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Hematological parameters and aminotransferase changes in dengue infection

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Abstract

Background: Dengue is a viral disease that is caused by dengue virus. The incidence of dengue has rapidly increased over the last few years. Classical dengue fever presents as fever, generalized body ache, myalgia, arthralgia, and headache. The hematological parameters such as hemoglobin (Hb), hematocrit (Hct), WBC count, differential WBC counts and platelet count vary each day of the fever in dengue patients. This study was undertaken to study the various hematological parameters and aminotransferases and their correlation with severity of dengue.

Methods: Descriptive study of 100 patients admitted in KBNTGH, Kalaburagi was carried out to evaluate the hematological parameters and changes in aminotransferase levels.

Results: 58 were male and 42 were female and the age ranged between 1yr-75yr. The haemoglobin was found to be decreased in 28% of the cases, whereas in 19% of the cases hematocrit was found to be increased. 52% of the cases had a decreased leucocyte count and 66% showed increased lymphocyte percentage. Decrease in platelet count was seen in 87 cases. 85 showed increased AST levels and 67 showed increased ALT levels.

Conclusion: Dengue is a self-limiting disease. Peripheral blood parameters are very helpful for disease monitoring and can be useful in prediction of prognosis. Liver involvement is also seen and is related to severity of dengue. These indicators, if rightly and timely assessed can be of value for better care of complicated cases

Keywords: Parameters, aminotransferase

Introduction

Dengue is a viral disease that is caused by dengue virus (Arbovirus) that belongs to the genus *Flavivirus* and family *Flaviviridae* and transmitted by female mosquitoes most commonly by *Aedes aegypti* and *Aedes albopictus* [1]. Dengue virus has four serotypes (DEN-1, DEN-2, DEN-3 and DEN-4). the clinical spectrum of dengue ranges from an asymptomatic infection to an undifferentiated fever to classic dengue fever, severe Dengue hemorrhagic fever (DHF) and Dengue shock syndrome [2].

The incidence of dengue has rapidly increased over the last few years. Recent figures indicates 390 million dengue infections per year, with clinical manifestations in 96 million. [3] There are 3.9 billion people are at risk of infection with dengue viruses in 128 countries according to another study [4]. WHO 2018 report increase in number of cases from 2.2 million in 2010 to 3.2 million in 2015 [1].

Dengue virus was isolated in India for the first time in 1945 and poor hygiene and weaker health system are the factors for spread of the disease [5].

After an incubation period of 4–8 days, classical dengue fever presents as fever, generalized body ache, myalgia, arthralgia, and headache [6]. Liver involvement, central nervous involvement (encephalopathy) and cardiac alterations in DF are the atypical manifestations [7]. The hematological parameters such as hemoglobin (HB), hematocrit (HCT), WBC count, differential WBC counts and platelet count vary each day of the fever in dengue patients [8]. Leukopenia is the most prominent hematological change with lymphocytosis in the form of presence of atypical lymphocytes is also commonly seen. Increased hematocrit concentration thrombocytopenia occurs in DHF.

The most frequent changes in the biochemical variables occur in liver function tests such as in serum aspartate aminotransferase (AST), serum alanine aminotransferase (ALT), Gamma Glutamyl transpeptidase and alkaline phosphatase levels, and serum albumin concentrations.

Complete Blood count (CBC) is an important part of the diagnostic workup of patients, parameters like total white cell count, atypical lymphocyte count and haematocrit aid in diagnosis and prognosis in dengue. Comparison of various finding in CBC including peripheral smear and liver enzyme estimation aids in better management of the patient.^[9]

This study was undertaken to study the various hematological parameters and aminotransferases and their correlation with severity of dengue

2. Material and Method

This is an observational type of descriptive study conducted in the department of pathology, Khaja Bandanawaz Teaching and General hospital, Kalaburagi. Data was retrieved form from the medical records department of 100 patients, who were diagnosed of dengue fever and severe dengue from may 2018 to September 2018.

A detailed history was taken and a careful clinical examination was performed. The laboratory investigations like hemoglobin (HB), the total and the differential leucocyte counts (TLC and DLC), platelet count, hematocrit (HCT), Peripheral smear examination and estimation of aminotransferases was done in all the patients.

3. Results

A total of 100 patients admitted to our hospital with dengue NS1 positivity were studied. Of these, 58 were male and 42 were female and the age ranged between 1yr-75yr (mean age 20.5yr).

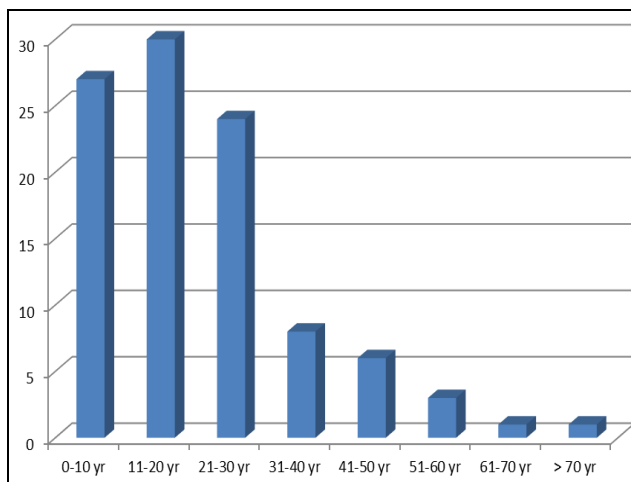


Fig 1: Diagram showing age distribution of the cases of dengue.

Haematological investigations included haemoglobin concentration, hematocrit, platelet count, total leucocyte count, differential count, and SGOT, SGPT. The haemoglobin was found to be decreased in 28% of the cases, whereas in 19% of the cases hematocrit was found to be increased. These were the patients that developed severe dengue.

As many as 52% of the cases had a decreased leucocyte count and 66% showed increased lymphocyte percentage with variable atypical lymphocytes. Decrease in platelet count was seen in 87 cases, out of which 9 patients had counts less than 20,000. While 28 patients had counts less than 50000.

Out of 100 patients 85 showed increased AST levels and 67 showed increased ALT levels.

Table 1: Age wise distribution of haemoglobin concentration and haematocrit

Age group	Hemoglobin		Hematocrit		
	<10gm/dl (%)	>10gm/dl (%)	<35	35-45	>45
<20yrs	15	42	13(22.8)	34(59.6)	10(17.5)
20-40yrs	9	23	8 (25)	17 (53.12)	7(21.8)
>40	4	7	4(36.3)	5(45.4)	2(18.2)
	28	72	25	56	19

Table 2: Age wise distribution of total leucocyte count

Age group	Total leucocyte count		Atypical lymphocytes
	<4000 cells/cumm	>4000 cells/cumm	
<20yrs	27	24	35
20-40yrs	19	20	23
>40	6	4	8
	52	48	66

Table 3: Age wise distribution of platelet profile

Age group	Platelet profile				
	<20,000	21,000-50,000	51,000-1,00,000	1,00,000-150000	>1.5
<20yrs	6	15	17	11	8
20-40yrs	2	10	9	7	4
>40yrs	1	3	4	2	1
	9	28	30	20	13

Table 4: Degree of change in transaminase levels

	AST	ALT
Normal	15	33
<2 fold rise	47	31
2-4 fold rise	25	26
4-10 fold rise	8	8
>10 fold rise	5	2
	100	100

4. Discussion

Dengue infection is a mosquito borne disease that is endemic in India due to the tropical climate, urbanization, poor living conditions and improper waste management. Hepatic involvement is characterized by right hypochondrium pain, hepatomegaly, jaundice, and elevated aminotransferase levels.^[6] Elevated transaminases is a result of factors such as use of hepatotoxic drugs and direct viral effect, due to aggressive host immune response to the virus, or complex interaction of these two mechanisms. DF initiates the inflammatory responses leading to liver parenchymal changes and causing release of transaminases in circulation^[7, 10].

In approximately 90% of the patients with DF, Aspartate Aminotransferase (AST) is higher than the Alanine Aminotransferase (ALT)^[5, 11].

We studied 100 patients with dengue that were admitted to Khaja Bandanawaz teaching and general hospital. The highest incidence of dengue was seen in <20 years of age group and with male preponderance.

The presenting symptoms were fever, headache, myalgia and retro orbital pain, vomiting, pain abdomen and skin rashes. Other significant findings included hem

Concentration evident as raised hematocrit, decrease in the total leukocyte count and an increase in the percentage and number of atypical lymphocytes.

We found thrombocytopenia to be the most important abnormality which correlated well with findings of Patel K

et al [12]. and Tahlan A *et al* [13]. Decrease in platelet occurs due to depression of bone marrow or direct infection of the megakaryocytes by virus leading to increased destruction of the platelets or the presence of antibodies directed against the platelets [9]. Hemorrhagic manifestations are very common with severe thrombocytopenia and severity of hemorrhagic tendency correlates with the platelet counts.

Leucopenia was the 2nd most significant abnormality detected in 52% of the cases which correlated well with other studies [12, 14]. Sixty six cases showed atypical. Leucopenia occurs as a result of marrow suppression, whereas atypical lymphocytes are the result of increased production of antibodies against the virus.

Heamoconcentration with raised hematocrit was seen in 19 cases which was similar to study by Meena KC *et al* [14]. who found raised hematocrit in 13%. Majority of the patients had hematocrit between 35-45%. In a study by Joshi A *et al* [9]. hematocrit was increased in 72%. Heamoconcentration occurs because of fluid leakage from the vascular compartment which is the cause of effusions in dengue. This finding was consistently present in patient who had DHF. 28% of the patients had hemoglobin less than 10gm/dl in our study

In our study live transaminases were found to be increased. AST was increased in 85 cases with majority of cases showing 2-4 fold increase and 5 patients had >10 fold increase. ALT was increased in 67 cases and majority had 2-4 fold increase, while 2 patients had >10 fold increase. Severity of dengue correlated with increased levels of aminotransferases. These findings correlated with Lee LK *et al*. [15].

5. Conclusion

Dengue is a self-limiting disease. However deaths occur in severe dengue because of hemorrhage and shock. Liver involvement is also seen and is related to severity of dengue. Peripheral blood parameters are very helpful for disease monitoring and can be useful in prediction of prognosis. Most of the cases in our study had raised hematocrit, lymphocytosis with atypical forms & thrombocytopenia and deranged liver enzymes. These indicators, if rightly and timely assessed can be of value for better care of complicated cases.

6. References

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