ORIGINAL ARTICLE

Clinical Evaluation of Dengue Cases in Bangladesh Shishu Hospital & Institute

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Abstract

Background: In Bangladesh, the re-emergence of dengue patients has created a huge burden on our children's morbidity and mortality. A dengue outbreak erupted in Bangladesh in 2019, resulting in the highest number of deaths to date.

Objective: To see the clinical and laboratory profile and hospital outcome of the children admitted in Bangladesh Shishu Hospital & Institute.

Methods: A prospective observational study was conducted among the children having dengue infection at the inpatient department of Bangladesh Shishu Hospital & Institute from 1st August 2022 to 31st January 2023. A total of 385 confirmed dengue cases were finally enrolled. Data collected from a standard questionnaire were analysed using SPSS 26.0 statistical software.

Results: Mean age of the dengue patients were 6.09(±4.74) years. Most of the patients suffering from dengue were male 227(59%). According to their BMI, underweight 254(66%), normal weight 97(25.2%), overweight 24(6.2%) and obese 10(2.6%). Most underweight patients age group were 1-5 years age 106(75.7%), according to the association of BMI with age considering p value 0.058. A diagnostic confirmation test revealed that 296 patients (76.9%) were NS1 positive, 65(16.9%) were IgM positive, 21(5.5%) were IgG positive, NS1 & IgM both positive 2(0.5%) and NS1 & IgG positive 1(0.3%). Most of the respondents according to their symptoms had fever 383(99.5%), less urine output 359(93.2%), anorexia 225(58.4%), abdominal pain 136(35.3%), nausea/vomits 126(32.7%), headache 94(24.4%), cough 86(22.3%), joint pain 54(14.0%), rash 44(11.4%), retro orbital pain 34(8.8%), diarrhoea 31(8.1%), back pain 30(7.8%), chill 26(6.8%), others 33(8.6%), etc. Respondents according to sign had enlarged lymph node 40(10.4%), dehydration 9(2.3%), enlarged liver 10(2.6%), ascites 4(1.0%), joint swelling 1(0.3%) and splenomegaly 1(0.3%). Most of the respondents according to the final diagnosis had dengue fever 157(40.8%), dengue fever with warning sign 200(51.9%) and severe dengue 28(7.3%), among them dengue shock syndrome 16(4.2%), expanded dengue syndrome 9(2.3%) and dengue hemorrhagic fever 3(0.8%).

Conclusion: To reduce mortality and morbidity, health care providers must remain alert of the changing pattern of presentation. This challenge requires proper public health interventions to reduce the morbidity and mortality due to severe dengue infection. The outcomes of this study will help to identify potential areas for improvement.

Keywords: Dengue, outcome, mortality.

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Received: 1 March 2023; **Accepted**: 10 May 2023

Introduction

Dengue has become a global problem since the second world war and is common in more than 120 countries, mainly in Southeast Asia, South Asia and South America.[1-3] About 390 million people are infected per year, about half a million require hospital admission,[4] and approximately 40,000 die.[5] In 2013 it caused about 60 million symptomatic infections worldwide, with 18% admitted to hospital and about 13,600 deaths.[6] The worldwide cost of dengue case is estimated US$9 billion.[6] For the decade of the 2000s, 12 countries in Southeast Asia were estimated to have about 3 million infections and 6,000 deaths annually.[7] In 2019, a significant increase in the number of cases was seen.[8] It is classified as a neglected tropical disease.[9] It is one of the most common vector-borne diseases worldwide.[10] In Bangladesh, South Asia, dengue fever was first reported in 1964 but became a disease of public health significance from 2000 onwards.[11,12] Bangladesh has a lower dengue prevalence than most Southeast Asian states,[13] but recently has sustained an upsurge in dengue outbreaks; from 2769 cases in 2017 to 10148 cases in 2018. In 2019, the Directorate General of Health Services (DGHS)[14] recorded 87953 cases with 81 deaths, a 9-fold increase in the incidence rate of dengue from the previous year.[15] Previous studies indicate that the number of dengue cases and deaths are highest in the warmer months from July to November, and that men were twice as likely to become infected than women.[16] Many cases of dengue are misclassified because of the wide spectrum of disease signs and symptoms and lack of effective case definitions.[17] Over 100,000 people were hospitalized and 129 deaths were recorded in 2019, the most extensive and deadliest outbreak of dengue in the history of Bangladesh.[18] The unofficial number of cases and deaths might be higher as the health reporting system is poor in the country. High incidence of dengue shock syndrome (DSS) and secondary dengue infections were suspected to be associated with high mortality.[19] Dengue virus has four different serotypes (DENV-1 to 4). Infection with one serotype provides long-term immunity to that serotype only but not to the other serotypes, sequential infections with a different serotype put people at greater risk for severe disease by a mechanism called antibody dependent enhancement (ADE).[20] Many dengue virus infections produce only mild flu-like illness and over 80% of cases are asymptomatic. Among isolated four serotypes in Bangladesh with a predominance of DENV-3 till 2002.[21,22] After 2002, DENV-1 and DENV-2 were the prevalent serotypes, which increased the susceptibility of severe secondary infection by other serotypes.[23] DENV-2 serotype was predominant cause of sharp rise of dengue cases till 2018.[24] Thereafter, the 2019 dengue outbreak was predominantly caused by the DENV-3 serotype.[25] Among children, nearly 95% of dengue cases are aged less than 15 years.[26] Owing to their immature hemodynamic system, children and particularly infants, tend to develop severe dengue disease.[27] National surveillance data from Asian countries show that infants under 1 year of age and children aged 4-9 have consistently been at the highest risk for severe dengue disease.[28] Shubhankar Mishra et al[29] founds 13.40% severe dengue cases among 97 children's where the mean age of admission was 8.7 years. The most common presenting symptom was fever seen in 100% and hepatomegaly (43.8%), the most common physical finding. Gastrointestinal bleeding was markedly seen in severe dengue (76.9%). Elevation in aspartate transaminase (SGOT) was found in 47.42% and thrombocytopenia in 27.5%. The correlation between hepatomegaly and elevated SGOT was significant (P value 0.0346). Case fatality rate (CFR) was 1.03%. The mean duration of hospitalization was 3.8 days. Most people with dengue have mild flu like symptoms or no symptoms and will get better in few days. Symptoms may include high fever (40°C/104°F), severe headache, pain behind the eyes, muscle and joint pains, nausea, vomiting, swollen glands and rash. Severe dengue symptoms may include severe abdominal pain, persistent vomiting, bleeding gums or nose, blood in vomit or stool, being very thirsty, pale, and cold skin. Early diagnosis and effective management can reduce the severity of dengue disease. Over the last 10-15 years, dengue fever (DF) and dengue hemorrhagic fever (DHF) have become one of the leading causes of hospitalization and deaths among both children and adults in South-East Asian regions. So, early evaluation of cases is crucial in management of dengue to reduce the complications and mortality. Although children are the main group affected by dengue, little published data are available regarding dengue infections in children living in South Asia and data in Bangladesh is even more scarce.[30] Therefore, the objectives of this study were to see the clinical and laboratory profile and the hospital outcome of the children admitted in this Hospital.
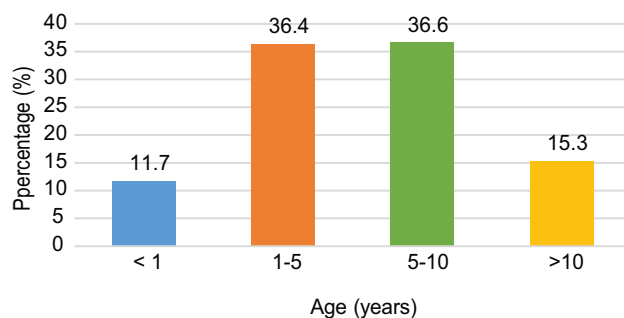
Materials and Methods

A prospective observational study was conducted at Bangladesh Shishu Hospital & Institute from 1st August 2022 to 31st January 2023. Bangladesh Shishu Hospital & Institute was established in 1972 and situated in Sher-e-Bangla Nagar, Dhaka, with

around 700 beds including all facilities. Data were collected from the inpatient department of Bangladesh Shishu Hospital & Institute. A total of 385 confirmed dengue cases were finally enrolled. All the children below 18 years of age have clinical features of dengue and confirmed by IgM or NS1 and clinically by a consultant with a positive IgG report. Children with other diseases were excluded from the study. Informed consent was taken from parents. Detailed history and examination findings of each patient were recorded. The dengue patient's age, gender, weight, signs, symptom severity grading, and final diagnosis were recorded on a standard questionnaire. Ethical Review Committee (ERC) of Bangladesh Shishu Hospital & Institute examined and approved this study protocol. Data were assessed for completeness and were finally analyzed by using SPSS (Statistical Packages for Social Science) version 26.

Results

Table I shows the distribution of the study subjects according to their age, among them below one year 45(11.7%), one years to five years 140(36.4%), five years to ten years 141(36.6%) and more than ten years 59(15.3%). Mean age of the study subjects were 6.09(±4.74) years.
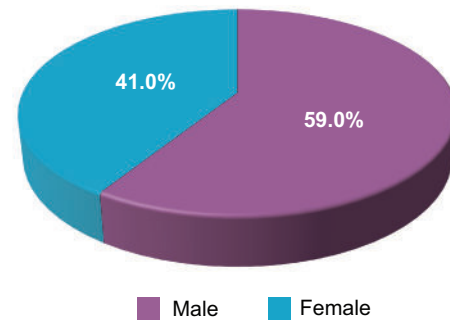
Table I
Distribution of the study subjects according to age (N=385)

Age (years)	Frequency	Percentage
<1	45	11.7
1-5	140	36.4
5-10	141	36.6
>10	59	15.3
Total	385	100.0

Fig.-1 *Distribution of the study subjects according to age*

Table II shows that most of the patients suffering from dengue were male 227 (59%) and female 158(41%).

Table II
Distribution of the study subjects according to gender (N=385)

Gender	Frequency	Percentage
Male	227	59.0
Female	158	41.0
Total	385	100.0

Fig.-2 *Distribution of the study subjects according to gender*

Table III shows the distribution of the study subjects according to their BMI, among them - underweight 254(66%), normal weight 97(25.2%), overweight 24(6.2%) and obese 10(2.6%).

Table III
Distribution of the study subjects according to BMI (N=385)

BMI (kg/m^2)	Frequency	Percentage
Under weight (<18.5)	254	66.0
Normal weight (18.5-24.9)	97	25.2
Overweight (25.0-30.0)	24	6.2
Obese (>30.0)	10	2.6
Total	385	100.0
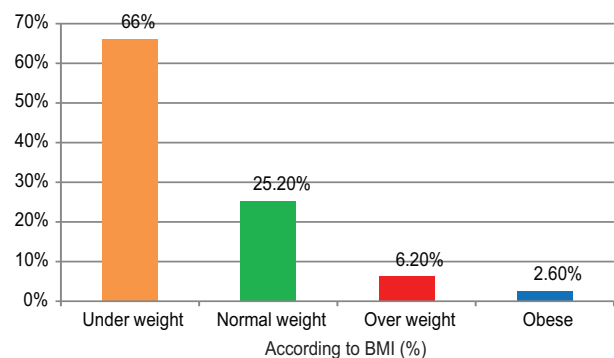
Fig.-3 *Distribution of the study subjects according to BMI*

Table IV
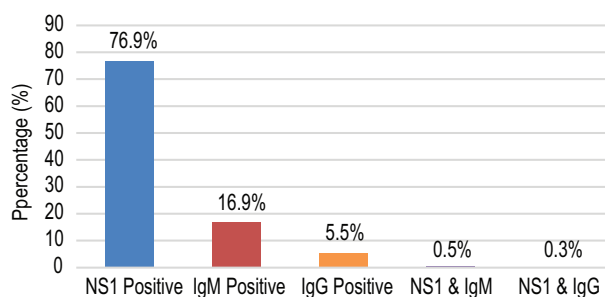*Distribution of the respondents according to the association of BMI with age (N=385)*

BMI (kg/m^2)	Age (years)				p value
	<1 n(%)	1-5 n(%)	5-10 n(%)	>10 n(%)	
Under weight (<18.5)	28(62.2)	106(75.7)	91(64.5)	29(49.1)	0.058
Normal weight (18.5-24.9)	14(31.1)	23(16.4)	38(27.0)	22(37.3)	
Overweight (25.0 - 30.0)	3(6.7)	7(5.0)	8(5.7)	6(10.2)	
Obese (>30.0)	0(0.0)	4(2.9)	4(2.8)	2(3.4)	

Table IV shows the distribution of the study subjects according to the association of BMI with age. most underweight patients age group were 1-5 years age 106(75.7%), 5-10 years age 91(64.5%), <1 years age 28(62%) and >10 years age 29(49.1%); considering p=0.058.

Table V shows the distribution of the respondents according to the diagnostic confirmation test, most of the patients were NS1 positive 296(76.9%), IgM positive 65(16.9%), IgG positive 21(5.5%), NS1 & IgM both positive 2(0.5%) and NS1 & IgG positive 1(0.2%)

Table V
Distribution of the respondents according to the diagnostic confirmation test (N=385)

Diagnostic features	Frequency	Percentage
NS1 Positive	296	76.9
IgM Positive	65	16.9
IgG Positive	21	5.5
NS1 & IgM	2	0.5
NS1 & IgG	1	0.2

Fig.-4 *Distribution of the respondents according to the Diagnostic confirmation test (N=385)*

Table VI shows the distribution of the respondents according to their to symptoms, among them fever 383(99.5%), less urine output 359(93.2%), anorexia 225(58.4%), abdominal pain 136(35.3%), nausea/ vomits 126(32.7%), headache 94(24.4%), cough 86(22.3%), joint pain 54(14.0%), rash 44(11.4%), retro orbital pain 34(8.8%), diarrhea 31(8.1%), back pain 30(7.8%), chill 26(6.8%), others 33(8.6%), neck pain 21(5.5%), cold skin 16(4.2%), respiratory distress 13(3.4%), sore throat 12(3.1%), convulsion 8(2.1%), eye redness 7(1.8%), jaundice 6(1.6%), pallor 3(0.8%), coughing blood 2(0.5%), nasal bleeding 2(0.5%), vaginal bleeding 2(0.5%) and hematuria 2(0.3%).

Table VI
Distribution of the respondents according to symptoms (N=385)

| Symptoms*	Frequency	Percentage
Fever	383	99.5
Urine output	359	93.2
Anorexia	225	58.4
Abdominal pain	136	35.3
Nausea/Vomits	126	32.7
Headache	94	24.4
Cough	86	22.3
Joint pain	54	14.0
Rash	44	11.4
Retro orbital	34	8.8
Others	33	8.6
Diarrhea	31	8.1
Back pain	30	7.8
Chill	26	6.8
Neck pain	21	5.5
Cold skin	16	4.2
Respiratory distress	13	3.4
Sore Throat	12	3.1
Convulsion	8	2.1
Eye redness	7	1.8
Jaundice	6	1.6
Pallor	3	0.8
Coughing blood	2	0.5
Nasal bleeding	2	0.5
Vaginal bleeding	2	0.5
Hematuria	1	0.3

*Multiple responses

Table VII shows the distribution of the respondents according to their to sign, among them mean (±sd) systolic bp 94.36 (±9.76), mean (±sd) diastolic bp 61.10 (±8.06), mean (±sd) respiratory rate 26.75 (±4.73), mean (±sd) temperature 98.81 (±1.30), enlarged lymph node 40(10.4%), dehydration 9 (2.3%), enlarged liver 10(2.6%), ascites 4(1.0%), joint swelling 1(0.3%) and splenomegaly 1(0.3%).

Table VII
Distribution of the respondents according to sign (N=385)

Sign	Mean ± SD	Min - max
Systolic BP	94.36±9.76	70-140
Diastolic BP	61.10±8.06	40-90
Respiratory rate	26.75±4.73	18-50
Temperature	98.81±1.30	97-104
	Frequency	Percentage
Enlarged Lymph node	40	10.4
Dehydration	9	2.3
Enlarged Liver	10	2.6
Ascites	4	1.0
Joint swelling	1	0.3
Splenomegaly	1	0.3

Table VIII shows the distribution of the respondents according to the final diagnosis among them dengue fever 157(40.8%), dengue fever with warning sign 200(51.9%) and among severe dengue 28(7.3%) - dengue shock syndrome 16(4.2%), expanded dengue syndrome 9(2.3%) and dengue hemorrhagic fever 3(0.8%).

Table VIII
Distribution of the respondents according to the final diagnosis (N=385)

Final Diagnosis	Frequency	Percentage
Dengue Fever	157	40.8
Dengue Fever with warning sign	200	51.9
Severe Dengue-		
Dengue Shock Syndrome	16	4.2
Expanded Dengue Syndrome	9	2.3
Dengue Hemorrhagic Fever	3	.8
Total	385	100.0
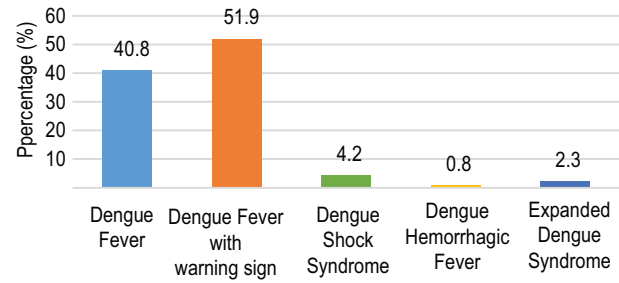
Fig.-5 *Distribution of severity of the dengue*

Discussion

In this observational study we have found that according to the respondent's age, below one year's 45(11.7%), One years to five years 140(36.4%), Five years to ten years 141(36.6%) and more than ten years 59(15.3%). The mean age found was 6.09 (± 4.74) years, like the previous studies by Faridi et al[31] and Wichmann et al[32] and similarly Khan et al[33] found 5.6 (± 3.8) years. The commonest age group was 5-10 years, similar result observed by Palaniappan.[34-36] However, Kale et al[37] and Rasul et al[38] showed that the age group most affected was 11-15 years and 10-14 years, respectively.

Most of the patients suffering from dengue were male 227 (59%) and female 158(41%), male to female ratio was 1: 0.7. this study found that male patients predominated female patients by their number, similarly predominance found by Anker et al[39] but this finding was opposite to the finding by Sultana et al[40] and Afroze et al.[41]

According to the BMI, most of the respondents were Underweight 254(66%), Normal weight 97(25.2%), Overweight 24(6.2%) and Obese 10(2.6%). This study found BMI had no significant relationship with the final diagnosis. Although Zulkipli et al[42] found Obese children with DHF, had been previously found to have an increased risk to develop shock. According to the association of BMI with age group among dengue patients, most sufferer were underweight patients having age group were 1-5 years age 106(75.7%), 5-10 years age 91(64.5%), <1 Years age 28(62%) and >10 years age 29(49.1%); considering p value .058. Kamruzzaman et al[43] showed that around 31% of the total study children (2–10 years) were considered underweight (low weight-for-age), approximately 15% were severely underweight. The percentage of underweight and low BMI-for-age (wasted) children was higher at all age categories (25 to 35%) and was found extremely high compared to the BDHS report, where the

prevalence of stunting, underweight, and wasting in Bangladesh was 31, 22, and 8% respectively.[44]

To identify dengue cases, the main targets include the specific serotype detection, the cross reactivity of antibody responses (immunoglobulin M or IgM) and detecting the viral nonstructural protein 1 (NS1 antigen through ELISA), the so-called principal infection marker.[45,46] According to the diagnostic confirmation test, dengue patients were having NS1 positive 296(76.9%), IgM positive 65(16.9%), IgG positive 21(5.5%), NS1 & IgM both positive 2(0.5%) and NS1 & IgG positive 1(0.2%). The usefulness of the NS1 antigen rapid test for dengue diagnosis has been widely documented.[47-50] In this study respondents had symptoms like: fever 383(99.48%), less urine output359(93.2%), anorexia 225(58.4%), abdominal pain 136(35.3%), nausea/vomits 126(32.7%), headache 94(24.4%), cough 86(22.3%), joint pain 54(14.0%), rash 44(11.4%), retro orbital pain 34(8.8%), diarrhoea 31(8.1%), back pain 30(7.8%), chill 26(6.8%), others 33(8.6%), neck pain 21(5.5%), cold skin 16(4.2%), respiratory distress 13(3.4%), sore throat 12(3.1%), convulsion 8(2.1%), eye redness 7(1.8%), jaundice 6(1.6%) and pallor 3(0.8%). pothapregada et al[51] found similar findings like fever in 94.6% cases, headache (75.1%), retro-orbital pain (51.3%), joint pain (28.7%) and rash (17.2%). Khan, et al[33] found, All the dengue patients had fever, vomiting was present in 40%, ascites and skin rash in 21%, pleural effusion 20%, abdominal pain 14% and 12.2% came with shock. Thrombocytopenia, raised HCT, raised liver enzymes and abnormal coagulation profile were more common in dengue hemorrhagic fever when compared to patients with dengue fever.

The most common hemorrhagic manifestations in this study were coughing blood 2(0.5%), nasal bleeding 2(0.5%), vaginal bleeding 2(0.5%) and haematuria 2 (0.3%), much lower to the previous studies by Rachel et al[52] The probable mechanism for myositis is the release of myotoxic cytokines, particularly TNF-α thereby injuring the affected muscle.[53] In this study we have recorded sign like mean (±SD) systolic BP 94.36 (±9.76), mean (±SD) diastolic BP 61.10 (± 8.06), mean (±SD) respiratory rate 26.75 (±4.73), mean (±SD) temperature 98.81 (±1.30), enlarged lymph node 40(10.4%), dehydration 9(2.3%), enlarged liver 10(2.6%), ascites 4(1.0%), joint swelling 1(0.3%) and splenomegaly 1(0.3%).

splenomegaly was in 20.7% of cases in our study and is an unusual manifestation of dengue fever. Faridi et al, in their study similarly showed a high percentage (32.4%) of splenomegaly in children with dengue.[54,55]

In this study we have found that the respondents were finally diagnosed as Dengue Fever 157(40.8%), Dengue Fever with warning sign 200(51.9%) and Severe Dengue 28(7.3%) - Dengue Shock Syndrome 16(4.2%), Expanded Dengue Syndrome 9(2.3%) and Dengue Hemorrhagic Fever 3(0.8%). It was observed that 71.1% of children had non-severe dengue disease and 28.9% had severe dengue disease, according to Khan et al.[56] Ratageri et al[57] and Aggarwal et al[58] reported that shock was the most common presentation in severe dengue infection in 22% and 33% of cases, respectively. There was a much lower rate of Dengue Hemorrhagic Fever 3(0.8%) found in this study compared to other studies.[59-61] The authors of this study found that children have 3% expanded dengue syndrome, which is like the results of Kumar et al.[62]

Conclusion

Dengue fever has resurfaced with a different pattern of presentation in recent epidemics. To reduce mortality and morbidity associated with severe dengue infection, clinical vigilance and awareness are essential.

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