Original Research Article

A study of hematological profiles in dengue in a tertiary care hospital

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Abstract

Background: Dengue virus (DENV) infection is a major cause of disease in tropical and subtropical areas, with an estimated 50 million infections occurring each year and more than 2.5 billion people being at risk of infection.
Materials and methods: The study was conducted in the Department of Pathology of Smt. B. K. Shah Medical Institute and Research Centre, Vadodara, Gujarat. About 70 patients with early manifestations (1-5 days) of fever were included along with constitutive symptoms of pain abdomen, headache, myalgias, arthralgias, skin rash, nausea, vomiting and retro-orbital pain. They were assessed on the basis of complete blood count and peripheral smear. Patients were hemodynamically stable throughout the study. There was no mortality observed.
Results: About 50 cases showed antigen NS1 positivity and 20 cases showed antigen NS1 with IgM and IgG antibodies. The most common symptoms that occurred were fever (71.4) in majority of patients, followed by headache (17.2) and joint pain (7.2) and only a handful of patients had vomiting (4.2). In our study, 28.5% of the patients had leucopenia (<4000), 62.8% had leucocyte count in normal range (4,000-11,000) and only 8.7% had leukocytosis (>11,000).
Conclusion: Total leucocyte count was normal during initial phases of illness and majority of the cases had neutropenia which resolved without any use of antibiotics. This led to a conclusion that there must be judicious use of antibiotics. This study also concluded that the most of the patients were NS1 positive and the most common hematological finding of thrombocytopenia and leucopenia were the predictors of dengue infection.

Key words

Hematological profile, Dengue, Fever.

Introduction

Dengue is a mosquito borne disease prevalent in the tropical areas. [1]. It is spread by female Aedes mosquito named as Aedes aegypti. The virus has namely four serotypes: DEN-1, DEN-2, DEN-3, and DEN-4. Primary infection with one serotypes provide lifelong immunity from that serotype only. However, subsequent infection with other serotypes increases the risk of contracting a more severe disease [1, 2]. Dengue is now endemic in over 100 countries and WHO estimates 50-100 million cases of dengue each year.

Dengue virus (DENV) infection is a major cause of disease in tropical and subtropical areas, with an estimated 50 million infections occurring each year and more than 2.5 billion people being at risk of infection. The incubation time generally ranged from 3 to 14 days with majority of patients having mild symptoms like fever, body ache, vomiting and a skin rash which can be efficiently managed. Recovery period is of around 2 to 7 days [3]. A handful of people can develop more severe symptoms which can be manifested as dengue hemorrhagic fever (DHF), resulting in bleeding, low levels of blood platelets and blood plasma leakage, or into dengue shock syndrome (DSS), where dangerously low blood pressure occurs. However, the pediatric age group has symptoms mimicking those of common cold or gastroenteritis and is at a greater risk for severe complication [4].

Dengue fever and DHF/DSS have similar early presentation; therefore there is difficulty in assessing which patients will develop more complicating features [5]. DHF has three stages of clinical phase that is used to differentiate it from DF. These are:

- **Febrile phase:** Viremia-driven high fevers.
- **Critical/plasma leak phase:** Sudden onset of varying degrees of plasma leak into the pleural and abdominal cavities.
- **Convalescence or reabsorption phase:** Sudden arrest of plasma leak with concomitant reabsorption of extravasated plasma and fluids.

Proper understanding of these differentiating features of DF and DHF helps to monitor the treatment and clinical course. Anticipatory management and monitoring indicators are essential in effectively administering therapies as the patient enters the critical phase. New-onset leucopenia (WBC <5,000 cells/mm^3) indicate that the fever will likely dissipate within the next 24 hours and that the patient is entering into the critical phase [6]. Thus the need of measuring total leucocyte count in early phase is necessary for detection of any severe cases.

Neutrophils form the first line of defense and are the first to migrate to sites of inflammation to phagocytose the microorganisms. They do by forming neutrophil extra cellular traps (NETs) to trap and kill pathogens.

Aim and objectives

- To study various clinical features in DF.
- To assess the total WBC count and platelet count in the early febrile period.
- To determine the neutrophil count and in early stages of dengue fever.

Materials and methods

The study was conducted in the Department of Pathology of Smt. B. K. Shah Medical Institute and Research Centre, Vadodara, Gujarat.

Type of study: Prospective observational study.
Inclusion criteria:

- Patients above 18 years of age.
- Rapid dengue test positive patients.
- Patients with a history if recent fever.

Exclusion criteria:

- Febrile illness other than dengue.
- Patients of DHF and DSS.

About 70 patients with early manifestations (1-5 days) of fever were included along with constitutive symptoms of pain abdomen, headache, myalgias, arthralgias, skin rash, nausea, vomiting and retro-orbital pain. They were assessed on the basis of complete blood count and peripheral smear. Patients were hemodynamically stable throughout the study. There was no mortality observed.

Results and Discussion

A study on 70 patients revealed results as per **Table – 1** to **Table – 6**.

Table - 1: Pattern of dengue antigen and antibody positivity:

Antigen/Antibody	No. of patients	%
NS1+	50	71.4
NS1+ and IgG+	12	17.2
NS1+ and IgM+	08	11.4
Total	**70**	**100.0**

Table - 2: Clinical manifestations of patients with dengue infection.

Features	No. of patients	%
Fever	50	71.4
Headache	12	17.2
Joint pain	05	7.2
Vomiting	03	4.2
Total	**70**	**100.0**

Table - 3: Gender distribution.

Gender	No. of patients	%
Female	21	30
Male	49	70
Total	**70**	**100.0**

Table - 4: Total WBC counts of patients.

Total Leukocyte Count (per cubic millimeter)	No. of patients (n=70)	%
· <4000	20	28.5
· 4000-11000	44	62.8
· >11000	6	8.7
Total	**70**	**100.0**

Table - 5: Differential counts of patients studied.

Differential count- Neutrophils	No. of patients (n=70)	%
· <40	43	61.4
· 40-80	25	35.7
· >80	2	2.9
Total	**70**	**100.0**

Table - 6: Platelet counts of patients.

Platelet count/µl	No. of patients	%
40,000-55,000	10	14.2
56,000-70,000	08	11.4
71,000-99,000	12	17.2
100,000-150,000	40	57.2
Total	**70**	**100.0**

The samples were assessed based on the serological result of NS1antigen, IgM and IgG antibodies of the dengue virus. About 50 cases showed antigen NS1 positivity and 20 cases showed antigen NS1 with IgM and IgG antibodies. The results were in agreement with that reported by Qais Yusuf, et al. [7].

In the study conducted above showed that females constitute 30% and males constitute 70% leading to male to female ratio of 2.3:1. A similar study conducted by Nagaram PP, et al., about 174 confirmed cases of dengue were included with 95 (54.6%) males and 79 (45.4%) females [8].

The most common symptoms that occurred were fever (71.4) in majority of patients, followed by headache (17.2) and joint pain (7.2) and only a handful of patients had vomiting (4.2).

In our study, 28.5% of the patients had leucopenia (<4000), 62.8% had leucocyte count in normal range (4,000-11,000) and only 8.7% had leukocytosis (>11,000).

In study by Nagaram PP, et al. leukopenia (<4000/mm^3) was observed in 96 (55.17%) cases of study with 3 severe dengue cases and 93 non-severe dengue cases, while 26 cases (14.94%) had leukocytosis (>11,000/mm^3). Normal

leukocyte counts were observed in 52 (29.89%) cases with counts between 4000-11000 cells/mm3 with 10 cases of severe dengue and 42 cases of non-severe dengue [8].

Presently it has been studied that neutrophils not only have important role in inflammation but also are involved in modifying the immune response. They do so by having a cross talk with dendritic cells, Macrophages and other cells [9].

The importance of neutropenia in dengue patients is not very much studied and hence patients with severe neutropenia of less than 0.5 x 10^9/L are at a high risk of secondary bacterial infection. This data is scarce and dengue patients with serve neutropenia must be given prophylactic antibiotics is a query [10].

In our study, neutrophil count of less than 40% was found in 43 (61.4%) indicating neutropenia and 25 (35.7%) patients had neutrophils between 40 to 80% and 2 (2.9%) of patients had >80% which was in concordance with a study conducted by Thein, et al., showing that 1,579 (82.2%) patients had ANC of (absolute neutrophil count) < 1.5 × 109/L [10].

The 30 cases of the selected patients had platelet counts between 40,000 – 99,000/µl in concordance with the 78% of patients showing platelet count of less than 50000/c.mm by Arshad, et al. [11].

Conclusion

While most of the data correlated with the similar studies, the total leucocyte count was normal during initial phases of illness and majority of the cases had neutropenia which resolved without any use of antibiotics. This led to a conclusion that there must be judicious use of antibiotics. This study also concluded that the most of the patients were NS1 positive and the most common hematological finding of thrombocytopenia and leucopenia were the predictors of dengue infection.

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