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Original Research Article

Assessment of clinical and hematological profile in dengue fever

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ABSTRACT

Background: 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. 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 study was conducted on 80 indoor patients. Patients presenting to the emergency department, outpatient department (OPD) or pediatric 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. 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.
Results: Raised hematocrit (>47%) was noted in 10 (16.6%) 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 80 cases of dengue fever, 85% cases had thrombocytopenia and 15% cases had severe thrombocytopenia (< 20,000/cumm) with bleeding manifestations.
Conclusions: 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.

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 thrombocytopoenia (platelet count <100×109/l); 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]

Most common clinical presentation of dengue fever (DF) is of an acute febrile viral disease with headaches, bone, joint and muscular pains, rash and leucopenia. It is also known as break bone fever due to the severe bone pains.[7]

Dengue hemorrhagic fever (DHF) is characterized by four major clinical manifestations: high grade fever, hemorrhagic phenomena, often with hepatomegaly and, in severe cases, signs of circulatory failure. Severe plasma leakage in these patients can lead to hypovolemic shock and circulatory failure. This is called dengue shock syndrome (DSS) and can lead to death.[8]

Clinical diagnosis of early dengue patients is challenging as it presents with nonspecific symptoms, including fever, headache and myalgia. Since there are many infectious diseases which have similar clinical features, a combination of clinical and laboratory parameters in any acute febrile illness could be used as markers to diagnose early dengue infection.

So, 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 General Medicine at Tertiary Care center of Gujarat for duration of 6 months. This study was conducted on 80 indoor patients. Patients presenting to the emergency department, outpatient department (OPD) or pediatric 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

Most of the cases were seen in the 20-30 years age group (Table 1). 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 34 cases (42.5%) cases (Table 2).

Present study showed hemoglobin range of 6 gm% to 17 gm% (Table 3). Raised hematocrit (>47%) was noted in 10 (16.6%) 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 80 cases of dengue fever, 85% cases had thrombocytopenia and 15%

cases had severe thrombocytopenia (<20,000/cumm) with bleeding manifestations.

Table 1: Age wise distribution of study participants.

Age in years	Number	Percentage
20-30	37	46.25
31-40	15	18.75
41-50	16	20
51-60	7	8.75
>61	5	6.25
Total	80	100

Serum AST and ALT were elevated in 69% cases and were normal in 31% cases. In the present study, hepatomegaly was noted in 32% and splenomegaly was seen in 17% of cases.

Table 2: Distribution of clinical features.

Clinical features	Number	Percentage
Fever	34	42.5
Myalgia	10	12.5
Fever and myalgia	12	15
Headache	4	5
Nausea and vomiting	6	7.5
Fever and skin rashes	6	7.5
Petechiae	5	6.25
Fever and itching	3	3.75
Total	80	100

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

Hemoglobin level			Hematocrit		
Hb (gm/dl)	**No. of cases**	**%**	**HCT (%)**	**No. of cases**	**%**
6-8.9	08	10	20-26	-	-
9-11.9	32	40	27-36	38	47.5
12-14.9	28	35	37-46	28	35
15-17.9	12	15	47-56	14	17.5
Total	80	100%	Total	80	100%

DISCUSSION

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. Hematological and biochemical profile of serologically confirmed 80 dengue cases were done.

In the present study most of the cases were seen in the 20-30 years age group. Deshwal et al studied a total of 515 patients of dengue.[9] In their study too maximum patients were in 21-40 years age group (62.91%). Vibha et al studied 100 patients, and observed 49 (49%) to be in the 15 to 25 years age group followed by 33 (33%) cases in the 26 to 35 years age group.[10] Meena et al (12 did a randomized study of 100 patients with dengue fever.[11] Ahmed et al (n=205) observed the age range for dengue as 10-65 years and the mean age was 31.29 years (SD+13.65).[12] Our findings compare well with the observations of the above authors.

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.[9,10] The male to female ratio was 1.7:1 in Vibha et al study. In the study by Ahmed et al the number of males was 193 (94.15%), while females were 12 (5.85%) with male to female ratio of 9:1 approximately.[12]

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.[2]

Present study showed hemoglobin (Hb) ranging from 6 gm% to >15 gm%, 32 cases showed Hb of 9-11.9 gm%, followed by 28 cases showed Hb of 12-14.9 gm%, 08 had Hb of 6-8.9 gm% and 12 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.[12] 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.[13] Studies done by Gajera et al and Butt et al showed hematocrit values raised in 28% and 50% cases respectively. In studies done by Gajera et al and Butt et al there are more cases of dengue hemorrhagic fever 30% and 100% respectively.[14,15]

In the present study, total leukocyte count ranged from 1500 to >11000 cells/mm^3. In Deshwal et al study

leucopenia was noticed in around 20.19% of cases.[9] In Meena et al study total leukocyte count ranged from 1310 to16700 cell/mm^3, with mean total leukocyte count of 4701 cells/cumm.[11] In studies done by Yaseen et al and Gajera et al TLC <4,000/mm^3 was seen in 50% and 39% cases respectively and >11,000/mm^3 was seen in 12% cases which was similar to our study.[14,15] 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/mm^3. 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.

In the present study out of 80 cases of dengue fever, 85% cases had thrombocytopenia and 15% cases had severe thrombocytopenia (<20,000/cumm) with bleeding manifestations. Serum AST and ALT were elevated in 69% cases and were normal in 31% cases. In the present study, hepatomegaly was noted in 32 % and splenomegaly was seen in 17% of cases. This was similar to study done by Shekar et al in which thrombocytopenia was seen in 61% cases[16]. While in studies done by Gajera et al and Tahlan et al platelet count <1 lakh/mm^3 was seen in 81% and 67.39% cases respectively.[14,15] Reason for discrepancy was we were having more early cases of dengue fever as compared to these studies. In study done by Ahmed et al Platelet count <1 lakh/mm^3 was observed in 54.7% of the cases. Moderate thrombocytopenia and severe thrombocytopenia were found in 16.98% and 3.77% of the patients respectively which is very much similar to our study.[17] Bone marrow suppression, immune-mediated clearance and spontaneous aggregation of platelets to virus infected endothelium may be responsible for such thrombocytopenia. Platelet count starts falling from as early as 3rd day of the onset of symptoms and starts recovering by 7th to 9th day of illness.

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. This would minimize morbidity and mortality arising out of serious complications of dengue fever.

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