

Evaluation of platelet count as a predictive parameter in pediatric patients with dengue fever in a tertiary care center in Davangere

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Abstract

Background: Dengue hemorrhagic fever (DHF) and Dengue Shock Syndrome (DSS) are the two most severe complications of DF and are associated with severe thrombocytopenia and increased vascular permeability.

Objective: To determine the relationship between the platelet count and the severity of the dengue fever among paediatric age group.

Materials and Methods: This prospective study was conducted for 1 year among all Serological confirmed dengue patients admitted at a tertiary care center in Davangere. Platelet count was repeated regularly during the hospital stay and also at the time of discharge. Data was entered in excel sheet and results were analysed using epi-data software.

Results: Total 336 were confirmed cases of Dengue. Of these seropositive cases 78.6% had thrombocytopenia (<1L), 32% of the cases were noted in the age group of 6-10 years, 50% had platelet counts between 51,000 and 1 lakh. Majority (55.1%) of the cases with severe thrombocytopenia presented with DHF/DSS, the difference of which was found to be statistically significant.

Conclusion: Majority of patients with thrombocytopenia were 6-10 years of age. The occurrence of DHF/DSS increased with the severity of thrombocytopenia.

Keywords: Dengue, Platelet count, Paediatric age, Thrombocytopenia

Introduction

Malaria and dengue fever are the most common mosquito – borne diseases seen in Indian subcontinent. Recently, rate of malaria has declined largely due to adaptation of various preventive measures, but the incidence of Dengue Fever (DF) and Dengue Hemorrhagic Fever (DHF) has been increasing.⁽¹⁾ The incidence of dengue fever is estimated to have increased by 30 fold in the past few years.⁽²⁾

Dengue fever is caused by the dengue virus which is transmitted to humans by the bite of a day biting mosquito *Aedes aegypti*. Patients suffering from dengue fever (DF) present with fever, myalgia, headache, rash, leukopenia and thrombocytopenia.⁽³⁾ Dengue hemorrhagic fever (DHF) and Dengue Shock Syndrome (DSS) are the two most severe complications of DF as they are associated with decreasing platelet counts and increased vascular permeability.⁽⁴⁾ Thrombocytopenia in dengue fever with associated vascular complications is a bad prognostic indicator and is characterized by three important parameters - altered coagulation profile with increased hematocrit and liver enzymes.⁽⁵⁾

DHF/ DSS occurs most frequently in children with a history of dengue infection and in infants with waning levels of dengue antibodies derived from the mother.⁽⁶⁾ In most of the cases, thrombocytopenia occurs transiently and most of them are asymptomatic.⁽⁷⁾ Spontaneous bleeding (e.g.: intracranial hemorrhage) is seen in patients with platelet counts of <20,000. Lesser degrees of hemorrhagic manifestations like petechiae/ purpura is seen in patients with platelet counts of 20,000 – 40,000. Therefore, platelet count should be monitored

regularly among the patients suffering from dengue fever as it is an important prognostic indicator.

Hence the present study was conducted to determine the relationship between the platelet counts and the severity of the disease in pediatric patients of dengue fever.

Objective

To determine the relationship between the platelet count and the severity of the dengue fever among paediatric age group.

Material and Methods

The present study was conducted prospectively for a period of 1 year. Children below 15 years experiencing a febrile illness clinically consistent with dengue infection fulfilling the criteria for diagnosis of DF/DHF/DSS⁽²⁾ admitted at a tertiary care center in Davangere between January 2015 to December 2015 were taken for the study. All the patients who were serologically positive for Dengue were included as study subjects. After obtaining the informed consent of the parents, blood samples were collected from all 935 pediatric patients experiencing a febrile illness clinically consistent with dengue infection during the study period. Dengue Duo IgM and IgG Rapid Strip test (SD Dengue Duo, Alere) was used for the detection of dengue specific antibodies and NS1 antigen Serological confirmation of dengue infection was done in all these patients of which 336 were positive for dengue. Platelet count was repeated regularly during the hospital stay and also at the time of discharge for the confirmed dengue cases.

Data was entered into excel sheet, analysed using epi-data software. Results were expressed in terms of percentage, proportion and chi-square test.

Results

During the study period there were 935 pediatric cases admitted with fever. Of these 336 were diagnosed as Dengue positive based on serological tests. Of these

seropositive cases, 78.6% had thrombocytopenia (<1L) while the remaining 21.4% had normal platelet counts.

Majority of the dengue cases were noted in the age group of 6-10 years and in the same age group there was a male predominance. The next majority of cases were noted among 11-15 years followed by 1-5 years. The least number of cases were seen in the age group of < 1 year. (Table 1)

Table 1: Age and sex wise distribution of dengue seropositive cases

Gender	Age in years				Total
	0 – 1	2 – 5	6 – 10	11 – 15	
Male	28 (52.9%)	44 (54.3%)	62 (57.4%)	62 (66.0%)	196 (100)
Female	25 (47.1%)	37 (45.7%)	46 (42.6%)	32 (34.0%)	140 (100)
Total	53 (15.8%)	81 (24.1%)	108 (32.1%)	94 (28%)	336 (100)

Of the patients with thrombocytopenia (platelet count <1 lakh), 132 patients (50.0%) had platelet counts between 51,000 and 1 lakh (mild thrombocytopenia), 103 patients (39.0 %) had platelet counts between 21,000 and 50,000 (moderate thrombocytopenia) while the remaining 29 patients (11.0%) had platelet counts <20,000 (severe thrombocytopenia). The difference in platelet count between various age groups was found to be statistically significant. (Table 2)

Table 2: Platelet counts and age wise distribution of cases

Age groups	Platelet counts				Total	p-value
	< 20,000	21 – 50,000	51 – 1 lakh	> 1 lakh		
0 – 1	1	18	37	17	73	<0.05
	3.4%	17.5%	28.0%	23.6%	100%	
2 – 5	6	31	36	21	94	
	20.7%	30.1%	27.2%	29.1%	100%	
6 – 10	12	36	47	23	118	
	41.3%	35.0%	35.6%	32.0%	100%	
11 – 15	10	18	12	11	51	
	34.5%	17.5%	9.1%	15.2%	100%	
Total	29	103	132	72	336	
	8.6	30.7	39.2	21.4	100%	

The seropositive patients were evaluated clinically for the presence of symptoms suggestive of DHF/DSS and further were correlated with the platelet counts. All of them presented with thrombocytopenia, whereas 22 of them had features of DHF/DSS on admission. In the present study 55% cases of severe thrombocytopenia, 4.85% with moderate thrombocytopenia and 0.76% cases with mild thrombocytopenia presented with DHF/DSS (Table 3). This difference was also found to be statistically significant. (P<0.05). Those who presented with DHF/DSS had significantly low platelet count.

Table 3: Platelet counts compared with severity of disease at admission

Platelet count	Categories of dengue			p-value
	DF	DHF / DSS	Total	
<20,000	13	16	29	<0.05
	44.8%	55.1%	100%	
21 – 50,000	98	5	103	
	95.1%	4.85%	100%	
51 – 1 lakh	131	1	132	
	99.2%	0.76%	100%	
>1lakh	72	-	72	
	100%	-	100%	
Total	314	22	336	

	93.4%	6.55%	100%	
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Discussion

DEN1, DEN2, DEN3 and DEN4 are the four antigenically distinct virus serotypes responsible for DF and DHF. There is no cross immunity by infection with these viruses, and hence people from the dengue endemic area are susceptible for infection with four different dengue virus serotypes.⁽⁸⁾

In the present study majority of patients were male children (54.8%) belonging to 6-10 years age group. Similar findings were seen in the study done at Belgium.⁽⁹⁾ Other studies have noted that 5-9years is the most prevalent age group in pediatric dengue patients.^(10,11)

In the early phase, the DHF diagnosis cannot be based on the clinical findings alone, relevant investigations like decreasing platelet count and raising hematocrit helps in diagnosing DHF at the earliest. Even though low platelet count may not be seen in all DF, it is one of the diagnostic criteria as thrombocytopenia is a constant feature in DHF.⁽¹²⁾

In patients with DHF two mechanisms are operative in causing thrombocytopenia, one of them being dengue virus induced bone marrow suppression thereby decreasing the platelet synthesis and the other being an immune reaction causing increased platelet destruction.⁽⁴⁾ The present study showed that the vascular complications like DHF/DSS was more commonly seen in patients of DF with thrombocytopenia. Similar finding were noted in the study conducted by Mourao MP.⁽¹³⁾

In the present study 100% of the cases of DHF/DSS had thrombocytopenia. However, Variable prevalence of thrombocytopenia has been revealed in various studies which ranges from 58-83%.^(9,10)

The diagnosis of DF/DHF/DSS was based on the clinical criteria,⁽²⁾ whereas in the study done by de Castro et al,⁽⁴⁾ the confirmation of DHF was made by the presence of hemorrhagic manifestations like petechiae with purpura, epistaxis, menorrhagia or a positive tourniquet test. The confirmation of DSS was made when the pulse pressure was 20 mmHg or below. None of the literatures have given a clear cut description of the clinical presentation of dengue fever and the prevalence of thrombocytopenia in these patients.⁽¹³⁾ There is always a need to classify the severity of dengue infection in order to define the different entities of dengue infections.⁽⁵⁾

Platelet count greatly influenced the prognosis in the present study where those patients who showed increasing platelet count improved clinically and those with declining platelet count had a fatal outcome. This similar findings were made in the study by Mourao.⁽¹³⁾

Conclusion

Majority of the patients were 6-10year age with thrombocytopenia. There was positive correlation between severity of thrombocytopenia and development of DHF/DSS.

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