

A Study of Hematological Parameters in Dengue Positive Cases in a Tertiary Care Hospital

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Received: 25-07-2023 / Revised: 28-08-2023 / Accepted: 30-09-2023

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Conflict of interest: Nil

Abstract:

Background: In tropical nations, dengue fever has been recognized for more than a century. Today, dengue fever is the most widespread arboviral disease in the world. Globally, the incidence of disease has increased along with the frequency of DF, DHF, and associated epidemics over the past 20 years. The clinical profile of dengue fever is unclear, and it must be distinguished from other febrile disorders such leptospirosis, typhoid, and malaria. Reverse transcription polymerase chain reaction (RT-PCR) and enzyme immunoassay and immunochromatographic testing are used to diagnose dengue and to find the NS1 antigen and matching IgM and IgG antibodies. In many hospitals, the serology for certain diagnoses is expensive and unavailable. So the hematological parameters like platelet count, hematocrit, leucocyte count, and peripheral smear findings will aid in the diagnosis of Dengue Fever.

Methods: The study was carried out over duration of four months, from June 2015 to September 2015, at the pathology department of the D Y Patil Medical College in Navi Mumbai. The study comprised patients with verified NS1 positive. An automated hematology analyzer, the Horiba Pentra XLR, was used to get the hematological analysis, and subsequent peripheral smears were checked for the estimation of platelets and differential counts.

Results: The adult age group, with a small male preponderance, had a higher prevalence of dengue infection. The majority of cases had hematological indicators such increased hematocrit, reduced platelet count, and abnormal lymphocytes.

Conclusion: Early detection of dengue infection will be aided by elevated hematocrit, thrombocytopenia, leucopenia, and atypical lymphocytes on the peripheral smear. For a successful treatment of the disease, early detection and prevention of consequences are more important than treatment.

Keywords: Dengue fever, Hematocrit, Thrombocytopenia, Leucopenia, Atypical lymphocytes.

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Introduction

In tropical and subtropical areas, dengue is a major avoidable and treatable cause of morbidity and mortality in both children and adults. [1] Around 50 million cases of dengue fever are reported annually, and 2.5 billion people live in risk areas, according to WHO estimates. [1,2]

Dengue fever was listed as an emergent public health condition in the International Health Regulation (IHR) in 2005, with consequences for health safety because of the disease's international expansion. [1,2]

Over the past forty years, dengue fever (DF) cases have multiplied. Unplanned urbanization, population migration from rural to urban regions, and a lack of adequate sanitary services are significant causes of this issue in emerging countries like India. [2] Around the world, tropical and subtropical climates are where the disease is

most prevalent. [3] Vellore, India, reported the first case of dengue fever in 1956, and Calcutta, India, reported the first case of dengue hemorrhagic fever in 1963. [4]

The annual incidence in India is thought to range between 7.5 and 32.5 million. Five closely related but serologically distinct dengue virus strains, known as DEN-1, DEN-2, DEN-3, and DEN-4, are what are known as arboviruses (arthropod-borne viruses) and are a part of the family Flaviviridae genus. [1,2]

Dengue 1, 2, 3, and 4 serotypes have all been isolated in India. The dengue virus infection may be asymptomatic or result in dengue fever (DF), dengue hemorrhagic fever (DHF), or dengue shock syndrome (DSS), among other febrile illnesses (viral syndrome). Even though dengue infection is a self-limiting illness, if it is not identified and

treated at an early stage, it can be fatal. Dengue is diagnosed with viral isolation, RTPCR (Reverse Transcription Polymerase Chain Reaction) determination of the viral genomic sequence, and NS1 antigen testing.

The platelet count is the hematological variable of greatest significance for the diagnosis of dengue. [6,8] Numerous investigations and academic works have demonstrated the significance of a drop in platelet count and an increase in hematocrit as a diagnostic and therapeutic indicator for DHF/DSS.[9] The diagnosis and prognosis of dengue are aided by the additional hematological indicators such as total white cell count and atypical lymphocyte count. [9-10]

In the current study, we have highlighted the value of platelet count, rise in hematocrit, total leucocyte count, and atypical lymphocytes on peripheral smear and total leucocyte count in diagnosing Dengue infection even in remote areas with limited resources where viral isolation and genomic sequencing may not be possible. This will inform the medical staff, reducing problems and fatalities.

Material and Methods

Table 1: Gender-wise distribution of cases

Month	Number of Cases	Male	Female
June	8	4	4
July	20	14	6
August	45	29	16
September	27	17	10
Total	100	64	36
Percentage		64 %	36 %

Cases ranged in age from 0 to 70, with the third decade seeing the highest number of patients.

Table 2: Age-wise distribution of cases

Age Group	Number of cases (%)
0-10	17(17%)
11-20	27(27%)
21-30	31(31%)
31-40	6(6%)
41-50	10(10%)
51-60	7(7%)
61-70	2(2%)

Hemoglobin levels ranged from 4.5 g/dl to 17.7 g/dl, and Table 3 shows the Hb-wise distribution. 57% of the patients had decreased Hb levels, while 4% had increased Hb levels.

Table 3: Hemoglobin percentage of patients

Hb (g/dl)	No. of cases (%)
<8	7(7%)
8-10	15(15%)
10-12	35(35%)
12-14	27(27%)
14-16	12(12%)
>16	4(4%)

The distribution of hematocrit is shown in Table 4, where 22% of the cases had elevated levels, which may indicate hemoconcentration.

This study is conducted in the Department of Pathology, D Y Patil Medical College, Navi Mumbai from June 2015 to September 2015 for a period of 4 months.

This study included all patients of both sexes who had been hospitalized to medicine wards and had a confirmed case of dengue fever using the NS-1 Antigen Test. Patients who tested negative for dengue NS-1 Antigen while also having a fever were excluded from the research. The NS-1 Antigen Test results were retrieved from LIS. An automated hematology analyzer (Horiba Pentra XLR) was used for the hematological study, and after that, a Leishman stained peripheral smear was evaluated to determine the platelet count and differential counts.

Results

During the course of the investigation, 100 cases of dengue with NS-1 Antigen positivity were observed. The M:F ratio of these was 1.77:1, with 64 (64%) males and 36 (36%) females testing positive for dengue (Table 1). The most cases (45%) were observed in August.

Table 4: Hematocrit of patients

Hematocrit	No. of cases (%)
<30	25(25%)
30 to 35	27(27%)
35-45	26(26%)
>45	22(22%)

The patients' platelet counts were classified as having mild, moderate, or severe thrombocytopenia (Table 5). In this study, thrombocytopenia affected 74% of the patients, and 23% of those patients had severe thrombocytopenia.

Table 5: Platelet count of patients

Platelet count	No. of cases (%)
<50000(severe)	23(23%)
50-100000(moderate)	22(22%)
100-150000(mild)	29(29%)
>150000	26(26%)

Leucopenia, leukocytosis, and a normal WBC count were the three categories for total leucocyte counts. Among these, 25% of patients had abnormal lymphocytes, and 40% of the patients had lymphocytosis. Leukocytosis and neutrophilia were seen in 21% of the patients.

Table 6: Total leucocyte count of patients

Total leucocyte count /cu mm	No. of cases (%)
<4000	23(23%)
4000-11000	56(56%)
>11000	21(21%)

Discussion

India, a tropical nation, offers favourable weather for *Aedes* to thrive, and in recent years, there has been an increase in the disease burden. The illness dengue fever is self-limiting. Death and morbidity are brought on by dengue hemorrhagic fever. Since there is no effective antiviral medicine, the only available therapeutic methods are fluid and electrolyte replacement together with supportive therapy. The only approach to stop the spread of the disease is through vector control because there is no vaccination for it.

The clinical signs and symptoms of dengue include fever, headache, joint and muscle discomfort, nausea, and rash. The clinical profile of dengue fever is unclear, and it must be distinguished from other febrile disorders such leptospirosis, typhoid, and malaria.

Reverse transcription polymerase chain reaction (RT-PCR), IgM and IgG antibody detection using ELISA, and immunochromatographic testing are used to identify it. The peripheral areas might not have access to these testing. In order to diagnose dengue fever, hematological factors like platelet count, hematocrit, leucocyte count, and peripheral smear results would be helpful. In the early stages, the majority of patients have hematological profiles that are within the normal range. During the course of our study, 100 cases of dengue with NS-1 Antigen positivity were observed.

According to studies by Patel et al, Meena et al, and Deshwal et al, men made up the majority of

dengue positive patients. In our investigation, where the M:F ratio was 1.77:1.12, comparable outcomes were observed. This might be because males are more likely to experience mosquito bites while engaging in outside employment activities.

In their work, Patel et al., Meena et al., and Deshwal et al. observed a rise in hematocrit, which they attributed to hemoconcentration brought on by plasma leakage as a result of enhanced capillary permeability during the crucial period. [12] It helps with managing and predicting dengue. In the current study, an increase in hematocrit was seen in 22% of the dengue positive cases.

In a study conducted by Patel et al, Meena et al, and Deshwal et al, thrombocytopenia was frequently observed. [12] Similar findings were made in our investigation, where 23% of the dengue-positive subjects had severe thrombocytopenia. For the purpose of avoiding any hemorrhagic consequences, they required an emergency prophylactic platelet transfusion. The direct and antibody-mediated death of the megakaryocytes and platelets, as well as the virus's inhibition of the bone marrow, is the causes of thrombocytopenia. The existence of antibodies against platelets is another explanation for thrombocytopenia. [3] Leukocytosis was a more prevalent finding in the study by Deshwal et al, where leucopenia was only detected in 4% of cases. Patel et al's investigation revealed leucopenia in over half of the patients. [12] In our study, 21% of patients had leukocytosis and 23% of the patients had leucopenia. Patients with Classical Dengue

typically experience leukocytosis and neutrophilia in the initial stages of the illness, followed by leucopenia. [1] Leucopenia results from the virus's direct suppression of bone marrow.

Leucopenia, lymphocytosis, and thrombocytopenia are all symptoms of dengue. [13] Bone marrow suppression, platelet binding to dengue antigens, and antibody-mediated immunological death of platelets are some of the causes. [13] WBC changes are subpar predictors of disease severity. It is possible to distinguish dengue fever from other febrile infections using changes in WBC count. [13]

The anti-dengue IgG antibody has been reported to develop quickly to high titers early in the course of secondary dengue infection, suggesting that the atypical cells may represent the anamnestic antibody response to the dengue virus. [14] Atypical lymphocytes are present in the majority of patients, although they might potentially be a generalized response to any viral infection. [14]

Conclusion

Although the highest frequency still occurs during the rainy season, dengue infection is now endemic in India and not seasonal. Unplanned urbanization and poor sanitation are to blame for this. Most often, stagnant water serves as a breeding substrate. It is necessary to take steps to uphold adequate sanitation and to raise awareness of it. A thorough hematological profile and specific testing for dengue should be administered to any patient who has a fever and other clinical signs that are suspect of dengue. Dengue-related mortality can be significantly reduced with early and fast diagnosis and vigorous steps for good sanitation.

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