

Clinical and laboratory profile of dengue infection in children

Shah GS¹, Islam S², Das BK³

^{1,3}B P Koirala Institute of Health Sciences, Dharan, Nepal, ²Bangladesh Institute of Child Health, Dhaka, Bangladesh

Abstract

The present work is a prospective, observational, hospital based study on 100 sero positive cases of dengue infection, admitted to Dhaka Children Hospital, Dhaka, Bangladesh during the period 2000 –2001. The patients were in the age group 8 months to 14 years with a mean age of 8.3 years. The serological tests were performed by rapid strip test. Primary dengue infection (only Ig M positive) was observed in 15% cases while rest 85% were secondary dengue infection (either Ig G or both Ig M and Ig G positive). Classical dengue fever (DF) was noted in 11% patients and 89% children presented with dengue hemorrhagic fever / dengue shock syndrome (DHF / DSS). Common clinical presentations were fever, headache, retro- orbital pain, arthralgia / bone pain, vomiting, abdominal pain and bleeding manifestations. Other presentations were tachycardia, bradycardia, hypotension, hepatomegaly, splenomegaly, pleural effusion, ascites, thrombocytopenia and high hematocrit values. The incidences of tachycardia, hypotension, hepatomegaly, high hematocrit and thrombocytopenia were significantly higher in DHF / DSS cases. The tourniquet test was positive in significantly higher percentage of DF cases. The tourniquet test and thrombocytopenia did not correlate well with other bleeding manifestations suggesting alternate pathogenesis for bleeding. In an epidemic setting, if a child presents with fever, vomiting, musculoskeletal pain and bleeding along with hepatomegaly, low platelet count and high hematocrit, a strong possibility of DHF/ DSS should be kept.

Key words: Dengue fever, DHF, DSS

Dengue is a mosquito borne febrile viral illness. Since its first recognition during the last quarter of eighteenth century, outbreaks has been reported from both developed and developing countries with Asia always remaining the area of highest endemicity.^{1,2} In humans, dengue infection causes a spectrum of illness ranging from relatively mild, non specific viral syndrome known as dengue fever (DF) to severe hemorrhagic disease and death. The severe hemorrhagic form of disease is called dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS); a leading cause of hospitalization and death among children in Asia.³ Dengue virus belongs to the family Flaviviridae (single stranded nonsegmental RNA viruses) and has four distinct serotypes : DEN-1, DEN-2, DEN-3 and DEN-4. Dengue virus serotypes are distinguishable by complement fixation and neutralization tests. Infection with one serotype confers long term immunity to that serotype and therefore, a person can be infected up to four times. In fact, subsequent infection with other serotypes results in a severe illness. Human are the main reservoir for the dengue virus. Urbanization, substandard living conditions, lack of vector control and climatic changes are some of the important causes for dengue infection.⁴ During the summer of 1964, Dhaka city witnessed an outbreak of febrile illness (popularly known as Dacca fever) which was diagnosed as dengue infection on

the basis of viral and serological studies.⁵ Since then sporadic cases and small outbreaks; clinically suggestive of DF and DHF were seen in Bangladesh from time to time.⁶⁻⁸ Another outbreak occurred in Dhaka city in the year 2000 which involved younger population with severe manifestations which indicated the endemicity of the disease. The present report is on clinical features, laboratory investigations and outcome of 100 hospitalized children with dengue infection as it is essential to record the disease profile of each epidemic for strategic alterations of public health programs.

Materials and methods

This study was carried out in Dhaka Children Hospital, Dhaka, Bangladesh during the period February 2000 to July 2001, when the dengue outbreak occurred in the city. It was a prospective, observational hospital based study and included 100

Correspondence

Dr. G.S. Shah,
Assistant Professor, Department of Paediatrics
BP Koirala Institute of Health Sciences
Dharan, Nepal
E-mail: -gaurishah@yahoo.com

children in the age group of 8 months to 14 years admitted with a diagnosis of dengue infection. Informed consent was taken and the clinical and laboratory parameters were recorded in a pre designed data sheet. Paired sample of blood at the time of admission and during convalescent period were taken for serological and other relevant investigations. The serological tests for detection of IgM and Ig G were performed by rapid strip test (Dengue Duo Ig M and Ig G, Pan blow, Australia). Only serologically positive cases were taken for the final data analysis. None of the patients were vaccinated for Japanese encephalitis and yellow fever, which rules out cross reactivity.⁹ A fall of hematocrit by more than 20% on treatment was considered as high hematocrit on admission. Standard formula like ANOVA test was applied to find out the significance of difference in terms of P-value with the help of computer SPSS programme. P-value of 0.05 or less was considered as statistically significant.

Results

Hundred seropositive cases were reported in Dhaka Children Hospital during the study period. There were 11 cases of classical dengue fever (DF) while rest 89 had dengue hemorrhagic fever with/without dengue shock syndrome (DHF/DSS). The age group of the affected children was between 8 months to 14 years with a mean age of 8.3 years. Fifty seven (57%) patients were males. Ig M was positive in 15% cases suggesting primary dengue infection while in rest 85% cases, either Ig G or both Ig M and Ig G were positive, suggesting secondary dengue infection

(Table 2). However, these data may be interpreted with caution since positive test for Ig M antibodies gives only a probable diagnosis and prospective serological studies are hampered by the cross reactivity of ELISA tests with other flaviviruses.⁹ The common clinical manifestations were fever (100%), fatigue (98%), headache (98%), retro orbital pain (98%), arthralgia/bone pain (98%), vomiting (98%), abdominal pain (96%), myalgia (95%) and bleeding manifestations (68%) (Table 1). Most of the patients (77%) presented with fever ranging between 102-104⁰ F and the duration of fever was 3-7 days. The incidence of bleeding manifestations was significantly higher in DHF/DSS patients. The bleedings were in the form of skin bleeds (petechiae and purpura), subconjunctival bleeding, hematemesis, melena, epistaxis and gum bleeding (Table 2). Table 2 also depicts the comparative clinical and laboratory parameters of different types of dengue infection. There was significantly higher incidence of tachycardia, hypotension, hepatomegaly, high hematocrit and thrombocytopenia in cases of DHF/DSS as compared to classical dengue fever. Tourniquet test was performed in 41 cases where no skin bleeding was noted. The test was positive in about 61% cases with significantly higher incidence in DF cases. Severe thrombocytopenia (<50,000) was noted in 16 patients and all were cases of DHF/DSS. Leucopenia was observed in 63% of cases and about 24% cases had differential lymphocyte count of 40% or less. The duration hospitalization ranged from 7-14 days. The mortality rate of the present study was 4 per cent and all four cases were of DSS/DHF group.

Table 1: Clinical presentations of Dengue infection in children

Symptoms	Total (N=100) n (%)	DF (N=11) n (%)	DHF/DSS (N=89) n (%)
Fever [#]	100 (100%)	11(100%)	89 (100%)
Headache	98 (98%)	11(100%)	87(97.7%)
Retro orbital pain	98(98%)	11(100%)	87(97.7%)
Fatigue	98(98%)	11(100%)	87(97.7%)
Arthralgia/bone pain	98(98%)	11(100%)	87(97.7%)
Vomiting	98(98%)	11(100%)	87(97.7%)
Abdominal pain	96(96%)	9(81.8%)	87(97.7%)
Myalgia	95(95%)	10(90.9%)	85(95.5%)
Bleeding manifestations	68(68%)	0(0%)	68(76.4%)

[#] Duration of fever ranged from 3-7 days

*P-value < 0.001

Table 2: Clinical and laboratory parameters of Dengue cases

Parameters	Total (N=100) n (%)	DF(N=11) n (%)	DHF/DSS(N=89) n (%)
Bleeding	59 (59%)	0 (0%)	59 (66.2%) ***
Skin bleeds	59 (59%)	0 (0%)	59 (66.2%) ***
Hematemesis	09 (9%)	0 (0%)	9 (10.1%)
Melena	16 (16%)	0 (0%)	16 (17.9%)
Epistaxis	05 (5%)	0 (0%)	5 (5.6%)
Gum bleeding	11 (11%)	0 (0%)	11 (12.3%)
Tachycardia	60 (60%)	0 (0%)	60 (67.4%) ***
Bradycardia	29 (29%)	0 (0%)	29 (32.5%)
Hypotension	59 (59%)	0 (0%)	59 (66.2%) ***
Hepatomegaly(>3 cm)	77 (77%)	0 (0%)	77 (86.5%) ***
Splenomegaly(>1 cm)	23 (23%)	0 (0%)	23 (25.8%)
Pleural effusion	08 (8%)	0 (0%)	8 (8.9%)
Ascites	10 (10%)	0 (0%)	10 (11.2%)
+ve Tourniquet test ^a	25/41 (60.9%)	10/11 (90.9%) *	15/30 (50%)
High hematocrit ^a	85/96 (88.4%)	0/11 (0%)	85/85 (100%) ***
Thrombocytopenia (<1,00,000/mm ³)	57 (57%)	2 (18.1%)	55 (61.7%) **
Seropositivity			
Ig M positive	15 (15%)	10 (90.9%) ***	5 (5.6%)
Ig G positive	44 (44%)	0 (0%)	44 (49.4%) ***
IgM +IgG positive	41 (41%)	1 (9%)	40 (44.9%) ***

^a Tourniquet test and hematocrit were performed in 41 and 96 cases, respectively
P value - * p < 0.05, **p < 0.01, ***p < 0.001

Discussion

In the present study, most of the patients were in the age group of 5-15 years and 89% of them presented with DHF/DSS. Serologically also 85% cases had secondary dengue infection. There was no relation between the age of the patients and the symptoms.¹⁰ It suggests that most of the younger patients were sensitized for dengue viruses from early life due to frequent outbreaks endemicity of the disease around Dhaka city. Fever, fatigue, headache, retro orbital pain, myalgia, arthralgia/bone pain were the most common symptoms and occurred in almost equal frequency in DF and DHF/DSS groups. The risk factors for DHF/DSS was probably due to secondary infection with another serotype.¹¹ The frequency of constitutional symptoms were much higher in the present study as compared to a recent study from Chennai, India.¹²

The incidence of bleeding manifestations, tachycardia, hypotension, hepatomegaly, high hematocrit and thrombocytopenia were significantly higher in DHF/DSS group. We observed hepatomegaly in 77% cases which was much higher,

in contrast to previous studies¹²⁻¹⁴. The incidences of bradycardia, hypotension, and high hematocrit were much higher in this study as compared to that of Narayanan et al¹² while the incidence of thrombocytopenia was almost equal. Tourniquet test was performed in 41 cases in whom there was no bleeding manifestation and it was positive in about 91% of DF and 50% of DHF/DSS cases. Thus, the tourniquet test does not correlate well with other bleeding manifestations and may have different pathogenesis^{12, 15}. In fact, WHO no longer recommend tourniquet test as essential for the diagnosis of DHF¹. Severe thrombocytopenia was noted in 16% of our cases. However, there was no correlation between the degrees of thrombocytopenia and bleeding suggesting that the bleeding in dengue infection could be multifactorial. The mortality in the present study was similar to other studies reported in the region.^{12,16-18} All the four cases, those died were of DHF/DSS and the patients died within 4-6 hours of hospitalization.

The characteristics of DSS is rapid weak pulse with narrowing of pulse pressure (less than 20mm Hg) or profound hypotension (less than 90 mm Hg among those of 5 years of age or older). The patients recover either after volume replacement or die within 12-24 hours. The mortality rate may be as high as 40% and the prognosis depends on the duration of shock.¹⁰

To conclude, dengue infections are endemic in and around Dhaka city as secondary infections like DHF/DSS are common in childhood population. In an epidemic setting, if a child presents with fever, vomiting, and musculoskeletal pain and bleeding along with hepatomegaly, low platelet count and high hematocrit, a strong possibility of DHF/DSS should be kept. Positive tourniquet test is not essential for the diagnosis of DHF.

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