Research Article

Study of hematological and biochemical changes in dengue fever at tertiary care hospital at Ahmedabad

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Abstract

Background: Dengue viral infections are the most important mosquito-borne diseases of the Indian subcontinent and have become a major global public concern.

Objective: To evaluate hematological changes in serologically proven patients with clinical manifestations of dengue fever at tertiary care hospital.

Materials and Methods: Cases of fever, clinically suspected to be dengue were confirmed by immunochromatographic tests for dengue NS1 antigen and dengue IgM antibody during the period from September 2015 to November 2015. A total of 250 seropositive dengue cases were correlated with clinical features, hematological, and biochemical findings.

Result: With the most common clinical feature—high grade fever (95%), the main hematological findings were raised hematocrit (>29%), leukopenia (44%), and thrombocytopenia (59%).

Conclusion: Hemoconcentration, leukopenia, thrombocytopenia, raised SGPT, and raised serum bilirubin gave enough clues to test for dengue serology so as to reduce the morbidity and mortality because of this disease.

KEY WORDS: Dengue fever, dengue hemorrhagic fever, dengue shock syndrome, leukopenia, thrombocytopenia

Introduction

Dengue fever (DF) is the most common acute febrile viral disease among all the arthropod-borne viral diseases caused by a single-stranded RNA virus of Flaviviridae family. The term "dengue" is derived from the Swahili "Ki dengapepo" meaning a sudden seizure by a demon. The term "Break Bone Fever" was coined during Philadelphia epidemic in 1780.[1] It is caused by four closely related but serologically distinct dengue virus called DEN-1, DEN-2, DEN-3, and DEN-4.[2] Dengue virus infection is transmitted by the bite of *Aedes aegypti* and *Aedes albopictus* mosquitoes.[3] The World Health Organization (WHO) estimated that 40% of the world's population (approximately 2.5 billion) living in tropical and subtropical areas are at risk of getting infected by dengue virus.[4] DF has estimated 50 to 100 million infections and 200,000–500,000 cases of dengue hemorrhagic fever (DHF) per year. Case fatality rate is around 5%.[5] We studied seropositive cases of DF to correlate clinical, hematological, and biochemical findings of disease.

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Materials and Methods

This study of 250 patients with serologically confirmed dengue infection was carried out at the Department of Pathology in a tertiary care hospital for 3 months from September 2015 to November 2015 and was classified as DF, DHF, and dengue shock syndrome (DSS) as per the case definition of WHO.[6–8] Case definition criteria for DF were high fever, fever with rash, retro-orbital pain, myalgia, arthralgia, and conjunctival congestion. The criteria for DHF included (1) continuous high grade fever lasting 2 to 7 days; (2) hemorrhagic tendency as shown by a positive tourniquet test, petechiae, or epistaxis; (3) platelet counts <100,000/cumm; and (4) evidence of plasma leakage manifested by hemoconcentration (an increase in hematocrit 20% above the average for age, sex, and population), pleural effusion, and ascites. DSS was diagnosed if there were profound features of shock in the form of rapid

weak pulse and profound hypotension with systolic pressure of less than 90 mm Hg.

Data regarding the seropositivity of DF (dengue NS1 antigen using Microwell ELISA test and dengue IgM antibody using Microwell Capture ELISA test) were taken from Department of Microbiology. Hematological profiles and biochemical investigations of seropositive dengue cases were carried out at the time of admission and were correlated.

Hematological examination included complete hemogram with CELL-DYN Ruby (Abbott) and peripheral blood smear was evaluated. Hemoconcentration was seen as raised hemoglobin or red blood corpuscles count. Leukopenia was defined as less than 4,000/cumm and thrombocytopenia as less than 1.0 lakh/cumm. Liver function tests (SGPT and serum bilirubin) were done using C8000 Architect (Abbott) as a part of fever profile. Altered liver function was considered if SGPT value >55 IU/L and serum bilirubin value >1.2 mg/dL. Of the 250 dengue cases, coagulation profile of 75 dengue cases were assessed by measuring prothrombin time (PT) and activated partial thromboplastin time (APTT) by ACL Elite Pro Coagulation Analyzer (Instrumentation Laboratory). Altered coagulation profile was considered if PT was >16 s and APTT was >40 s.

Result

The clinical evaluation, hematological, and biochemical features observed were as shown in Tables 1 to 3.

Discussion

Of the 250 seropositive cases for DF, 200 were positive for dengue NS1 antigen and 50 were positive for dengue IgM antibody. In our study, Table 1 shows 83% cases of DF, 16% cases of DHF, and 1% cases of DSS. Similar reports were published by Avarebeel et al.[9] and Priyadarshini et al.[10]

Children are at a high risk of getting infected by DHF than adults because it has been suggested that baseline microvascular permeability in children is greater than that of adults.[11] In our study, the age group of patients was in the range of 5–55 years, of which 152 were male patients and 98 were female patients, showing a male to female ratio of 1.55:1. This was in agreement with the studies by Avarebeel et al.[9] and Neeraja et al.[12] The most common age group of the patients in our study was 25–35 years (44%). This was comparable to other studies by Avarebeel et al.[9] and Priyadarshini et al.[10] The most common clinical feature of dengue in our study was high fever (95%). In other studies conducted by Avarebeel et al.[9] and Achalkar,[13] similar results were found.

Hemoconcentration was seen in more than 29% of the patients [Table 2]. Study carried out by Achalkar[13] showed hemoconcentration in more than 50% of the patients.

Leukopenia was observed in 44% of the patients as per our study [Table 3]. Leukopenia was also observed in other studies by Avarebeel et al.,[9] Achalkar,[13] and Ratageri et al.[14] Thrombocytopenia (platelets <100,000/cumm) was seen in 59% of patients, which was similar to the studies by Avarebeel et al.,[9] Achalkar,[13] and Ratageri et al.[14] Liver function tests showed raised SGPT in 40% of the patients and raised serum bilirubin was observed in 4% of the patients. Altered liver function in dengue was also seen in the studies by Avarebeel et al.[9] and Basak and Talukder.[8] Hepatomegaly was observed in 26% of our patients suggesting right upper quadrant pain—an important sign and symptom of DF.

Coagulation profile tests such as PT and APTT were observed in 75 seropositive cases of dengue and increased PT and APTT were seen in 10 (13%) and 8 (11%) seropositive cases of dengue, respectively. Similar results were found in a study by Basak and Talukder.[8]

Table 1: Distribution of patients of dengue fever according to case definition criteria (WHO)

Diagnosis	No. of patients	Percentage (%)
Dengue fever (DF)	208	83
Dengue hemorrhagic fever (DHF)	40	16
Dengue shock syndrome (DSS)	2	1

WHO, World Health Organization.

Table 2: Hemoconcentration in patients with dengue fever

Hemoglobin (Hb) (g/dL)	No. of patients			Percentage (%)
	Total	Male	Female	
<9	44	35	09	18
9–11	63	43	20	25
11–14	120	62	[a]58	48
14–18	23	12	11	9

[a]Of the 58 female patients, 50 belonged to reproductive age group of 25–35 years, and Hb of 14 gm% in these female patients was taken as an evidence of hemoconcentration.

Table 3: Total WBC count, platelet count, and liver function tests in patients with dengue fever

	Total count (cells/cumm)		Platelet count (cells/cumm)		SGPT	S. bilirubin
	<4,000	4,000–11,000	<20,000	20,000–<1,00,000	>55 IU/L	>1.2mg/dL
No. of patients	110	130	8	138	100	10
Percentage (%)	44	52	4	55	40	4

Conclusion

Hemoconcentration, leukopenia, thrombocytopenia, raised SGPT, and raised serum bilirubin gave enough clues to test for dengue serology so as to diagnose dengue cases in their initial stages and thus facilitate early treatment and observation of dengue cases. This would minimize morbidity and mortality arising out of serious complications of DF. The correlation of positive laboratory findings with various types of DF was bound to strengthen community awareness, early diagnosis, management, and vector control measures, to reduce the morbidity and mortality because of this disease.

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