

Original Research Article

Retrospective study of white blood cell count and hematocrit in dengue fever

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ABSTRACT

Background: Dengue is an extremely important tropical disease transmitted by the *Aedes aegypti* mosquito. Aim of the study: to study the white blood cell levels in serologically proven dengue cases; to study hematocrit levels in cases of dengue fever.

Methods: The present study is a retrospective observational analysis of white blood cell count (WBC count) and hematocrit in 235 serologically proven Dengue cases admitted in the years 2011-2012

Results: 107 cases (45.5%) had leukopenia, 111 cases (47.2%) had normal WBC counts and 12 cases had leukocytosis (5.1%). 23 cases had increased hematocrit (9.8%), 76 cases had a low hematocrit (32.3%) and 128 cases had a normal hematocrit (54.5%).

Conclusions: A significant proportion of patients had leukopenia which may be an early marker of dengue infection. Only a small percentage of patients had raised hematocrit. It may be that rise from baseline levels of haematocrit which may be more significant than absolute values.

Keywords: Dengue fever, Leukopenia, Raised hematocrit

INTRODUCTION

Dengue is a very important viral disease transmitted by the bite of the infected *Aedes aegypti* mosquito. It has been increasing year after year and has expanded into multiple countries all over the world. There are about 50 million new dengue infections each year worldwide.¹ World health organization has stated that dengue infection can be considered to be a public health emergency because of its capacity to spread exponentially beyond national borders.

Dengue infection shows great variability in its incidence with high epidemic and non-epidemic years. It can present as large outbreaks of infection and also shows seasonal variation. There are multiple serotypes of dengue virus circulating in India.²

Dengue infection can be classified into undifferentiated fever, dengue fever and dengue hemorrhagic fever.³ Dengue hemorrhagic fever is further classified into 4 subtypes of which 3 and 4 are representative of dengue shock syndrome.

It can present with wide variety of symptoms. They include gastrointestinal symptoms such as anorexia, nausea, vomiting; skin manifestation such as rash, musculoskeletal features such as myalgia and arthralgia and laboratory manifestations such as leukopenia.⁴

METHODS

The present study is a retrospective observational analysis of white blood cell count (WBC count) and hematocrit in 235 serologically proven Dengue cases

admitted in the years 2011-2012. Inclusion criteria included patients above 15 years of age and were Dengue IgM positive.

Exclusion criteria excluded patients with other tropical infections such as malaria, typhoid and scrub typhus. Dengue serology was done by Elisa method.

WBC count and hematocrit were done by coulter technique. WBC count less than 5000 cells/mm³ was taken as leukopenia and WBC count greater than 10000 cells/mm³ was taken as leukocytosis.⁵ Hematocrit of less than 40% was taken as low and greater than 45% was taken to be raised hematocrit.

RESULTS

235 patients were part of the study. All the patients included in our study were Dengue IgM positive. WBC count was available for 230 patients. Our analysis showed that 107 cases (45.5%) had leukopenia. About 111 cases (47.2%) had normal WBC counts and 12 cases had leukocytosis (5.1%).

The comparison of leukopenia in our study has been done with other studies in Table 2 with the values varying in different studies. Hematocrit values were available for 228 patients. 23 cases had increased hematocrit (9.8%), 76 cases had a low hematocrit (32.3%) and 128 cases had a normal hematocrit values (54.5%).

Table 1: Range of distribution of white blood cell count.

WBC count	Number	Percent
Normal	111	47.2
Low	107	45.5
High	12	5.1
Not done	5	2.1
Total	235	100.0

Table 2: Different studies showing incidence of leukopenia.

Study	Leukopenia (%)
Christopher et al	87
Shyamsundar khatroth	20
Rajesh Deshwal et al	20.1
Present study	47.2

Table 3: Range of distribution of hematocrit levels.

Hematocrit	Number	Percent
Normal	128	54.5
Low	76	32.3
High	23	9.8
Not done	8	3.4
Total	235	100.0

DISCUSSION

Dengue fever has three phases namely, the febrile phase, the critical phase and the stage of plasma leakage. The febrile phase is characterized by dehydration. In the critical phase there is plasma leakage with accumulation of fluid in third spaces such as pleural and peritoneal cavities and the recovery phase may lead to hypervolemia especially if large amounts of fluids are being administered.

The febrile phase is the symptomatic stage and leukopenia may be present in this stage. Also increasing leukopenia precedes the stage of plasma leakage. In a study by Christopher J Gregory et al which dealt with the utility of tourniquet test and WBC count as a marker to differentiate dengue fever from other febrile illnesses, the authors showed that 87% of dengue cases had leukopenia compared to 28% of non dengue cases.⁶ The conclusion was that leukopenia could be taken up as one of the indicators to separate dengue from other febrile illnesses. The other indicator was a positive tourniquet test.

In another study by Kalyanarooj S et al, the authors concluded that early dengue infection was characterised by leukopenia.⁷ In a study by Rajesh Deshwal et al, the incidence of leukopenia was 20.19%. In another study by Shyamsundar Khatroth showed that the incidence of leukopenia was 20%.⁸

In our study the incidence of leukopenia was 47.2% which was higher than the studies by Kalyanarooj et al and Rajesh Deshwal. It is possible that a substantial subset of patients in our study could have presented in the febrile phase of the illness.

Rising hematocrit levels are a marker of the critical phase of dengue infection. After leukopenia there is the stage of plasma leakage where there are third space losses. Ultrasound and chest X-ray are useful tools to detect pleural effusion and ascites which are characteristic of this stage. The extent up to which hematocrit rises from the baseline can indicate the severity of plasma leakage. In a study by Francisca Raimunda et al, hematocrit was shown to be increased in patients with Dengue hemorrhagic fever.⁹

In another study by Kailash C Meena et al the percentage of patients with raised hematocrit was 9.8%.¹⁰ The percentage of patients with raised hematocrit in our study was 9.8% which was similar to Kailash C Meena's study.

CONCLUSION

Our study had an incidence of leukopenia of 47.2% which was higher than other comparable studies. Presence of leukopenia could be a marker of early dengue infection especially when combined with other indicators. The incidence of increased hematocrit was 9.8%. Rising

hematocrit may be a marker for the stage of plasma leakage necessitating increased fluid administration. Drawback of this study was that few patients did not undergo all the tests. More studies are required to look for serial WBC count and hematocrit levels during the course of dengue infection.

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Conflict of interest: None declared

Ethical approval: The study was approved by the institutional ethics committee

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