

Original Articles

Importance of Platelet Count and Hematocrit in Dengue Fever in Children

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Abstract:

Background: Dengue fever has become one of the most important public health concerns now a day due to increasing complications and fatal outcomes. Dengue hemorrhagic fever and dengue shock syndrome are life threatening but reversible complications of dengue fever.

Objectives: This study was performed to evaluate the relationship between platelet count and hematocrit with the severity of dengue infection in pediatric age group.

Materials & Methods: This was a prospective observational study which included 280 dengue seropositive children of 1 month to 15 years, conducted during 1st June to 30th November, 2018 in a tertiary care hospital of Dhaka.

Results: Out of 280 dengue cases, 187(66.78%) had thrombocytopenia and 88(47%) had raised hematocrit. Among the thrombocytopenic patients 44% had dengue fever, 47% had dengue hemorrhagic fever and 9% dengue shock syndrome. A significant co-relation was observed between the severities of thrombocytopenia and raised hematocrit with the appearance of dengue warning signs in case of dengue hemorrhagic fever.

Conclusion: Thrombocytopenia and raised hematocrit were related to the severity of dengue hemorrhagic fever.

Key words: Dengue fever, Dengue hemorrhagic fever (DHF), Dengue shock syndrome (DSS), Hematocrit, Platelet count, Thrombocytopenia

Introduction:

Dengue fever is the most important mosquito-borne viral disease in the world. Globally, 100 million dengue fever cases and half a million cases of dengue hemorrhagic fever (DHF) occur in a year.¹ It is a significant public health problem in Southeast Asia as two to three epidemics are reported in a year.² The incidence of dengue fever has increased to 30 fold in the past 50 years due to rapid and unplanned urbanization of developing countries.³ It is characterized by biphasic fever, myalgia, headache,

rash, leucopenia and various degree of thrombocytopenia.⁴ Thrombocytopenia can occur in the initial stage of dengue fever or it may develop during the hemorrhagic phase. Dengue hemorrhagic fever and dengue shock syndrome are life threatening but reversible complications of dengue virus infection.⁵ Dengue shock syndrome is associated with increased vascular permeability.⁶ Severity of the disease is related to decreasing platelet counts, which is also associated with increased hematocrit, increased liver enzymes and altered coagulation profile.⁷ In spite of a number of discoveries regarding pathogenesis and management of dengue infection, it is still dreadful. Patient may develop shock or may experience severe bleeding within short time. Bleeding may not always correlate with platelet count as other factors like

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altered coagulation profile and deranged liver functions may be responsible.⁸ This study aimed to evaluate the relationship of platelet count and hematocrit to determine the severity of dengue infection in pediatric age group.

Materials and Methods:

In this prospective observational study, children of 1 month to 15 years, seropositive for dengue fever (either NS 1 or dengue serology for IgM) admitted in Dr.MR Khan Shishu Hospital, a tertiary care pediatric hospital in Dhaka, between June to November, 2018 were enrolled. Before enrollment consent was taken from parents or caregivers of each child. Prior approval from the ethical review committee of this hospital was taken for the study. Meticulous history was taken and thorough clinical examination was done. Laboratory parameters like complete blood count, serial platelet count and hematocrit, liver function test, chest X-ray, and abdominal sonography were done when required. The children were followed up clinically to develop symptoms of dengue hemorrhagic fever, dengue shock syndrome and correlated with the respective platelet and hematocrit count. Children with other comorbidities like enteric fever, rickettsial fever, malaria, meningitis, hepatitis

were excluded from the study. Initially total 280 seropositive dengue fever cases were enrolled in this study and then data were analyzed among 187 cases of thrombocytopenia in seropositive dengue fever cases. The case definitions, diagnosis, and management of dengue fever were done according to WHO guidelines. Thrombocytopenia was defined as platelet count below 100,000/cumm according to WHO guideline.⁹ During analysis of signs and symptoms abdominal pain or tenderness, persistent vomiting, clinical fluid accumulation, mucosal bleeding, lethargy, restlessness, liver enlargement more than 2 cm were considered as severe dengue (Dengue warning signs) according to WHO guideline.^{9,10}

Results:

Among total 280 seropositive cases of dengue fever, 166(59.3%) were male and 114(40.7%) were female. Majority of the children with dengue cases were from age group 6 to 10 years and there was a male predominance in that age group. The least number of patients were seen in the age group 1 month to 1 year. Table-I shows the age and sex distribution of the study population.

Table-I
Age and sex distribution of the study population (n=280)

Sex	Age group				Total
	1 mo-1 year	2-5 year	6-10 year	11-15 year	
Male	12 (7.2%)	58 (35%)	72(43.35%)	24 (14.45%)	166
Female	18 (15.8%)	40 (35%)	34 (29.8%)	22 (19.4%)	114
Total	30(10.71%)	98 (35%)	106(37.8%)	46 (16.42%)	280

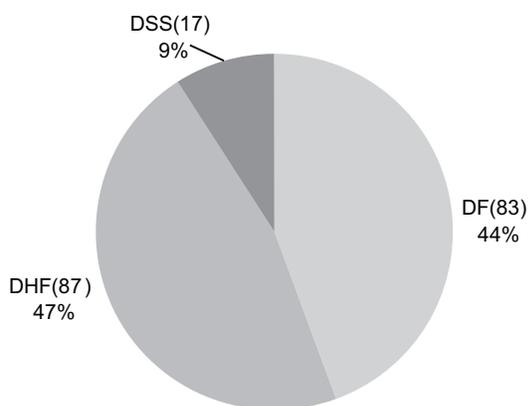


Fig-1: *Frequency of different types of dengue infection in thrombocytopenic children (n=187)*

Out of 280 dengue cases, 187(66.78%) had thrombocytopenia and 93(33.21%) had normal platelet count.

Figure-1 shows the distribution of dengue fever, dengue hemorrhagic fever and dengue shock syndrome among the thrombocytopenic patients. Thrombocytopenic patients were again divided into three groups according to the severity. Table II shows the three groups of thrombocytopenia.

Table II

Severity of thrombocytopenia in study population (n=187)

Platelet count /cumm	No.of cases
Mild (51,000- 100,000)	81 (43.31%)
Moderate (21,000- 50,000)	80 (42.78%)
Severe(<20,000)	26(13.91%)
Total	187

The thrombocytopenic patients were followed clinically for the development of dengue warning signs and were correlated with respective platelet count. Among the cases of thrombocytopenia (n=187), it was noted that 41.98% (34/81) cases of mild thrombocytopenia, 56.25% (45/80) cases of moderate thrombocytopenia and 96.16% (25/26) of severe thrombocytopenia developed dengue warning signs. A significant co-relation was observed between all categories of thrombocytopenia and development of dengue warning signs. Table III shows the relationship of thrombocytopenia with dengue warning signs in case of dengue hemorrhagic fever and dengue shock syndrome.

Table III

Dengue warning signs in thrombocytopenic cases (n=187)

Thrombocytopenia	Presence of Dengue warning sign	P value
Mild(n=81)	34/81(41.98%)	<0.005
Moderate(n=80)	45/80(56.25%)	<0.005
Severe(n=26)	25/26(96.16%)	<0.005

Out of total 187 thrombocytopenic children, 88(47%) had raised hematocrit count (20 percent or more from the baseline).Platelet count was correlated with raised hematocrit. Hematocrit value rose significantly in case of severe and moderate thrombocytopenia, but not in mild thrombocytopenia. Table IV shows the relationship between thrombocytopenia and raised hematocrit.

Table IV

Relation between thrombocytopenia and raised hematocrit in dengue infection (n=187)

Platelet count/cumm	Raised hematocrit	P value
<20,000(n=26)	21/26(80.76%)	<0.05
21,000-50,000(n=80)	52/80(65%)	<0.05
51,000-100,000(n=81)	15/81(18.51%)	>0.05
Total(n=187)	88(47%)	

The thrombocytopenic children, who also had raised hematocrit were followed for the appearance of dengue warning signs. Raised hematocrit was found significant in the development of dengue warning signs when it was associated with severe and moderate thrombocytopenia. Table V showed the relationship of thrombocytopenia along with raised hematocrit with dengue warning signs.

Table V

Dengue warning signs status among dengue fever cases with thrombocytopenia along with raised hematocrit(n=88)

Thrombocytopenia along with raised hematocrit	Dengue warning signs	P value
<20,000/cumm (n=21)	20/21(95.23%)	<0.05
21,000-50,000/cumm (n=52)	35/52(67.30%)	<0.05
51,000-100,000/cumm (n=15)	3/15(20%)	>0.05
Total (n=88)	58(66%)	

Discussion:

Dengue hemorrhagic fever and dengue shock syndrome have become more prevalent in endemic areas due to secondary infection and the widespreading of the virus. Dengue virus has four serotypes (DEN 1, DEN 2, DEN 3and DEN 4). Infection with one serotype does not provide cross immunity to other serotypes and secondary infection becomes more severe.¹¹ In the present study dengue fever was more common in males (59%) and among the age group 6 to 10 year; it was consistent with the study done by Jayashree et al⁴ and Chairulfatah et al.¹² Thrombocytopenia was found in 67% of our study population. According to the study done by Shinde P A¹³, the prevalence of thrombocytopenia

in dengue fever varies from 58 to 83%. We had mild, moderate and severe thrombocytopenia in 43%, 42% and 14% among our study children, which was 40%, 31% and 8% respectively in the study done by Shinde P A.¹³

Thrombocytopenia has dependably been one of the criteria utilized by the WHO rules as a potential indicator of clinical severity.¹⁴ We also found a significant correlation between thrombocytopenia and severities of dengue hemorrhagic fever and dengue shock syndrome (Table III).

Raising hematocrit (20% or more from the baseline), is also a useful indicator of plasma leakage. Increased hematocrit value was found in 88(47%) cases of our dengue children, which was 36% in Upadhy N et al. study.¹⁵ Serial hematocrit values may help in increasing or decreasing intravenous fluids and guides us whether blood or blood products are needed or not. A significant number of thrombocytopenic children developed raised hematocrit (Table IV). This finding was consistent with the study of Jayashree K et al.⁴ Raised hematocrit along with moderate to severe thrombocytopenia was found significant in the development of severe dengue infection (Table V).

Conclusion:

Falling platelet and raising hematocrit are related to dengue warning signs thereby associated with severity of dengue infection. So careful monitoring of serial platelet and hematocrit values along with dengue warning signs can predict severity of dengue fever.

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