

Original Research Article

Clinical profile of dengue among children in Bangladesh: observation from a single pediatric hospital

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ABSTRACT

Background: To delineate the predominant clinical features of dengue infection among children in Bangladesh.

Methods: A cross-sectional descriptive study was in Dhaka Shishu hospital, Dhaka, Bangladesh. All children of age <18 years admitted with suspected dengue infection starting from July 2019 till September 2019 were enrolled in this study. Demographic variables, presenting complaints and examination findings were recorded on a standard questionnaire. Data was analyzed by using SPSS version 27.

Results: A total of 584 children were included in the study, of which 345 (59.1%) were male. Children ranged from age 1 month to 18 years with a mean of 5.6±4 years. Most of the children did not go to school or were less than 5 years of age 532 (91.1%). All the children presented with either high- or low-grade fever, and around half of them complained of vomiting. Notable symptoms among the children were abdominal pain in 20% cases, dehydration, and flu-like symptoms (cough and cold) in 10% of cases. Dengue warning signs were noted in 161 cases (27.6%), and vomiting was present in 43.7% of cases. Anaemia, respiratory distress, and pleural effusion were rarely noticed among the studied patients. Laboratory investigation of the dengue patients revealed that NS1 antigen was positive in 49 cases (8.4%). Haemoglobin was low in one-third of the cases, and leukopenia and thrombocytopenia were present in 23.5% and 38.7% cases, respectively. Among the dengue patients, around 12% (n=71) were infants.

Conclusions: This descriptive study identifies that vomiting, abdominal pain, and dengue warning signs are the predominant clinical features of dengue infection among children in Bangladesh. Comparison with earlier studies reveals that clinical and laboratory features of dengue might vary by age, severity and region.

Keywords: Leukopenia, Pleural effusion, Respiratory distress

INTRODUCTION

Dengue is a mosquito-borne viral infection found mostly in urban and semi-urban areas of tropical and sub-tropical countries. It is prevalent worldwide and its effect or variation in risk is influenced by local rainfall, humidity, temperature, and urbanization.¹ The virus responsible for causing dengue is called dengue virus (DENV), which belongs to the *Flaviviridae* family. Four distinct but closely related serotypes cause dengue (DENV-1, DENV-

2, DENV-3, and DENV- 4).² The virus is transmitted to humans by the bite of infected female mosquitoes, mainly of the species *Aedes aegypti* and sometimes *Ae. albopictus*.

Dengue causes a broad spectrum of diseases. It can range from subclinical disease (people may not know they are even infected) to severe flu-like symptoms in those infected. Patients usually present with fever, joint pain, body ache, rash, respiratory symptoms, gastrointestinal

disorders, and abnormal liver function tests. Although less common, some people might develop a severe form of dengue, which can have a number of complications, such as severe bleeding, organ impairment along with plasma leakage. Incubation period of dengue virus infection is 3-14 days with a variety of clinical manifestation including asymptomatic infection or undifferentiated fever dengue fever (DF), dengue hemorrhagic fever (DHF), and life-threatening dengue shock syndrome (DSS).³

Like other tropical infections, dengue infection is associated with multiple organ dysfunction involving the liver, muscles, heart, brain, and kidneys.^{4,5} Severe dengue has a higher mortality rate is not managed appropriately. This severe form of dengue was recognized during dengue epidemics of Philippines and Thailand in 1950s. Over the recent years, severe dengue is prevalent in most Asian and Latin American countries and is a leading cause of hospitalization and death among children and adults residing in these regions.

Dengue in recent years has become a major international public health concern. One modeling estimate by Bhatt et al. indicates 390 million cases of dengue fever per year, of which 96 million are severe cases.⁶ Dengue is now found in 128 countries, which indicate that 3.9 billion people are at risk of being infected with dengue virus.⁷ Despite the prevalence of dengue globally, 70% of the actual burden is in Asia.⁶ The most adversely affected countries being India, Bangladesh, Pakistan, and Sri-Lanka.^{8,9} Bangladesh seems to be facing its worst dengue outbreak since 2000, with infection affecting children, pregnant women, and older people.¹⁰⁻¹² Dengue affects any individual, irrespective of age, gender or health status. In fact, 90% of the dengue infections occur in children, and their risk of dying during a secondary attack is nearly 15-fold higher than that of adults.¹³ National surveillance data from Asian countries also report that children <1 year and 4-9 years are at the highest risk of severe dengue disease.¹⁴⁻¹⁵ Clinical features of dengue also differ between adults and children.¹⁶ Myalgia, arthralgia, retroorbital pain, and nausea are the common clinical symptoms in adults, whereas vomiting and skin rash are most prevalent among children. In terms of laboratory investigations, adults tend to have higher rates of Thrombocytopenia, Erythrocyte Sedimentation Rate (ESR) and alanine transaminase (ALT) compared to children.¹⁷

Though children are most prone to this infection, little published data are available on dengue infection in children living in South Asia. This could be because most dengue infections in younger children are asymptomatic or minimally symptomatic. A better understanding of common clinical patterns among children in dengue endemic zones like Bangladesh, would help better preparation for future outbreaks in these regions. Besides, it is also necessary to identify clinical and laboratory features associated with dengue infection in children, as

monitoring these signs and fluid-replacement therapy are the only option currently available for dengue management.

METHODS

This cross-sectional descriptive study was conducted under the department of pediatrics of Dhaka Shishu hospital, Dhaka, Bangladesh. All children of age <18 years admitted with suspected dengue infection starting from July 2019 till September 2019 were enrolled in this study. Clinically suspected cases of dengue were approached based on the national guideline for clinical management of dengue Syndrome, Bangladesh 2018.¹⁸ Children presenting with fever along with vomiting, rash and any warning signs of dengue, such as abdominal pain, persistent vomiting, bleeding or lethargy were considered a suspected case, whereas patients presenting with clinical features of suspected case along with presence of NS1 antigen were considered as confirmed cases of dengue. We excluded cases with comorbidity or co-infection from this study. The final cohort comprised 584 children, and their detailed clinical history, examination and investigation were recorded after obtaining informed consent from their parents. Data was collected by a team of skilled data collectors assigned within the department. Demographic variables, presenting complaints and examination findings were recorded on a standard questionnaire.

Laboratory assay

Laboratory investigations such as complete blood count, hematocrit, alanine transaminase (ALT) and Aspartate transaminase (AST) and other laboratory assays were performed when relevant to clinical investigation. All laboratory investigations were performed at the study site. Leukopenia was defined as total white blood cell count <4000/mm³; Thrombocytopenia was defined as a total platelet count <100 000/mm³, and elevated ALT and AST was considered when the lab value was >50 IU/L. Hematocrit reading >48% was considered high and haemoglobin <11 g/dL was considered low.

Ethical clearance

Ethics approval for the study was obtained from the ethical review committee of Dhaka Shishu hospital.

Statistical analysis

The test statistics used to analyze the data were descriptive statistics, chi-square (X²) test and Fisher's exact test where appropriate. Data were analyzed with IBM SPSS Statistics ver. 27 software

RESULT

A total of 584 children were included in the study, of which 345 (59.1%) were male. Children ranged from age

1 month to 18 years with a mean of 5.6 ± 4 years. Most of the children did not go to school or were less than 5 years of age 532 (91.1%) (Table 1).

Table 1: Demographics of the study cohort, (n=584).

Patient characteristics	Values, N (%)
Age (years)	
Infant (≤ 1)	71 (12.2)
2-5	205 (35.1)
6-10	197 (33.7)
11-14	101 (17.3)
15-18	10 (1.7)
Sex	
Male	345 (59.1)
Female	239 (40.9)
School going	
Yes	52 (8.9)
No	256 (43.8)
Under 5	276 (47.3)
Types dengue fever	
Classical	441 (75.5)
Haemorrhagic	94 (16.1)
DSS	49 (8.4)

All the children presented with either high- or low-grade fever, and around half of them complained of vomiting. Based on the conventional classification of dengue, the majority of the cases belonged to the classical dengue fever category 441 (75.5%). Notable symptoms among the children were abdominal pain in 20% cases, dehydration, and flu-like symptoms (cough and cold) in 10% of cases. Dengue warning signs were noted in 161 cases (27.6%), and vomiting was present in 43.7% of cases. Anaemia, respiratory distress, as well as pleural effusion were rarely noticed among the studied patients, (Table 2).

Laboratory investigation of the dengue patients revealed that NS1 antigen was positive in 49 cases (8.4%). Haemoglobin was low in one-third of the cases, and Leukopenia and Thrombocytopenia were present in 23.5% and 38.7% cases, respectively. AST was high in nearly half of the patients (48.6%), whereas ALT was high in one-fifth (22.1%) of them (Table 3).

Among the dengue patients, around twelve percentages (n=71) were infants. Comparison of signs and symptoms between infants and children revealed statistically significant differences in some of the presenting characteristics/symptoms. Abdominal pain, vomiting, rash, and cough were a few of the presenting symptoms that differed statistically between infants and older children. Comparison of laboratory investigations revealed significant differences in presentation of platelet count, white blood cells count, and level of the haemoglobin between the two age groups as shown in the Table 4.

Table 2: Dengue clinical profile/ presenting symptoms among the children, (n=584).

Presenting symptoms	Values, N (%)
Fever	
High grade	65 (11.1)
Low grade	519 (88.9)
Headache	23 (3.9)
Vomiting	255 (43.7)
Abdominal pain	119 (20.4)
Anuria	34 (5.8)
Nausea	19 (3.3)
Dehydration	59 (10.1)
Loose motion	48 (8.2)
Rash	44 (7.5)
Ascites	2 (0.0)
Cough and cold	60 (10.3)
Pleural effusion	3 (0.5)
Respiratory distress	4 (0.0)
Warning sign	161 (27.6)
Anemia	4 (0.7)

Table 3: Laboratory findings of the dengue cases, (n=584).

Laboratory findings	Values, N(%)
Haematocrit	
High ($>48\%$)	5 (0.9)
Normal ($\leq 48\%$)	579 (99.1)
Haemoglobin	
Normal (≥ 11 g/dl)	404 (69.2)
Low (<11 g/dl)	174 (29.8)
Missing	6 (1)
Leukopenia	
Present ($<4000/\text{mm}^3$)	137 (23.5)
Absent ($\geq 4000/\text{mm}^3$)	441 (75.5)
Missing	6 (1)
Thrombocytopenia	
Present ($<150\ 000/\text{mm}^3$)	226 (38.7)
Absent ($\geq 150\ 000/\text{mm}^3$)	352 (60.3)
Missing	6 (1)
NS1 antigen	
Confirmed dengue (positive)	49 (8.4)
Suspected dengue (negative and missing)	535 (91.6)
SGPT (ALT)	
High (> 50 IU/l)	129 (22.1)
Normal (≤ 50 IU/l)	304 (52.1)
Missing	151 (25.9)
SGOT (AST)	
High (>50 IU/l)	284 (48.6)
Normal (≤ 50 IU/l)	133 (22.8)
Missing	167 (28.6)

Table 4: Comparing signs, symptoms and laboratory investigations of dengue among infants and children.

Variables	Infants, (n=71)	Children, (n=513)	P value	Total, (n=584)
Presenting symptoms				
Fever (high grade)	14 (19.7)	51 (9.9)	0.024	65 (11.1)
Headache	0 (0.0)	23 (4.5)	0.096	23 (3.9)
Vomiting	20 (28.2)	235 (45.8)	0.005*	255 (43.7)
Abdominal pain	2 (2.8)	117 (22.8)	<0.001*	119 (20.4)
Anuria	3 (4.2)	31 (6.0)	0.787	34 (5.8)
Nausea	0 (0.0)	19 (3.7)	0.150	19 (3.3)
Dehydration	6 (8.5)	53 (10.3)	0.622	59 (10.1)
Loose motion	6 (8.5)	42 (8.2)	0.940	48 (8.2)
Rash	10 (14.1)	34 (6.6)	0.026*	44 (7.5)
Cough and cold	20 (28.2)	40 (7.8)	<0.001*	60 (10.3)
Warning Sign	15 (21.1)	146 (28.5)	0.195	161 (27.6)
Laboratory findings				
NS1 antigen (n=584)				
Positive	10 (14.1)	39 (7.6)	0.065	49 (8.4)
Negative	61 (85.9)	474 (92.4)		535 (91.6)
ALT, (n=433)				
High (>50 IU/l)	11 (15.5)	118 (23.0)	0.341	129 (22.1)
Normal (≤ 50 IU/l)	39 (54.9)	265 (51.7)		304 (52.1)
AST, (n=417)				
High (>50 IU/l)	36 (50.7)	248 (48.3)	0.625	284 (48.6)
Normal (≤ 50 IU/l)	13 (18.3)	120 (23.4)		133 (22.8)
Hematocrit, (n=484)				
High (>48%)	1 (1.4)	4 (0.8)	0.478	5 (0.9)
Normal (≤48%)	70 (98.6)	509 (99.2)		579 (9.1)
Thrombocytopenia, (n=578)				
Present (<150 000/mm ³)	19 (26.8)	207 (40.4)	0.048*	226 (38.7)
Absent (≥150 000/mm ³)	52 (73.2)	300 (58.5)		352 (60.3)
Haemoglobin, (n=578)				
Low (≥11 g/dl)	47 (66.2)	127 (24.8)	<0.001*	174 (29.8)
Normal (<11 g/dl)	24 (33.8)	380 (74.1)		404 (69.2)
Leukopenia, (n=578)				
Present (<4000/mm ³)	5 (7.0)	132 (25.7)	<0.001*	137 (23.5)
Absent (≥4000/mm ³)	66 (93.0)	375 (73.1)		441 (75.5)

Results are based on nonempty rows and columns in each innermost sub table. *The Chi-square statistic/Fisher's exact test is significant at the .05 level.

DISCUSSION

This cross-sectional study was conducted to determine the clinical features of dengue infection among children in Bangladesh. With a sample of 584 participants, this is the largest single-site study exploring dengue features among children of Bangladesh. It was also conducted during the monsoon season, which historically is the ideal time period for dengue outbreaks in tropical regions.¹⁹ Study population had a male to female ratio was 3:2; around half of the children were of age <5 years. Similar male-to-female ratio was also noticed in the study by Ahmed et al but only 14% of its sample constituted of under 5 children.²⁰ The mean age of Ahmed et al study sample was 8.4±3 years and, is comprised of a sicker population with DHF and DSS in 50 and 14% cases, respectively. Headache (78%) skin rash (38%) and vomiting (13%) some notable features among its population that were different from our findings.

Another study by Rahman et al looked at clinical features of dengue during a similar time period, but it comprised both adult and pediatric populations.²¹ Rahman et al noted fever (100%), headache (91%), vomiting (64%), and thrombocytopenia (56.7%), which were similar to our findings. A study by Srinivasa, exploring dengue fever among children in India, also found clinical features congruent to our study. Among its 200 dengue cases, vomiting and abdominal pain were present in 72% and 46% cases, respectively.²² Rash was found in 10.5% cases, thrombocytopenia in 97%, and leukopenia (<4000/mm³) in 63%. Shultana et al also observed the clinical features of dengue among children in Dhaka. It studied 89 children, of which 74.2% were enrolled with dengue fever.²³ Shultana et al found fever in all its cases, rash in 48.3%, nausea/vomiting in 37%, abdominal pain in 23.6%, and headache in 12.6% of its patients. Clinical features identified in the study resembled our findings

except for predominance of Pleural effusion (25.8%) and ascites (12.54%).

Clinical features of dengue among children also seem to markedly differ from that of adults. An earlier study conducted in a similar context found headache (61%), nausea (69%) and abdominal pain (84%) as the most prevalent features among its adult population.²⁴ They also noticed thrombocytopenia and elevated AST among its two-third of the cases. On the contrary, none of these clinical or laboratory features were found profound in our study sample.

Our study can be closely compared to the work of Islam et al. that was conducted a year prior to our study at the same site (Dhaka Shishu hospital), but with a significantly small population (n=82). The male to female ratio of its study population was 1:1 with a mean of 6.5±3.5 years.²⁵ Clinical features noted among its dengue patients were Fever (68.3%), vomiting (64.6%), abdominal pain (59.7%), and loose stool (11%). Among laboratory investigations, they noted a higher number of pleural effusion and Ascites among its patients.

Predicting dengue among children based on clinical features alone is challenging since its presentation closely resembles to common viral fevers. With this study, we attempted to provide an overview of common clinical presentation of dengue among children in the context of Bangladesh. The features identified here such as fever, vomiting, and warning signs, align with the algorithm suggested by WHO and could guide clinicians for early identification as well as better management of the such cases.²⁶

Limitations

The study has few methodological limitations. We did not include consecutive patients; thus, the findings might not be representative of the overall patient population. Additionally, we were not able to explore patient outcomes due to resource constraints. In terms of interpretation of results, a major limitation of this study is that most of the cases were not confirmed cases of dengue. It is also worth noting that despite the study's large sample size, it is a single-centre study and might not reflect the actual scenario of the whole population. Since most dengue cases are managed at the union level (primary care centre) and are referred to tertiary care centres only after significant deterioration, an investigation of dengue characteristics at the primary care level might have provided a better picture. Nevertheless, Dhaka Shishu hospital being the largest pediatric hospital and tertiary referral centre of the country provides an optimum glimpse of the clinical status of the pediatric population of Bangladesh. The study has other limitations such as, most of the cases were not confirmed cases of dengue.

CONCLUSION

This descriptive study identifies that vomiting, abdominal pain, and dengue warning signs are the predominant clinical features of dengue infection among children in Bangladesh. Comparison with earlier studies reveals that clinical and laboratory features of dengue might vary by age, severity and region. There seems to be a scarcity of research that explores clinical traits of dengue among children in South Asia.

Recommendations

More wide-scaled, multi-country evaluation of dengue needs to be carried out to understand its actual clinical scenario and determine its impacts. With billions of people residing in dengue prone zones and millions affected annually, dengue infection remains one of the largest public health issues threatening South Asia. Dense population, poor sanitation and hygiene systems are prolonging dengue outbreaks in countries like Bangladesh. The governments have initiated short-term measures such as use of bed nets and insecticides spraying, but those are limited to densely populated zones/cities. Nation-wide holistic steps should be taken for prevention of dengue.

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