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Original Research Article

A Hospital Based Prospective Assessment of Clinical and Hematological Profile in Dengue Fever

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Abstract

Aim: This study is an attempt to elucidate the positive laboratory profile of serologically diagnosed dengue patients so as to facilitate early diagnosis, treatment, management.

Methods: This was a descriptive study with analysis of patients who were admitted for dengue fever in the Department of Medicine, BMIMS, Pawapuri, Nalanda, Bihar, India for duration of 6 months. This study was conducted on 100 indoor patients. Patients presenting to the emergency department, outpatient department (OPD) with complaints of fever and clinical features of dengue with positive NS1 antigen test or dengue antibody serology IgM or IgG or both were included in the study.

Results: Most of the cases were seen in the 20-30 years age group followed by 31-40 years age group. Majority of the patients were males compared to females and the male to female ratio was 2:1. Fever was the most common presentation and was seen in 40 cases (40%) cases. Present study showed hemoglobin range of 6 gm% to 17 gm% (Table 3). Raised hematocrit (>47%) was noted in 15 (15%) of patients at presentation and the hematocrit ranged from 20-51%. The total leukocyte count ranged from 1500 cells/cumm to >11000 cells/cumm. Leucopenia with less than 4000 cells/cumm was present in 25% cases. In the present study out of 100 cases of dengue fever, 90% cases had thrombocytopenia and 10% cases had severe thrombocytopenia (<20,000/cumm) with bleeding manifestations.

Conclusion: Hemoconcentration, leucopenia, thrombocytopenia, and raised liver enzymes SGOT and SGPT along with reactive/ plasmacytoid lymphocytes on peripheral smear gives enough clues to test for dengue serology so that dengue cases can be diagnosed in their initial stages. This facilitates early treatment and aggressive fluid replacement therapy with good nursing care so that fatality rates can be reduced.

Keywords: Dengue, Hemogram, Hematocrit, Leucopenia.

Introduction

The word dengue is believed to have originated from Swahili language "ki denga pepo", which describes sudden cramp like seizure. The clinical symptoms suggestive of dengue virus infection were described as early as 265-420 AD in China. At that time the disease was associated with water and insects. [1] Dengue is one of the most important viral diseases especially in the tropical regions. According to the WHO almost 50 million people get dengue infection annually and

WHO estimates almost half of the world's population lives in countries having endemicity for dengue infection. [2]

There are four anti-genetically related but distinct serotypes of the dengue virus: DENV-1, DENV-2, DENV-3, and DENV-4. It is a positive-stranded encapsulated ribonucleic acid (RNA) virus. In humans, one serotype produces lifelong immunity against reinfection but only temporary and partial immunity against the other serotypes.1 Classic dengue fever is marked by rapid onset of high fever, headache, retro-orbital pain, diffuse body pain (both muscle and bone), weakness, vomiting, sore throat, altered taste sensation, and a centrifugal maculopapular rash. The WHO 2009 classification divides dengue fever into two groups: dengue with or without warning signs and severe dengue, though the 1997 WHO classification is still widely used. The 1997 classification divided dengue into undifferentiated fever, dengue fever (DF) and dengue hemorrhagic fever (DHF). DHF is further divided in to I to IV grades. III and IV grades are called as dengue shock syndrome (DSS). [3,4] Four main characteristic manifestations of dengue illness are continuous high fever lasting 2-7 days, haemorrhagic tendency as shown by a positive tourniquet test, petechiae or epistaxis and evidence of plasma leakage manifested by hemoconcentration (an increase in hematocrit 20% above average for age, sex and population), pleural effusion and ascites, etc. [5,6]

The risk of severe bleeding in dengue is much higher with a secondary infection and is seen in about 2-4% of cases having secondary infection. [7-10] Atypical presentations are also encountered with acute liver failure, encephalopathy with seizures, renal dysfunction and lower gastrointestinal bleeding. [11]

Leukopenia is the most prominent hematological change, sometimes with counts of less than 2 x 103/µL. However, there are reports of mild leukocytosis at the onset of the disease, with neutrophilia. Lymphocytosis is a common finding, with the presence of atypical lymphocytes. The hematocrit concentration should be monitored according to the days of illness, remembering that, with the progression to DHF, there will be a 20% increase in hematocrit from the patient's baseline, associated with thrombocytopenia (< 100 x 109/L). [12,13]

This study is an attempt to elucidate the positive laboratory profile of serologically diagnosed dengue patients so as to facilitate early diagnosis, treatment, management and vector control measures, to reduce the morbidity and mortality because of this disease.

Methods

This was a descriptive study with analysis of patients who were admitted for dengue fever in the Department of Medicine, BMIMS, Pawapuri, Nalanda, Bihar, India for duration of 6 months. This study was conducted on 100 indoor patients. Patients presenting to the emergency department, outpatient department (OPD) with complaints of fever and clinical features of dengue with positive NS1 antigen test or dengue antibody serology IgM or IgG or both were included in the study. Age, gender, clinical presentation, duration of fever, dehydration, hemodynamic status, urine output, hepatomegaly, ascites, pleural effusion, presence of petechiae, positive tourniquet test, other bleeding manifestations, hematocrit and platelet count were recorded at presentation.

Inclusion criteria

Inclusion criteria were febrile patients with positive NS1 antigen or IgM or both on rapid card tests. IgG may be positive or negative.

Exclusion criteria

Exclusion criteria were patients with only IgG positive on rapid card tests were excluded from the study. Patients with other identified illnesses like typhoid,

malaria which were coexisted with dengue positive serology were excluded from the study.

Hemogram was done on automated cell counter analyzer (Sysmex XP 100) which included hemoglobin, hematocrit, total leucocyte count (TLC), differential leucocyte count (DLC) and platelets count.

Platelets counts were cross checked on stained smears. Hematocrit raised >20% of normal was considered as hemoconcentration. Leukopenia was taken as total leucocyte count <4,000/mm3. Thrombocytopenia was taken as platelets count <1,00,000/mm3.

Biochemical parameters included serum Aspartate aminotransferase (AST), Alanine aminotransferase (ALT), total bilirubin (T. Bil.) and alkaline phosphatase (ALP) were done on Cobas c 311 from Roche (Hitachi) biochemistry machine.

Statistical analysis

The recorded data was compiled and entered in a spreadsheet computer program (Microsoft excel 2007) and then exported to data editor page of SPSS version 15 (SPSS Inc., Chicago, Illinois, USA). For all tests, confidence level and level of significance were set at 95% and 5% respectively.

Results

Table 1: Age wise distribution of study participants

Age in years	N	%
20-30	45	45
31-40	25	25
41-50	15	15
51-60	8	8
>61	7	7
Total	100	100

Most of the cases were seen in the 20-30 years age group followed by 31-40 years age group.

Table 2: Distribution of clinical features

Clinical Features	N	%
Fever	40	40
Myalgia	15	15
Fever and myalgia	12	12
Headache	8	8
Nausea and vomiting	7	7
Fever and skin rashes	8	8
Petechiae	6	6
Fever and itching	4	4

Majority of the patients were males compared to females and the male to female ratio was 2:1. Fever was the most common presentation and was seen in 40 cases (40%) cases.

Table 3: Distribution of study population by hemoglobin and hematocrit level

Hemoglobin			Hematocrit		
Hb (gm/dl)	No. of cases	%	HCT (%)	No. of cases	%
6-8.9	10	10	20-26	-	-
9-11.9	40	40	27-36	45	45
12-14.9	35	35	37-46	35	35
15-17.9	15	15	47-56	20	20

Present study showed hemoglobin range of 6 gm% to 17.9 gm% (Table 3). Raised hematocrit (>46%) was noted in 20 (20%) of patients at presentation and the hematocrit ranged from 20-51%. The total leukocyte count ranged from 1500 cells/cumm to >11000 cells/cumm. Leucopenia with less than 4000 cells/cumm was present in 25% cases. In the present study out of 100 cases of dengue fever, 90% cases had thrombocytopenia and 10% cases had severe thrombocytopenia (<20,000/cumm) with bleeding manifestations.

Discussion

Dengue fever is an infectious disease which is difficult to distinguish from other viruses prevalent in our region as there are no specific markers that can diagnose the disease early. Because it is a disease that can evolve with serious consequences and even be fatal, this study aimed at analyzing clinical and epidemiological data and laboratory dynamics in order to try to identify biomarkers that are predictive of severity. Dengue is caused by a virus belonging to the Flaviviridae family (single-stranded, positive, and non-segmented RNA virus). Infection with one serotype confers immunity to only that serotype, and hence, a person may be infected up to 4 times. Humans are the main reservoir of dengue virus. [2]

The most common age group affected in our study was 21–30 years and males outnumbered females which is comparable to that of studies done by Neeraja et al. [14] and Kumar et al., [15] and the reason for male preponderance is said to be due to their clothing habits or outdoor activities. Dengue is hemorrhagic viral fever which can prove fatal therefore this study is aimed at analyzing hematological and biochemical parameters for early diagnosis of dengue fever. Thrombocytopenia, leucopenia, increased hematocrit, lymphocytosis with reactive/ atypical/ plasmacytoid lymphocytes along with altered liver function tests are the hematological and biochemical abnormalities that appear in dengue fever.

In our study majority of the patients were males compared to females and the male to female ratio was 2:1. Deshwal et al and Vibha et al too observed a male predominance in their studies with 72.8% and 70% male patients respectively. [16,17] In this study, we found that fever was the commonest symptom in dengue patients, followed by headache/retro-orbital pain and myalgia. Other prominent symptoms were arthralgia, skin rash, skin hemorrhage, loose motion, mucosal bleed and nausea/vomiting. These findings were comparable to those documented by others, though the frequencies of the symptoms varied slightly. In our study, itching, especially in the palms and soles, was noted in 01% of patients which was comparable to similar study by Deshwal et al. [16]

Present study showed hemoglobin (Hb) ranging from 6 gm% to >15 gm%, 40 cases showed Hb of 9-11.9 gm%, followed by 35 cases showed Hb of 12-14.9 gm%, 10 cases had Hb of 6-8.9 gm% and 15 cases had Hb of 15-17.9 gm%. In the study by Meena et al hemoglobin ranged from 7.5-17.5 g/dl; mean hemoglobin value was 12.6 g/dl. [18] Hemoglobin level more than 15gm% was seen in 6% cases. Dongre et al observed hemoglobin level from 3.6 gm/dl to 16.7gm/dl with a mean of 11.9 gm/dl. [19] Studies done by Gajera et al and Butt et al showed hematocrit values raised in 28%-50% cases. In studies done by Gajera et al and Butt et al there are more cases of dengue hemorrhagic fever 30% and 100% respectively. [20,21]

In the present study, total leukocyte count ranged from 1500 to >11000 cells/mm3. In Meena et al study total leukocyte count ranged from 1310 to16700 cell/mm3, with mean total leukocyte count of 4701 cells/cumm. [22] In studies done by Yaseen et al TLC <4,000/mm3 was seen in 50% and Gajera et al TLC <4,000/mm3 was seen in 39% and >11,000/mm3 was

seen in 12% cases which was similar to our study. [20,21] Leucopenia has been reported among dengue patients in many studies leucopenia is the most prominent hematological change sometimes with counts of less than 2,000/mm3. [23] However mild leucocytosis with neutrophilia is seen at the onset of the disease developing leucopenia later on. Lymphocytosis was the common finding with the presence of atypical and plasmacytoid lymphocytes on peripheral smear were representative of augmented immune response to control the spread of dengue virus infected cells.

Conclusion

Hemoconcentration, leucopenia, thrombocytopenia, and raised liver enzymes SGOT and SGPT along with reactive/ plasmacytoid lymphocytes on peripheral smear gives enough clues to test for dengue serology so that dengue cases can be diagnosed in their initial stages. This facilitates early treatment and aggressive fluid replacement therapy with good nursing care so that fatality rates can be reduced. The disease was more severe in individuals aged 15 years and older with a more pronounced and persistent presence of liver abnormalities (AST, ALT) and hemoconcentration. The study results are relevant in the characterization of biological markers in the evolution of the disease and can be used as markers for the most severe forms thereby enabling early help with the adaption of therapeutic conduct for specific patients.

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