Study of Hematological Parameters In Dengue Fever: A Retrospective Study

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Abstract: Background and objectives: Dengue is a major preventable and treatable cause of morbidity and mortality among children and adults. Hematological examination is an essential step in the management. Hence this study was undertaken to document the haematological changes in dengue fever. Method: This is a retrospective study conducted in the Department of Pathology for a period of 6 months from January to June 2016. All patients with fever and clinical suspicion of dengue were subjected to NS1 antigen test. Patients with documented NS1 positivity were included in the study. Hematological analysis was done by 5 part differential cell counter and subsequent peripheral smear examination. Results: Total 57 serologically positive dengue cases were seen during the study period. Maximum no of cases were seen in January-February. Range of haemoglobin percentage was lowest 4.2 g/dl and highest 15.6 g/dl with a mean of 11.95g/dl. 50.8% had platelets above 75000 while 5.3% had <20000/cu mm. 52.6% had normal leucocytic count, 35% had leucopenia and 12.3% had leucocytosis. Conclusion: Dengue infection is on a rise in india. Many experts believe that it is now endemic in india and no longer seasonal since a cases can be detected round the year though the peak incidence still remains during the rains. Any patient with fever and other clinical symptoms suspicious of dengue should be subjected to complete haematological profile as well as specific tests for dengue. Early and prompt diagnosis goes hand in hand with aggressive measures for proper sanitation can greatly limit dengue afflicted mortality. [Madhuri K NJIRM 2017; 8(4):58-62]

Key Words: Dengue, endemic, leucopenia, thrombocytopenia, dengue shock syndrome

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Introduction: Dengue is a major preventable and treatable cause of morbidity and mortality among children and adults that occurs mainly in tropical and subtropical regions.[1]

According to the estimates of the WHO, about 50 million cases of dengue fever occur annually worldwide and 2.5 billion people live in the risk areas.[1,2,3,4]

It has emerged as a major international health problem with an expanded geographical distribution and potential to cause major epidemics.[5]

The disease is mainly found in the tropical and sub-tropical regions around the world.[5]

In 2005, the International Health Regulation (IHR)included the dengue fever as an emergent public health disease, with implications for health safety due to the spread of the disease beyond national boundaries.[1,2,4]

The incidence of dengue fever (DF) has increased manifold in the last four decades. In developing nations like India, unplanned urbanization and migration of population from rural to urban areas with lack of proper sanitation facilities are important factors resulting in this situation.[4]

Dengue infection is one of the leading causes of death and hospitalization in India. According to the WHO, dengue infection has existed in India for more than a century. The dengue virus was first isolated in India in 1946 and many outbreaks have been reported since.[6] In India, Dengue is widespread and 'endemic' in most major cities. This term is used when a virus, disease circulates throughout the year as is the case with dengue in India.[7]

Since the occurrence of the first outbreak to recent times a change in the pattern of its occurrence has been noted and it is being slowly estabilished that the virus no longer has a "season" in India.[1]

Dengue fever is an acute febrile illness characterized by a sudden onset of fever, intense headache, myalgia, retro-orbital pain, anorexia, gastrointestinal disturbances and rash.[8] Clinical manifestations range from uncomplicated dengue fever to dengue hemorrhagic fever (DHF) with/without shock.[1,5,9]

Dengue fever is caused by four closely related but serologically distinct dengue virus strains called DEN-1, DEN-2, DEN-3 and DEN-4, also referred to as an arbovirus (arthropode borne virus) that belongs to the genus flavivirus of the family Flaviviradae.[1,2,4]

Several serotypes can be in circulation during an epidemic.[10]

All four serotypes of dengue have been isolated in India. It is spread by the female aedes mosquito which breeds exclusively in domestic man-made water receptacles.[9]

Transmission to humans occurs by the bite of the female Aedes aegypti and Aedes albopictus mosquito infected by one of the four serotypes of the mosquito.[1,5,11.]

The mosquito , a domestic species adapted to urban conditions, is the main vector in India.[1]

In humans, the incubation period ranges from 3 to 15 days (intrinsic incubation) with an average of 5 days.[1,2]

The period of transmission from humans to mosquitoes begins one day before the start of fever, up to the sixth day of the illness, corresponding to the viremia phase.[1,2]

There is, as yet, no vaccine or specific anti-viral therapy for DF/DHF and management of cases remains largely supportive.[12]

There is no specific anti-viral treatment for dengue and management includes supportive therapy and hydration with close monitoring for signs and symptoms suggestive of DHF/Dengue Shock Syndrome(DSS)[.9]

Infection with one dengue serotype confers lifelong homotypic immunity to that serotype and a very brief period of partial heterotypic immunity to other serotypes, but a person can eventually be infected by all four serotypes.[5,10]

Early diagnosis of dengue is important for provision of special care which ensures marked reduction in morbidity and mortality.[1]

Hematological examination is an essential step in the management of these patients. Hence this study was undertaken to document the haematological changes in dengue fever.[11]

The haematological effects observed are changes in blood counts, hemoconcentration due to plasma leakage, leucopenia due to decreased neutrophils near the end of the febrile phase, presence of atypical lymphocytes, and relative lymphocytosis before shock, thrombocytopenia and changes in blood hemostasis with frequent presence of hemorrhagic manifestations.[8]

A small percentage of persons who have previously been infected with one dengue serotype develop bleeding and endothelial leak upon being infected with another dengue serotype. This syndrome is termed dengue hemorrhagic fever (DHF).[10]

DHF and DSS represent the severe end of the disease spectrum, which, if not properly managed, would result in significant mortality.[12]

The present study was conducted to find out the frequency of dengue positive cases in a tertiary care government healthcare setup in Mumbai from January to June when dengue virus is thought to be dormant in an effort to establish the fact that dengue fever in India is no longer seasonal . Routine haematological examination can help predict the infection by the specific haematological changes observed in the disease.

Aims And Objectives:
1. To study the number of dengue positive cases from January to June
2. To know the haematological profile associated with seropositive dengue cases.

Inclusion Criteria: All NS1 positive cases

Method: This is a retrospective study conducted in the Department of Pathology for a period of 6 months from January to June 2016. All patients with fever and clinical suspicion of dengue were subjected to NS1 antigen test. Patients with documented NS1 positivity were included in the study. Hematological analysis was done by 5 part differential cell counter and subsequent peripheral smear examination.

Results: Total 57 serologically positive dengue cases were seen during the study period. Out of these, 40 (70.2%) were males and 17(24.8%) were females with M:F ratio of 2.35:1. Cases ranged from 12-70 years of age. More males (70.2%) than females (24.8%) tested positive for dengue.

Table 1

Month	Number of Cases	Males	Females
January	20	12	8
February	19	17	2
March	0	0	0
April	2	2	0
May	9	5	4
June	7	4	3

Maximum no of cases were seen in January-February (68.3%).

Hemoglobin: Range of haemoglobin percentage was lowest 4.2 g/dl and highest 15.6 g/dl with a mean of 11.95g/dl. Hemoglobin percentage were grouped as <5g/dl, 5-8g/dl. 8-11g/dl and>11g/dl.

Table 2: Hemoglobin percentage of patients

Hb (g/dl)	No. of patients
<5	1
5-8	4
8-11	25
>11	27

Hematocrit were grouped as <30. 30 to 40 and >40.

Table 3: Hematocrit of patients

Hematocrit	No. of patients
<30	20
30 to 40	20
>40	17

35% had low hematocrit, 35% had normal hematocrit and 30% had raised hematocrit suggesting hemoconcentration.

Platelet counts of the patients were grouped as follows: <20 000/cumm, 20000to 50000 / cumm, 50000 to 75000 /cumm and >75000/cumm

Table 4: Platelet count of patients

Platelet count	No. of patients
<20,000	03
20-50,000	08
50-75000	17
>75,000	29

50.8% had platelets above 75000
 5.3% had <20000
 14% had 20-50000
29.8% had platelets 50-75000

Total leucocyte count were grouped as <4000/cumm, 4000 to 11000/cumm and >11000/cumm/

Table 5: Total leucocyte count of patients

Total leucocyte count /cu mm	No. of patients
<4000	20
4000-11000	30
>11000	7

52.6% had normal leucocytic count, 35% had leucopenia and 12.3% had leucocytosis.

Discussion: Dengue fever is a self limiting disease. Dengue hemorrhagic fever causes morbidity and mortality. No anti viral treatemt is available hence fluid and electrolyte replacement is and supportive therapy are the available modalities of treatment. Since no vaccine is available for the disease, vector control is the only way to check the transmission of the disease.[1]

Most of the patients are within normal range of haematological profile in early course. [4]

Total 57 serologically positive dengue cases were seen during our study period. Out of these, 40(70.2%) were males and 17(24.8%) were females with M:F ratio of 2.35:1 Similar results were seen in studies by Patel et al and Meena et al and Deshwal et al.[1,8,10]. This can be related to the increased risk of exposure of male gender to mosquito bites due to outdoor occupational activities.[1]

In our study,thrombocytopenia was a frequent finding, though severe thrombocytopenia (<20000) was found in only 5.3% of the patients.

Dengue is caused by four distinct serotypes. Infection with one serotype confers immunity only to that serotype, hence a person may be infected four times. Cross reactive anti dengue antibodies from previous infections bind to the new infecting serotype and enhance viral uptake by monocytes and macrophages. This antibody dependant mechanism results in an amplified cascade of cytokines and complement activation causing endothelial dysfunction and consumption of coagulation factors leading to plasma leakage and hemorrhagic manifestations. The severity of the disease depends on the strain and the serotype of the virus, age of the patient and the degree of viremia.[4]

 Similar results were found by Patel et al , Meena et al and Deshwal et al.[1,8,10] Thrombocytopenia is due to the direct and antibody mediated destruction of the

platelets and megakaryocytes and also due to the suppression of the bone marrow by the virus.[1]

Other explanations for thrombocytopenia include presence of antibodies directed against the platelets.[5] In our study, 35% patients demonstrated leucopenia. Study by Patel et al showed leucopenia in nearly half the patients while in the study by Deshwal et al, leucopenia was seen in only 4% cases with leucocytosis being more a more prominent finding.[1,8]. Leucocytosis is usually observed in patients with Classical Dengue in the first few days of the disease, followed by leukopenia.[2] Leucopenia is due to the direct suppression of bone marrow by the virus.[1]

Dengue causes leucopenia with lymphocytosis and thrombocytopenia.[9]. The causes include bone marrow suppression and binding of dengue antigens to platelets and antibody mediated immunological destruction of platelets.[9] WBC changes are poor indicators of severity of the disease. The changes in WBC count are useful in differentiating dengue fever from other febrile illnesses.[9]

Atypical lymphocytes are seen in a large percentage of patients; however, atypical lymphocytes are also seen as a non-specific response to any viral infection.[11]

Conclusion: Dengue infection is on a rise in india. Many experts believe that it is now endemic in india and no longer seasonal since a cases can be detected round the year though the peak incidence still remains during the rains. This can be attributed to improper sanitation and unplanned urbunisation. Stagnant water including sources like open drains and any water stored in the household — bathrooms, kitchens and coolers are the commonest breeding grounds. Potholes on the roads where water collects is a source often ignored. Measures to maintain proper sanitation and to create awareness for the same are required round the year and not merely during the peak season since non seasonal form of dengue is on a rise and cannot be ignored. Any patient with fever and other clinical symptoms suspicious of dengue should be subjected to complete haematological profile as well as specific tests for dengue. Early and prompt diagnosis goes hand in hand with aggressive measures for proper sanitation can greatly limit dengue afflicted mortality.

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