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Research Article

STUDY OF HAEMATOLOGICAL AND BIOCHEMICAL CHANGES IN DENGUE VIRAL FEVER AT TERTIARY CARE HOSPITAL IN LUCKNOW

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ABSTRACT

Aim: The objective of this study was to correlate laboratory tests during the evolution of dengue Fever in order to use test results to predict the severity of the disease.
Methods: This is an observational, descriptive and retrospective study of 60 patients with clinical, hematological, biochemical and serological diagnosis of dengue fever who, in the period from August to October 2015 were admitted in a pronounced hospital in lucknow. The tests analyzed were blood count, platelets, serum aspartate aminotransferase (AST) and alanine aminotransferase (ALT) concentrations along with card tests.
Results: Leucopenia, thrombocytopenia, elevated transaminases and positive card test were observed in patients with dengue fever. Most laboratory abnormalities were already present on day of admission.
Conclusion: These results are relevant in assessing the disease and follow up of the treatment started, because they can be used as markers for more severe forms andcan help by enabling the ada ptation of the therapeutic conduct to the needs of individual patients.

INTRODUCTION

Dengue is an acute febrile disease caused by the mosquito-borne dengue viruses (DENVs), consisting of four serotypes (DENV 1 to 4), that are members of the *flaviviridae* family, genus flavivirus[1]

Dengue virus infection can be asymptomatic or a self-limited, acute febrile disease ranging in severity. The classical form of dengue fever (DF) is characterized by high fever, headache, stomach ache, rash, myalgia, and arthralgia. Severe dengue, dengue hemorrhagic fever (DHF), and dengue shock syndrome (DSS) are accompanied by thrombocytopenia, vascular leakage, and hypotension. DSS, which can be fatal, is characterized by systemic shock [2]

Transmission to humans occurs by the bite of the female Aedes aegypti mosquito infected by one of four serotypesof the virus. This mosquito, a domestic species adapted to urban conditions, is the main vector[3]

The diagnosis of dengue fever is carried out based on clinical, e pidemiological and laboratory data. Among, laboratory tests, bothnon-specific [blood count, platelet count, liver function tes ts and serum albumin concentration] and specific tests (viral isolation tests and serology for antibody examination) are used.

Because the signs and symptoms of dengue fever are nonspecific, attempting laboratory confirmation of dengue infection is important. Laboratory criteria for diagnosis include one or more of the following:

- Isolation of the dengue virus from serum, plasma, leukocytes, or autopsy samples
- Demonstration of a fourfold or greater change in reciprocal immunoglobulin G (IgG) or immunoglobulin M (IgM) antibody titers to one or more dengue virus antigens in paired serum samples
- Demonstration of dengue virus antigen in autopsy tissue via immunohistochemistry or immunofluorescence or in serum samples via enzyme immunoassay (EIA)
- Detection of viral genomic sequences in autopsy tissue, serum, or cerebral spinal fluid (CSF) samples via polymerase chain reaction (PCR)

A reverse-transcriptase PCR test has demonstrated promise, yielding a serotype-specific diagnosis very rapidly[4,5]

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Characteristic findings in dengue fever are thrombocytopenia (platelet count < 100 x 10^9/L), leukopenia, and mild-to-moderate elevation of aspartate aminotransferase and alanine aminotransferase values. Jaundice and acute liver failure are uncommon. Enzyme levels begin to rise during the early stage and peak during the second week. Clinically severe involvement was found to be idiosyncratic and infrequent but did contribute to severe bleeding.[6]

In Leukopenia, often with lymphopenia, is observed near the end of the febrile phase of illness. Lymphocytosis, with atypical lymphocytes, commonly develops before defervescence or shock. A systematic review found that patients with dengue had significantly lower total WBC, neutrophil, and platelet counts than patients with other febrile illnesses in dengue-endemic populations[7]

Thrombocytopenia has been demonstrated in up to 50% of dengue fever cases. Platelet counts less than 100,000 cells/µL are seen in dengue hemorrhagic fever or dengue shock syndrome and occur before defervescence and the onset of shock. The platelet count should be monitored at least every 24 hours to facilitate early recognition of dengue hemorrhagic fever[7]

The IgM capture enzyme-linked immunosorbent assay (MAC-ELISA) has become the most widely used serologic assay for dengue.[8]In this context, the present study aimed to assess the biochemical and hematological dynamics of patients withdengu e fever in order to increase the sensitivity of the screening by he althcareprofessionals in the most serious,cases and to try to ide ntify laboratory markers that may indicate this evolution.

METHODS

This is a descriptive observational retrospective study of second ary data obtained from the medical records of 60,male and fem ale patients aged from 2 to 85 years who had serological diagno ses of dengue fever in a state hospital in lucknow from August to October 2015. The study included all patients diagnosed with positive serology for dengue using the card methord. The first day of the disease was, considered the onset of symptoms related to dengue fever and the laboratory profile was evaluated. The variables selected were: leukocytes, lymphocytes, platelets, ALT and AST.

RESULTS

The results of 60 patients with NS1 positive were analyzed; out of these 60 patients 8.4%patients did not showed any hematological or biochemical abnormality. In our study, 14(23.3%) were female and 46(76.6%) were male (figure 1).

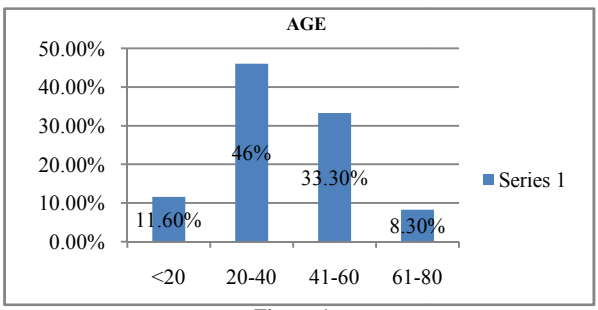

Figure 1

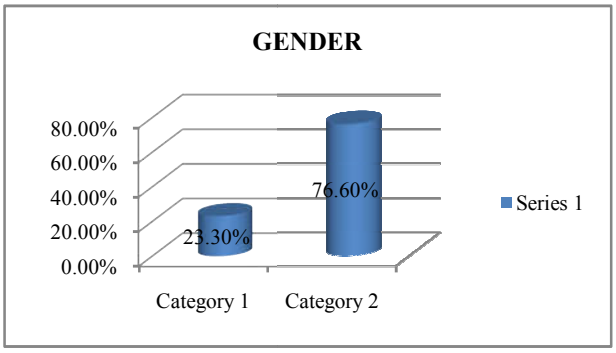

Figure 2

The ages ranged from 2 to 85 years with 11.6% aged <20 years, 46% between 20-40 years,33.3% between 40-60 years and 8.3% between 60-80 years respectively(figure 2).

Clinical features of patients studied varied. Most common clinical feature seen was fever which was present in 39 patients. Second most common is abdominal pain with 13 cases. Then comes rash and petechiae which was seen in 5 patients. Least common feature was mucosal bleeding which was seen in 3 patients.(table 1 & figure 3)

Table 1

Clinical features	No. of patients
Fever,body ache	39
Abdominal pain	13
Rash and petechae	5
Mucosal bleeding	3

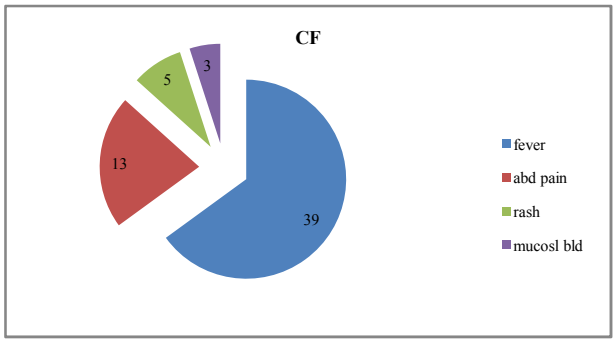

Figure 3

Patients showing petechiae had platelets ranging from 20,000 to 55,000.

Hematological, biochemical and serological abnormalities at time of admission (TABLE 2, TABLE 3 & TABLE 4)

Table 2

Hematological abnormalities	TLC		Lymphocytosis		platlets			
	<4000	>4000	Present	Absent	<1 Lakh	<50,000	<20,000	>1 Lakh
	25	35	45	15	12	13	5	30

As seen above 25 patients showed TLC less than 4000 whereas 35 showed TLC more than 4000. Lymphocytosis was seen in 45 patients. 30 patients showed platelets >1 lakh,12 patients showed platelets less than 1 lakh,13 patients showed platelets less then 50,000 and 5 patients showed platelets less than 20,000.

Table 3

Biochemical abnormalities	SGOT		SGPT	
	>40	<40	>56	<56
	43	17	40	20

As seen in table 3, 43 patients showed elevated SGOT and 40 patients showed elevated SGPT

Table 4

Serological abnormalities	NS1 POSITIVE
	60

As seen in table 4,all 60 patients were NS1 positive.
According to the platelets number patients were divided into:

1) SEVERE :- platelet count <20,000
2) MODERATE:-platelet count between 20,000 to 40,000
3) MILD:-platelet count >40,000 but <100000

All the severe category required platelet transfusion. Along with this 7 patients with hemorrhagic manifestation also required platelet transfusion.

Out of total 12 patients who required platelets,8 were male and 4 were female.

7 patients those which were lying in moderate category required one or two transfusions whereas 5 patients which lied in severe category required multiple transfusions.

Platelets were taken from single donors only after proper screening.

Five patients who required multiple platelet transfusion showed the following course (TABLE 5)

Table 5

	42 yr male	16 yr M	24 yr M	56 yr M	20 yr M
D1	17,000	8,000	17,000	8,000	5,000
D2	20,000	60,000	19,000	20,000	15,000
D3	53,000	Discharged	26,000	15,000	20,000
D4	Discharged		60,000	72,000	50,000
D5			Discharged	Discharged	Discharged

Patients were discharged as soon as platelets reached 50,000.
As shown in table 5, Three patients were discharged on day 5 where as the rest two patients were discharged on day 3 and day 4 respectively.

DISCUSSION

The frequency of dengue fever in the study was higher in the group aged 20-40 years (46%), however Rocha & Tauil [9] found 15 years to be the most common age group. There was a predominance of males in our study; in most published studies, there is no significant difference in the proportions by gender[9]

In our study it was found that dengue fever begins with hematological and biochemical abnormalities.

AST levels increased at the onset of symptoms in all clinical forms and remained at varying but high levels during disease evolution. ALT started with above normal values in the severe form and remained steady throughout the course of the disease. Similar results were obtained by Chen *et al*. [10] who showed that both AST and ALT exhibited higher-than average values. Chau *et al*. [11] found a significant increase in transaminases, especially AST, in children with dengue when compared to a control group with other febrile (non-dengue) illnesses.

For Chacko & Subramanian, [12] an increase in ALT (≥ 40 IU) in children with dengue fever can be considered a predictive marker for shock syndrome. The liver is one of the target organs for dengue and clinical manifestations of hepatic dysfunction can occur during the course of this disease. [13]The liver is deprived of oxygen leading to lesions of the parenchyma, in which the injured hepatocytes release transaminases that is detectable in the peripheral blood. [14]In most cases, the high levels of transaminases show the degree of hepatocellular injury, prolonging the clinical course of the disease; however, there is no correlation with prognosis. [15-17]

CONCLUSION

Hemoconcentration, leukopenia, thrombocytopenia, raised SGPT, and raised SGOT 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 Dengue Fever. The correlation of positive laboratory findings with various types of Dengue Fever was bound to strengthen community awareness, early diagnosis, management, and vector control measures, to reduce the morbidity and mortality because of this disease.

Future scope

Card test alone can not be relied hence hematological, clinical and biochemisty play important role. If card test is positive it should be confirmed by ELISA.

Benefit of these test is that they are cheap. Limitations are that sometimes false positive and false negative cases are seen.

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