Dengue Infection in Children: Clinical Profile and Outcome in Dhaka City

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Abstract: Dengue is a self-limiting acute mosquito born disease caused by Dengue virus. Dengue infections may be asymptomatic or can result in a wide spectrum of disease severity ranging from an influenza-like illness (Dengue fever) to the life-threatening Dengue hemorrhagic fever (DHF)/Dengue shock syndrome (DSS). We aimed to analyze the variation in clinical spectrum, outcome and possible risk factors for fatality among Dengue infected children. This was an observational study carried out over a period of one year involving 89 children up to 15 years of age. Upon clinical suspicion Dengue was confirmed by NS 1 antigen and/or Dengue antibody IgM, IgG. Positive Dengue cases were enrolled & interviewed and the information obtained related to the risk factors, clinical presentation, pattern of Dengue infection and outcome were documented in the pre-structured questionnaire. Among the 89 studied children the highest percentage (51.68%) was between 0-5 year and male female ratio was 1.2: 1. Mosquito net was not used by (74.15%) children and there was source of stagnant water in/near the house of (13.48%) children. Fever was present in (100%), rash in (48.31%), nausea/vomiting in (37.07%), headache in (12.35%), myalgia/arthralgia/backache (13.48%), retro orbital pain (1.12%) and abdominal pain in (23.59%) patient. Epistaxis was the commonest (70%) form of bleeding. CNS involvement was in the form of restlessness/irritability (19.10%), altered sensorium (2.24%) and convulsion. Pleural effusion was commoner than ascites; (25.84%) and (12.35%) respectively. Among the enrolled children Dengue fever was (74.15%), Dengue hemorrhagic fever (6.74%) and Dengue shock syndrome (19.10%). Two patients died out of 17 from Dengue shock syndrome which was (11.76%). World Health Organization (WHO) guideline based management should be applied in assessing and managing Dengue cases to reduce mortality rate. Public awareness should be widened to prevent Dengue.

Keywords: Dengue, Infection, Hemorrhage, Shock

1. Introduction

Dengue fever is one of the most common arboviral infections in human. Dengue is a self-limiting acute mosquito born disease characterized by fever, headache, muscle & joint pain, rash, nausea & vomiting [1]. These infections may be asymptomatic or may lead to (a) "classical" Dengue fever (DF), or (b) Dengue hemorrhagic fever (DHF) without shock,

or (c) Dengue hemorrhagic fever (DHF) with shock [1]. Dengue is caused by one of the four serotypes of the Dengue virus (DENV); (DENV-1 to DENV-4) belonging to the family *Flavivirida* [1]. The virus serotypes are closely related but antigenically distinct [1]. In the last 50 years, incidence has increased 30-fold with increasing geographic expansion to new countries [2]. Annually a 100 million cases of Dengue fever and half a million cases of Dengue hemorrhagic fever (DHF) occur in the world with a case fatality in Asian countries of 0.5%–3.5% [3]. At present, Dengue is endemic in 112 countries in the world [2] and approximately 2.5 billion people live in Dengue endemic countries [4]. Asian countries showed that the percentage of admitted cases developing shock, ranged from 9 to 60% with in-hospital case fatality rate 0.2 to over 9% [3]. Early recognition and prompt initiation of appropriate treatment are vital to reduce disease related morbidity [3].

Dengue infections can result in a wide spectrum of disease severity ranging from an influenza-like illness (DF) to the life-threatening Dengue hemorrhagic fever (DHF)/Dengue shock syndrome (DSS) [3]. Infection with one serotype of DENV provides lifelong immunity to that serotype, but results only in partial and transient protection against subsequent infection by the other three serotypes [3]. It is possible for a person to be infected as many as four times, once with each serotype [3]. It is well documented that sequential infection with different DENV serotypes increases the risk of developing DHF [3]. Ninety percent of DHF occur in children less than 15 years of age [3]. There is currently no specific treatment for DENV infection [3] although several potential vaccines are in development; therefore, the only method of preventing transmission is vector control [2]. In 2012, Dengue ranks as the most important mosquito-borne disease in the world. Outbreaks exert a huge burden on populations, health systems, and economies [5]. In 2009, the World Health Organization (WHO) revised the classification system for Dengue, defining two major entities – Dengue and severe Dengue [6]. The new classification also encompasses a set of 'warning signs' intended to help clinicians identify patients likely to develop complications during the critical phase of the illness [6]. In this study, we analyzed the variation in clinical features, outcome and possible risk factors for fatality among Dengue infected children.

2. Materials and Methods

This was an observational study carried out including patients of the prefixed private chambers in Dhaka city involving 89 children of both sex up to 15 years of age for a period of one year from January to December' 2018. Children who came to the private chamber for consultation and diagnosed as Dengue cases were enrolled in this survey. Stable patients were treated outdoor basis and those required admission were admitted in clinics or hospitals according to their own choice. In children with high degree clinical suspicion of Dengue infection NS 1 antigen (who came within first 48 hours of fever) and/or Dengue antibody IgM, IgG (who came after five days of fever) were performed. Positive

Dengue cases were taken written informed consent & interviewed on the risk factors of Dengue infection. Data related to patient's demography, risk factors, clinical presentation, pattern of Dengue infection and outcome were documented on the pre-structured questionnaire. Co-relation between the risk factors and mortality was also observed. All enrolled patients were treated according to the standard management protocol of national Dengue guideline (published in collaboration with WHO and Ministry of Health and Family welfare (MOHFW), Bangladesh). This was a study based on private consultation chamber and hence institutional ethical approval was not necessary. Written informed consent was taken from the individual patient prior to enrollment.

3. Results

In Table 1, among the 89 studied children, (51.68%) were between 0-5 years, (31.46%) between 6-10 years and (16.85%) between 11-15 years of age. Male participants comprised of (55%) and male female ratio was 1.2: 1. Children up to 2 years of age were (23.59%) among which weight for length between (3rd – 97th) percentile was (66.66%) and >97th percentile was (33.33%). BMI was measured in (76.40%) children >2 years of age among which BMI ≥95th percentile was (42.64%) and <5th Percentile was (11.76%). Most of the studied children (84.26%) lived above the ground floor and mosquito net was not used by (74.15%) of the total. There was source of stagnant water in/near the house of (13.48%) children. Only (1.12%) of the studied children had previous history of Dengue infection and (6.74%) had affected family member.

Table 1. *Demography and risk factors of the studied children (n=89) Data are presented as number (%).*

Clinical Profile	Number (%)
Age	
0-5 year	46 (51.68%)
6-10 year	28 (31.46%)
11-15 year	15 (16.85%)
Sex	
Male	49 (55%)
Female	40 (45%)
M:F	1.2: 1
Nutritional Status	
<2 year (Weight for Length)	21 (23.59%)
3rd – 97th Percentile	14 (66.66%)
>97th Percentile	7 (33.33%)
>2 year (BMI)	68 (76.40%)
<5th Percentile (Under Weight)	8 (11.76%)
5th – 85th Percentile (Healthy Weight)	21 (30.88%)
85th – 95th Percentile (Over Weight)	10 (14.70%)
≥95th Percentile (Obese)	29 (42.64%)
Housing	
Ground Floor	14 (15.73%)
Above Ground Floor	75 (84.26%)
Mosquito Net	
Used	23 (25.84%)
Not Used	66 (74.15%)
Source of Stagnant Water	
Yes	12 (13.48%)
No	77 (86.51%)

Clinical Profile	Number (%)
Previous History of Dengue	
Yes	1 (1.12%)
No	88 (98.87%)
Affected Other Family Member	
Yes	6 (6.74%)
No	83 (93.25%)

Table 2 showing the clinical manifestations of the studied children. Fever was present in (100%) children where (66.29%) had high grade (101°-105° F) fever. Rash was present in (48.31%) and nausea/vomiting in (37.07%) patient. Pain in the form of headache was present in (12.35%), myalgia/arthralgia/backache (13.48%), retro orbital pain (1.12%) and abdominal pain in (23.59%) patient. Bleeding was present in (11.23%) affected children where epistaxis was more frequent (70%) than gum and gastrointestinal (GI) bleeding. Seventeen (19.10%) children were found to have restlessness/irritability. Serositis in the form of pleural effusion and ascites was present in (25.84%) and (12.35%) children respectively. Sixteen (17.97%) patients presented with abdominal tenderness and (19.10%) with hepatomegaly. Only (4.49%) patient had positive tourniquet test.

Table 2. *Clinical symptoms and signs of Dengue infection (n=89) Data are presented as number (%).*

Clinical Presentation	Number (%)
Fever or H/O Fever	89 (100%)
Low grade (99°-101° F)	30 (33.70%)
High grade (101°-105° F)	59 (66.29%)
Rash	43 (48.31%)
Nausea/Vomiting	33 (37.07%)
Headache	11 (12.35%)
Myalgia/Arthralgia/Backache	12 (13.48%)
Retro Orbital Pain	1 (1.12%)
Abdominal Pain	21 (23.59%)
Itching	20 (22.47%)
Bleeding	10 (11.23%)
Epistaxix	7 (70%)
Gum Bleeding	1 (10%)
GI Bleeding	2 (20%)
Respiratory Distress	4 (4.49%)
Restlessness/Irritability	17 (19.10%)
Altered Consciousness	2 (2.24%)
Pleural Effusion	23 (25.84%)
Abdominal Tenderness	16 (17.97%)
Hepatomegaly	17 (19.10%)
Ascites	11 (12.35%)
Positive Tourniquet Test	4 (4.49%)
Others	12 (13.48%)
Loose Motion	8 (66.66%)
Convulsion	3 (25%)
Rhinorrhea	1 (8.33%)

Table 3 showing the types of Dengue infection and clinical outcome (n=89) where Dengue fever was (74.15%), Dengue hemorrhagic fever was (6.74%) and Dengue shock syndrome was (19.10%) respectively. There was no death from Dengue fever or Dengue hemorrhagic fever. Two patients died out of 17 from Dengue shock syndrome which was (11.76%). Co-relation between patient's nutritional status and mortality was shown in Table 4. Number of patient having BMI ≥95th percentile was 29 among which 2 patients died (6.89%).

Table 3. *Types of Dengue infection and outcome (n=89) Data are presented as number (%).*

Types of Dengue infection	Number (%)
Dengue fever	66 (74.15%)
Improved	66 (100%)
Death	0
Dengue Hemorrhagic Fever	6 (6.74%)
Improved	6 (100%)
Death	0
Dengue Shock Syndrome	17 (19.10%)
Improved	15 (88.23%)
Death	2 (11.76%)

Table 4. *Co-relation between nutritional status and mortality (n=68).*

Nutritional Status (BMI) in children > 2 year	Number of Patients	Death
<5th Percentile	8	0
5th – 85th Percentile	21	0
85th – 95th Percentile	10	0
≥95th Percentile	29	2 (6.89%)

4. Discussion

In this study there was a distinct higher incidence observed among the younger age group (0-5 years) accounting for (51.68%) of the total cases with a male preponderance and the male to female ratio was 1.2: 1. In a study by Choudhury [7] the commonest age group was above 10 years with male predominance and male to female ratio was 2:1. Similarly, male predominance was observed in other studies like Agarwal et al [8], Narayana et al [9] and Gomber et al [10]. All patients in this study were from urban area which was also noticed in a study by Srinivasa [11] though WHO has reported shift of Dengue to rural areas. A seasonal pattern was observed in this study and the highest incidence was recorded in the monsoon (May-August) and the postmonsoon (September-December) seasons during the one year study period. Wongkoon S et al [12] have also described the seasonal pattern of Dengue, mostly in the rainy season due to abundance of mosquito breeding in the season. In a case control study in Thailand [13], the primary Dengue infection was noticed in (9.5%) and (11.4%) in case and control group respectively, whereas in this study, (98.87%) cases having no previous history of Dengue infection.

Fever was noted among (100%) patients. Rash and vomiting were the next common symptoms followed by abdominal pain representing (48.31%), (37.07%) and (23.59%) respectively. Agarwal et al [8] in their study in Delhi showed fever, abdominal pain and vomiting as the commonest symptoms. In one more study by Wang et al [14], vomiting (60.5%) and abdominal pain (32.5%) were the commonest presenting symptoms in Dengue infected children. Headache was seen in (12.35%) studied children whereas about (28.8%) observed in Narayanan et al [9], (77%) in Kalyanarooj et al [15] and (22%) in Ratageri et al [16] studies. In our study myalgia was found in (13.48%) cases whereas in a study [1] in India (16.3%) cases had myalgia. Malena and epistaxis were the most common bleeding manifestation noted in study by Srivastava [17] and

Ahmed et al [18] which was similar to this study. In another study by Ratageri et al [16] the common bleeding manifestations were GI bleeding (22%) and petechiae (18%).

Hemant [4] showed respiratory distress in four patients (6.1%) [n=65] whereas we observed this symptom in four (4.49%) patients [n=89]. CNS involvement was seen in eight patients (4.3%) [n=185] in a study [19] whereas we found total two patients (2.24%) with altered sensorium, seventeen patients (19.10%) with restlessness or irritability and three (25%) with convulsion [n=85]. Dengue encephalopathy should always be considered in a child presenting with neurological symptoms in endemic areas [19]. A study by Shubhankar Mishra [20] detected (25.77%) cases having pleural effusion which is quite similar (25.84%) to our study. Hepatomegaly and ascites was seen in (19.10%) and (12.35%) cases respectively whereas other studies [19] showed hepatomegaly in (86.9%), ascites (93.4%), pleural effusion (82.6%) and facial puffiness in (84.7%) study population. Setiwan et al [21] and Mehdi SA et al [22] noted (95%) and (60%) ascites in severe Dengue and (34%) and (17.7%) in mild Dengue cases respectively.

In a study by Mishra [20] tourniquet test was found to be negative in majority of the cases whereas studies in other countries especially Southeast Asian countries reported tourniquet test positivity as the commonest bleeding manifestation [20]. In this study tourniquet test was positive in (4.49%) cases. In another study in Bangladesh [10] tourniquet test was positive in (32%) cases. Low proportion of positive tourniquet test in Indian studies may be due to the darker skin color in Indian children [20]. But in a study in Brazil [11] test was positive in (81.8%) cases.

Ratageri et al [16] found DF in (18%), DHF in (60%) and DSS in (22%) cases. Jasmin [23] reported in India (90%) cases of DF, (10%) DHF and no case of DSS. In a study in Bangladesh [5], (40.7%) found to have DF and (27.8%) DHF. Whereas, we observed sixty six (74.15%) DF, six (6.74%) DHF and seventeen (19.10%) DSS.

In India, Choudhury [7] and Mishra [20] showed (10%) and (1.03%) mortality respectively in their study due to intractable shock. Another study in Bangladesh [5] reported (6%) mortality due to DHF. Shewale [24] in his study reported (21.4%) mortality in severe Dengue group than Dengue group with one or more warning signs (1.4%). We observed two (11.76%) deaths due to DSS (n=17) and both were obese. A review article by MohdSyis [25] revealed obesity to be a risk factor for dengue severity among children whereas an Indonesian study [16] found no association between body weight and dengue severity.

5. Conclusion

It was observed that Dengue, a febrile illness, had wide spectrum of clinical presentation in children ranging from flue like illness to life threatening hemorrhage and shock. Classical Dengue fever (DF) was most prevalent in the pediatric population and the outcome was favorable. Mortality was related to the development of shock in Dengue infected children (DSS). In this study, two patient died of Dengue shock syndrome who were obese (BMI >95th percentile), this observation has become a matter of future research to see whether there is any temporal relationship between obesity and mortality in Dengue affected children. High index of clinical suspicion, early diagnosis and prompt initiation of fluid therapy remain the most important aspect in treating Dengue patients. WHO guideline based management should be applied in assessing and managing Dengue cases to reduce mortality rate. Above all public awareness should be widened and all measures should be taken to prevent Dengue fever. Large scale multi- center study is recommended to delineate the co-relation between obesity and mortality in Dengue affected children in a greater depth.

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