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Dengue viral infection among children in Bangladesh: Experience from a single pediatric hospital

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Abstract
Background: To observe the key clinical features of dengue infection among children in Bangladesh.
Methods and Materials: A cross-sectional descriptive study was conducted under the Department of Infectious Diseases and Community Pediatrics of Bangladesh Shishu Hospital & Institue, Dhaka, Bangladesh. All children of age <18 years admitted with suspected dengue infection starting from July to September 2024 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 20.
Results: A total of 584 children were included in the study, of which 345 (59.1%) were male. About half of the children reported vomiting, and all of them had either a high- or low-grade fever when they first arrived. Among children, notable symptoms included dehydration in 10% of cases, flu-like symptoms (cold and cough) in 10% of cases, and abdominal pain in 20% of cases. In 161 cases (27.6%), dengue warning signs were observed, and in 43.7% of cases, vomiting was observed. Rarely were anemia, respiratory distress, and pleural effusion observed in the patients under study. 49 instances (8.4%) of the dengue patients tested positive for the NS1 antigen, according to laboratory analysis. Haemoglobin was low in one-third of the cases, and Leukopenia and Thrombocytopenia were present in 23.5% and 38.7% cases, respectively. Approximately 12% (n=71) of the dengue patients were young children. When the signs and symptoms of newborns and children were compared, some of the presenting traits and symptoms showed statistically significant changes. Abdominal pain, vomiting, rash, and cough were a few of the presenting symptoms that differed statistically between infants and older children.

Keywords: Leukopenia, pleural effusion, respiratory distress

Introduction

The virus that causes dengue is spread by mosquitoes and is primarily found in tropical and sub-tropical countries' cities and semi-urban areas. It is common around the world, and local rainfall, humidity, temperature, and urbanization all affect its impact or variance in danger [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* [3]. Multiple organ dysfunction affecting the liver, muscles, heart, brain, and kidneys is linked to dengue infection, just as other tropical infections [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 [6]. Dengue is now found in 128 countries [7] which indicates that 3.9 billion people are at risk of being infected with dengue virus. 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, 11, 12]. Despite the fact that children are particularly vulnerable to this infection, there is a dearth of published information regarding dengue infection in South Asian children. This might be the case due to the fact that the majority of dengue infections in younger children are either asymptomatic or just mildly symptomatic.

Methods

A cross-sectional descriptive study was conducted under the Department of Infectious Diseases and Community Pediatrics of Bangladesh Shishu Hospital & Institue, Dhaka, Bangladesh. All children of age <18 years admitted with suspected dengue infection starting from July to September 2024 were enrolled in this study. While patients exhibiting clinical features of a suspected case along with the presence of NS1 antigen were considered confirmed cases of dengue, children presenting with fever, vomiting, rash, and any warning signs of dengue, such as abdominal pain, persistent vomiting, bleeding, or lethargy, were considered suspected cases. We excluded cases with comorbidity or co-infection from this study. The final 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 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.

Ethical clearance: Ethics approval for the study was obtained from the Ethical review committee of Bangladesh Shishu Hospital & Institue.

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 version 27 software

Result

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

Patient Characteristics	Values, n (%)
Age (Years)	
Infant (≤1)	25 (4.28)
2-5	251 (43.1)
6-10	197 (33.7)
11-14	101 (17.3)
15-18	10 (1.7)
Sex	
Male	360 (61.6)
Female	224 (58.3)
Types Dengue Fever	
Classical	441 (75.5)
Haemorrhagic	94 (16.1)
DSS	49 (8.4)

Table: 1 A total of 584 children were included in the study, of which 360 (61.6%) were male. Children ranged from age 1 month to 18 years with a mean of 5.6 ± 4 years.

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

Presenting symptoms	Values, n (%)
Fever	
High Grade	45 (7.7)
Low Grade	539 (92.29)
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: 2 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, and Pleural effusion were rarely noticed among the studied patients.

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

Laboratory findings	Values, n (%)
Haematocrit	
High (>48%)	5 (0.9)
Normal (≤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/mm^3)	137 (23.5)
Absent (≥4000/mm^3)	441 (75.5)
Missing	6 (1)
Thrombocytopenia	
Present (<150 000/mm^3)	226 (38.7)
Absent (≥150 000/mm^3)	352 (60.3)
Missing	6 (1)
NS1 antigen	
Confirmed dengue (positive)	49 (8.4)
Suspected dengue (negative + 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: 3 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.

Discussion

The purpose of this cross-sectional study was to identify the clinical signs of dengue infection in Bangladeshi children. The study population had a male to female ratio was 3:2; around half of the children were of age < 5 yrs. 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%) were 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/mm^3) 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 Thrombocytepenia 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.

Limitation

The results may not be typical of the total patient population because we did not include consecutive patients. Furthermore, due to resource limitations, we were unable to investigate patient outcomes. A significant drawback of this study in terms of interpreting the findings is that the majority of the cases were not verified dengue cases.

Conclusion and Recommendation

According to this descriptive study, the most common clinical manifestations of dengue infection in Bangladeshi children include vomiting, stomach pain, and dengue warning symptoms. Clinical and laboratory characteristics of dengue may differ by age, severity, and location, according to comparison with previous research. Research examining the clinical characteristics of dengue in children in South Asia appears to be lacking. To comprehend dengue's true clinical situation and ascertain its effects, a more comprehensive, multi-country assessment of the disease is required.

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Consent to participate: Informed written consent was ensured before participation of all subjects from the accompanying parents.

Availability of data and material: Data and material are available from the corresponding authors and could be shared based on reasonable request.

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