leukocyte count, AST, ALT & dengue viral specific antigen (NS1) &IgM, IgG antibody. Hb, Haematocrit, platelets count, leukocytes count done manually method/automated hematological-analyzer & AST, ALT values determined by the automated biochemistry - Analyzer.
Result: All the patients show body rash, vomiting, abdominal pain, back pain &spleenomegaly. In hematological finding, the average of haemoglobin 13.0 gm/dl, haematocrit 38.29%, total leukocyte count 6.3 Lac. Cells per cubic mm, thrombocyte count 2.12 lacks where mild decreases of platelet count. In biochemical finding, moderate decrease AST (191.33IU/L) & ALT(232.25IU/L)valuein dengue patient's serum.
Conclusion: The destruction of mosquito is necessary, which transmitted dengue virus.

Keywords: Hematological, biochemical, parameters, dengue

Introduction
Around 2.5 billion people are equally significant in tropical & subtropical region [1, 2]. The name derived from the Swahili word for “the walk of a Dandie” in Spanish. The first case of the dengue fever was recorded during the Jin Dynasty (265-420 AD) I China. After the naming & identification of the disease in 1779 by Benjamin, first epidemic recognized simultaneously in Asia, Africa & North America in the 1780 [3].
Dengue virus is a member of the Flavivirus family. There are four serotypes (antigenically) which are designated as DENV-1, DENV-2, DENV-3 & DENV-4. [4] Arbovirus transmitted by *Aedes aegypti* & *Aedes albopictus* mosquitoes.
Between 2006 & 2012 the National Vector Borne Disease Control Program reported an annual average 20,474 dengue cases & 132 deaths from dengue infection [5]. In which include dengue fever, dengue Haemorrhagic fever (DHF) & dengue shock syndrome (DSS) [6-10]. High dengue disease burden and frequent outbreaks result in a serious drain on country’s economy and stress on the health systems. In India, case detection, case management, and vec- tor control are the main strategies for prevention and control of dengue virus transmission [11]. A new dengu evaccine is now available and several vaccines are in the process of development [12-14]. Information about dengue disease burden, its prevalence, incidence and geo- graphic distribution is necessary in decisions on appropriate utilization of existing and emerging prevention and control strategies. With this background, we conducted a systematic review and meta-analysis to estimate the disease burden of dengue fever in India. We also reviewed serotype distribution of dengue viruses in circulation, and estimated case fatality ratios as well as proportion of secondary infections. The various manifestations of dengue may not have a distinct line of demarcation: apart from the classic features, reports of rare presentations have recently become more frequent [15, 16]. Some presentations that are not classifiable under the World Health Organization (WHO) definitions may be potentially serious and may lead to increased morbidity and mortality of the disease. Many of these manifestations may remain unrecognized and unreported due to lack of awareness among primary care physicians.

The most recent dengue outbreak was observed in the northern part of the country last year during the monsoon and post-monsoon period [17]. According to WHO (2009) dengue categorized in dengue with or without warning signs or severe dengue. Dengue: fever & to these nausea, skin rash, vomiting, body ache, leucopenia, or any warning sign include abdominal pain, tenderness, persistent vomiting, fluid accumulation like effusions & ascites, bleeding, liver enlargement or rise in hematocrit with the rapid decrease platelet count. In severe dengue: plasma leakage, bleeding & organ impairment include hepatic transaminases elevated beyond 1000 IU/L & central nervous system manifestations like alteration in sensorium or cardiac or other organ involvement [18]. Liver enlargement, abdominal pain & anorexia are more common in dengue fever, but present in both dengue fever & dengue Haemorrhagic fever. In the adult dengue patients the frequency of hepatomegaly & 19-22 clinical jaundice ranges from 4%- 52% range & 1.7%-17% simultaneously [19, 22].

Materials and Methods

All the patients were not suffering from dengue. We included 13 patients suffering from dengue fever & found positive NS1, IgM, IgG from August-2015 to October & remaining patients suffering from other diseases such as Malaria, Typhoid, So we excluded from this study. Patients were not graded according to WHO criteria. Blood samples collected in vaccutainers for Hb, Haematocrit, Platelets, leukocyte count, AST, ALT & dengue viral specific antigen (NS1) &IgM, IgG antibody. Hb, Haematocrit, platelets count, leukocytes count done manually method/automated hematological- analyzer & AST, ALT values determined by the automated biochemistry - Analyzer. NS1, IgM, IgG done by Rapid Card Test (manufactured by j. Mitra& Co. Pvt. Okhla Ind. area, ph-1, New Delhi, India). The performance of the test was evaluated & compared with ELISA test (According to manufacturing laboratory manual).

Statistical analysis

Statistical analysis was performed by Chi Square test done by using the Statistical Package for Social Sciences (SPSS 15.0 version, IBM. Chicago, USA) with $p < 0.05$ taken as statistically significant.

Ethical considerations

The study was approved by the Institutional Ethics Committee and written informed consent was obtained from all the patients

Results

We study on 130 patients which show clinical sign & symptoms as dengue but only 13 Patients shows NS1, 1Gg &IgM antibody positive. All the patients show body rash, vomiting, abdominal pain, back pain & spleenomegaly. In hematological finding, the average of haemoglobin 13.0 gm/dl, haematocrit 38.29%, total leukocyte count 6.3 Lac. cells per cubic mm, thrombocyte count 2.12 lacks where mild decreases of platelet count. In biochemical finding, moderate decrease AST (191.33IU/L) & ALT (232.25IU/L) valuein dengue patient's serum. [Table 1].

Table 1: showing haematological& biochemical parameters.

Investigation	Normal lab value	Range	Mean	Remarks
Haemoglobin (gin/dl)	M 14.0-18.0 F:12.0-15.0	9.0-14.6	13.00	<13.011=06 (42.65%)
Hematocrit (%)	M38.8-46.4 F:35.4-44.4	28.5-40.6	39.24	<40.011=06 (42.65%)
TLC /cubic mm	4000-11000	1800-16500	6.3	<5.011=05 (34.31%)
Platelet count (cells/cubic mm)	1.5-5.0 Lac.	30000-160000	2.12	<1.011=09 (66.63%)
ALT (IU/ L)	0 8 - 4 5	31.0-1294	192.34	>4611=13 (100%)
AST (IU/ L)	1 0 - 4 0	59.0-1100	234.28	>4111=12 (100%)

Discussion

Rashes developed due to immunological mechanism- when the dengue virus interacts with host cells, the release of cytokines & stimulation of the immunological mechanism by which vascular endothelial changes, infiltration of mono-nuclear cells & perivascular edema occurs. Retro-orbital pain & headache mostly from systemic inflammatory mediators & fever is non-specific immunological mechanism. Some neurological manifestations have also noted. Involvement of neurological manifestation in dengue due to neurotropism of dengue virus & immunological mechanisms. Dengue virus usually transmission during the rainy season when the temperature is conducive for build-up of the vector population breeding in secondary habitats as well as for longer mosquito survival. This season is breeding season for mosquitoes & they needed protein for egg production. So small-size female mosquitoes are forced to take more blood meals to obtain protein. In our study, average platelet counts 1.11 Lac cells per cubic mm & 66.66% cases show below than 100000 cells/cubic mm observed. The causes include dengue antigen binds to platelets & antibody mediated immunological destruction of platelets.

A significant proportion of patients (84%) with classical or uncomplicated dengue fever had thrombocytopenia and 13% of them had an altered coagulation profile as well. Overall, an altered coagulation profile was observed in 34% patients in our study and is indicative of the activation of both coagulation and fibrinolysis during acute dengue infection, which is found to be particularly greater in patients with dengue hemorrhagic fever [23].

The application of WHO the classification system is not as simple and straightforward as it seems and clinical features may overlap among different categories. The WHO classification system of dengue does not include unusual manifestations such as encephalopathy, acute hepatic failure, cardiomyopathy and acute respiratory distress syndrome, which might be life-threatening. Although these manifestations are rare, they have been reported from endemic regions [15, 24]. Therefore, clinicians should have a high index of suspicion and knowledge of these atypical manifestations, particularly in view of the increasing burden of dengue on the health-care system.

Arise in serum transaminases (AST/ALT) observed in our study, which is more than normal ranges. The values of serum transaminase increased due to hepatic inflammation

or liver involvement in dengue infection. Heparansulphate plays a pivotal role for the intrusion of the dengue virus into the liver (Hep G2) cells. AST is more than ALT because the sources of AST are more such as heart, striated muscles, erythrocytesetc.

Conclusion

The exact data are not available because many of the smaller outbreaks go unreported. So governments have to collect data properly, which helps to know the current status of dengue infection. The destruction of mosquito is necessary, which transmitted dengue virus. We should spray anti-mosquito pesticides for the destruction of the larval stage of *A. aegypty*, which helps to prevent from dengue infection.

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