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ORIGINAL ARTICLE

THE OUTBREAK OF DENGUE IN 2023 AT A PRIMARY HEALTH CARE CENTER, BANGLADESH

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Abstract:

Background: *Dengue is an emerging arboviral infection caused by a flavivirus strain. All four serotypes are prevalent in Bangladesh. In 2023, Bangladesh experienced a severe upsurge of dengue resulting in high number of dengue-related deaths in Bangladesh. Several factors are associated with the increasing risk of the spread of the dengue epidemic in Bangladesh.* ***Methods:*** *This is a single-center, descriptive type of observational study. Total 940 confirmed dengue patients were considered the analytical sample for our study.The finalized data were imported into the statistical software (SPSS Version 25) for analysis and compared with clinical findings, measured BP level, IV fluid, antibiotic use, and outcome of the dengue patients.* ***Results:*** *In 2023, Bangladesh had the worst dengue outbreak including our study place. In our Upazila Health Complex, Mohammadpur, Magura, Khulna Bangladesh, in 2022 only 11 confirmed dengue cases were reported (0.2% of total admitted patients) and in 2024 the documented number was101 (1.5% of total admitted patients) but in 2023 total of 1041 confirmed (940) and clinical dengue (101) patients (14% of total admitted patients) were treated as dengue. A total of 940 admitted confirmed dengue cases were included in the study. Male patients supersede females in number. All patients were symptomatic and 6.7% had co-morbidities.Out of 940 patients; 83.5 %(785) patients had dengue fever, 1.5 %(13) had dengue hemorrhagic fever, and 15 %(142) had dengue shock syndrome. Sex did not affect on clinical severity (p value=0.378). Most of the patients (64.1%) stayed less than 3 days in hospitals (CI at 95.0%level is 0.11). A total of 8.6% (81) patients developed complications during inpatients. Most (94.8%) of the admitted dengue patients were treated with IV fluids (p value=0.01).* ***Conclusion:*** *In 2023 Bangladesh faced a severe and unexpected outbreak of dengue infection. Male and young patients were mostly affected by dengue infection. Though there have been a large number of deaths in recent years, most of the patients recovered uneventfully.*

Key words: *Dengue fever, clinical severity, outcome, complication*

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Introduction:

~~Dengue is an emerging arboviral infection caused by a flavivirus strain. The global incidence of dengue has~~

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markedly increased over the past two decades which leads to public health challenges. From 2000 to 2019, the World Health Organization (WHO) documented a ten-fold rise in reported cases worldwide increasing from 500,000 to 5.2 million. The year 2019 marked an unprecedented peak, with reported instances spreading across 129 countries. Several factors are associated with the increasing risk of spread of the dengue epidemic including, the changing distribution of the vectors (chiefly *Aedes aegypti and Aedes albopictus*), especially in previously dengue naïve countries and climate change leading to increasing temperatures and high rainfall, humidity among others; fragile health systems amid COVID-19 pandemic, political and financial instabilities in countries facing complex humanitarian crises and high population movements. These factors also challenge the response to the epidemic and the risk of further spread to other countries. "Weakness in the surveillance systems in many affected countries may have led to delayed reporting and response and missed identification of symptoms, contributing to increased severe dengue outcomes." says WHO.

Dengue remains endemic since 2000 in Bangladesh. In 2023 Bangladesh faced a severe upsurge of dengue infection. Bangladesh witnessed a record-high number of dengue-related deaths in 2023 .[6,7] In 2023, over 320,000 confirmed dengue cases and 1,700 deaths reported in Bangladesh.[9] Up to 31 December 2023, the Directorate General of Health Services (DGHS) website data revealed 321,179 hospitalizations and 1,705 deaths due to the Aedes mosquito-borne tropical disease outbreak and in the year of 2024 (January to 20 December 2024) a total of 99888 cases are detected in Bangladesh.[10,11]Aedes aeegypti is the primary vector. According to the WHO report published on 24 July 2024, increases in dengue cases were reported in Bangladesh In Bangladesh overall, the total number of dengue cases for the period January to July 2024 remains lower than that reported for the same period in 2023 (4577 in 2024 as of 14 July compared to 20837 in 2023).

All four serotypes are circulating in Bangladesh. Infection with one serotype confers life-long immunity but a second infection with different serotypes is associated with an increased risk of severe disease. Previously it was thought that dengue was an urban disease but nowadays it is spreading everywhere in Bangladesh. Clinical case classification includes dengue fever, dengue hemorrhagic fever, and dengue shock syndrome. Definitive diagnosis of dengue requires a positive NS1 or serologic examination (IgM, IgG antibody) in addition to clinical features.[12]

Magura is one among ten smallest districts of Bangladesh. Mohammadpur Upazilla of Magura district isalso a smaller one in Bangladesh. People of this Upazilla also faced the Dengue epidemic with great surprise as Magura district of Bangladesh was regarded as a non-endemic for Dengue infection before 2022. Before the outbreak in 2023 Dengue was confined among the people coming from Dhaka and Saver areas but recent outbreak broke the trend, leading to disease among all kinds of local cultivating people of that area.

Methods:

This is a single-center; descriptive type of observational study conducted at Upazila health complex, Mohammadpur, Magura district of Khulna division, Bangladesh. Sampling technique was purposive and the inclusion criteria were all admitted clinical dengue patients who were positive NS1 or positive dengue IgM antibody. Data were collected from 1st August to 31 December 2023 and compared with previous and recent years. Information on all admitted confirmed dengue patients based on clinical features and positive NS1 or dengue IgM antibody in this facility were included in this study. The Authority/ institutional review board has approved this study and informed consent was taken from the patients. A total of 940 confirmed dengue patients out of 1041 admitted dengue patients (clinical and confirmed) were considered the analytical sample for our study. The information collected from the patients and their medical records were entered in the Microsoft Excel workbook by the researchers followed by reviewing the data for any necessary corrections. The finalized data were imported into the statistical software (SPSS Version 25) for analysis.

Patients were categorized into: age categories less than 15 years, 16-30 years, 31-45 years, 46-60 years, and more than 60 years. During the initial and subsequent consultations that were done on daily basis throughout their hospital stay, the patients also gave information related to comorbidities, duration of symptoms, and the in-hospital outcome of the patients. Clinical severity and grading were assessed by symptoms, hemorrhagic manifestations, documented measured blood pressure, and some laboratory parameters and categorized as dengue fever, dengue hemorrhagic fever, and dengue shock syndrome respectively.Clinical features including hemorrhagic manifestations, evidence of plasma leakage including rising Hct >20%, platelet count <100,000 cells/mm3, and measured blood pressure levels were categorized as dengue hemorrhagic fever or dengue shock syndrome.[12] Laboratory investigations were done on different time of clinical presentations. Some patients were done on single time due to financial constraints and some

patients were done several times. Hypotension by age, is defined as systolic pressure less than 80 mmHg for those aged <5 years or 80 to 90 mmHg for older children and adults and pulse pressure equal to or less than 20 mmHg with increased diastolic pressure.[12] We have also compared with clinical findings, measured BP level, IV fluid, antibiotic use, and outcome of the dengue patients.

To describe the characteristics of the study sample, we have categorized their demographic information, health status, and clinical findings associated with dengue fever, which were summarized as counts and percentages, and to assess their association using the significance level of P <0.05 (in case of small sample size, less than 5, in the bivariate cells Fisher's exact test was used). Next, considered the measured blood pressure level and evidence of any kind of bleeding manifestation of the patient as a clinical severity marker and investigate a similar association between the results. We used SPSS, version 25, to perform the data management and statistical analysis.

Results:

A total of 940 confirmed admitted dengue patients out of total 1041 clinical (101) and confirmed (940) admitted dengue patients were evaluated. Among them 50.2 %(472) were male and 49.8 %(468) were female. 98.5 %(926) were Muslim and only 1.5 %(14) were Hindu. Age variation ranged from 1 to 90 years and the mean age was 34.19±17.13SD. Age groups were divided into 1-15 years 13% (17), 16-30 years 35.5% (116), 31-45 years 28% (105), 46-60 years 16.5% (155) and more than 60 years 7% (66). Out of 940 patients, 6.7% (63) had comorbidities and the most common co-morbidities among the dengue patients were DM-38.09 %(24), HTN-15.87 %(10), IHD-9.52 %(6) and pregnancy were 23.8 %(15). 15.87% (10) patients had multiple co-morbidities. Co-morbidities affected hospital outcomes as referral to higher centre due to turn into severe dengue or development of complications though not statistically significant (p-value 0.132) but 7.9% of referred patients had co-morbidities and on the other hand, 3.4% of referred patients had no co-morbidities. All admitted patients were symptomatic and the most common symptoms during admission were fever (85%), nausea/vomiting (43.7%),bodyache(15%), headache (13.2%), diarrhea (10.2%).Out of 940 patients; 83.5 %(785) patients had dengue fever, 1.5 %(13) had dengue hemorrhagic fever, and 15 %(142) had dengue shock syndrome whose systolic blood pressure was <90 mmHg or pulse pressure equal or less than 20 mmHg. Interestingly age group more than 60 years had no hemorrhagic fever. 18.6% of clinically dengue shock syndrome patients were age group>31 to 45years and 18.2 % were age group more than 60 years though age group had no significant relation on clinical severity (p-value=0.2). Sex did not affect on clinical severity (p value=0.378). 15.3% of male and 15% of female patients were clinically dengue shock syndrome.

Age group and Grade: Cross tabulation

			Dengue fever	Dengue Haemorrhagic fever	Dengue shock syndrome	Total
Age group	1 to 15 years	Count	111	1	10	122
		% within Age_group	91.0%	0.8%	8.2%	100.0%
	16 to 30 years	Count	280	7	47	334
		% within Age_group	83.8%	2.1%	14.1%	100.0%
	31 to 45 years	Count	211	3	49	263
		% within Age_group	80.2%	1.1%	18.6%	100.0%
	46 to 60 years	Count	129	2	24	155
		% within Age_group	83.2%	1.3%	15.5%	100.0%
	>60 years	Count	54	0	12	66
		% within Age_group	81.8%	0.0%	18.2%	100.0%
Total		Count	785	13	142	940
		% within Age_group	83.5%	1.4%	15.1%	100.0%

Among the dengue hemorrhagic fever patients, 1.9% patients were male and 0.9% patient were female. Of those who presented with dengue shock syndrome, 15.9% had co-morbidities though statistically not significant p=0.61.

Comorbidity * Grade: Cross tabulation

			Dengue fever	Dengue Haemorrhagic fever	Dengue shock syndrome	Total
Comorbidity	no	Count	732	13	132	877
		% within comorbidity	83.5%	1.5%	15.1%	100.0%
	yes	Count	53	0	10	63
		% within comorbidity	84.1%	0.0%	15.9%	100.0%
Total		Count	785	13	142	940
		% within comorbidity	83.5%	1.4%	15.1%	100.0%

Regarding in-hospital stay, patients stayed from one to 15 days; most of the patients (64.1%) stayed less than 3 days and 33.7% of patients stayed from 4 to 7 days (Confidence Interval Level (95.0%) is 1.09). Male patients had more hospital stays than female patients (p value=0.04,).

Regarding in-hospital outcome, 86.5% (813) were recovered, 3.7% (35) were referred, 6.5% (61) were discharged on risk bond (DORB) and 1.5% (15) was discharged on request and 1.8% (17) was absconded. There was no death among the admitted patients during in hospital stay. Only 6.7% of admitted confirmed dengue patients had co-morbidities. Most of the patients (82.6%) were not been given antibiotics but 17.4% of patients were treated with antibiotics. The hospital documents showed the causes of antibiotic use were due to secondary infection and severe form of dengue fever with possible co-infection. Among the secondary infections, 26 patients had UTI, 13 patients had enteric fever, 7 patients had RTI, 2 patients had pneumonic consolidation and one patient had cellulitis. The result showed that 21.8% of dengue shock syndrome, 15.4% of dengue hemorrhagic fever, and 16.7% of dengue fever patients were treated with antibiotics.

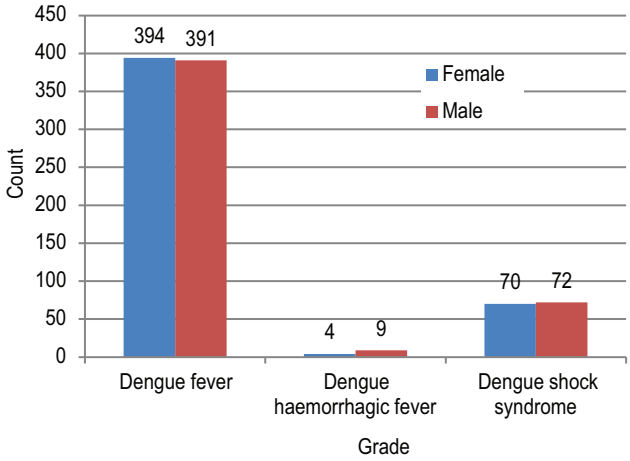

Fig 1: *Grading of admitted dengue patients according to sex at UHC, Mohammadpur*

Age group * Hospital Stay: Cross tabulation

			Hospital_Stay				Total
			1 to 3 days	4 to 7 days	8 to 10 days	11 to 15 days	
Age group	1 to 15 years	Count	81	38	2	1	122
		% within Age_group	66.4%	31.1%	1.6%	0.8%	100.0%
	16 to 30 years	Count	227	102	5	0	334
		% within Age_group	68.0%	30.5%	1.5%	0.0%	100.0%
	31 to 45 years	Count	165	94	3	1	263
		% within Age_group	62.7%	35.7%	1.1%	0.4%	100.0%
	46 to 60 years	Count	93	57	3	2	155
		% within Age_group	60.0%	36.8%	1.9%	1.3%	100.0%
	>60 years	Count	37	26	2	1	66
		% within Age_group	56.1%	39.4%	3.0%	1.5%	100.0%
Total		Count	603	317	15	5	940
		% within Age_group	64.1%	33.7%	1.6%	0.5%	100.0%

Regarding in-hospital outcome, 86.5% (813) were recovered, 3.7% (35) were referred, 6.5% (61) were discharged on risk bond (DORB) and 1.5% (15) was discharged on request and 1.8% (17) was absconded. There was no death among the admitted patients during in hospital stay. Only 6.7% of admitted confirmed dengue patients had co-morbidities. Most of the patients (82.6%) were not been given antibiotics but 17.4% of patients were treated with antibiotics. The hospital documents showed the causes of antibiotic use were due to secondary infection and severe form of dengue fever with possible co-infection. Among the secondary infections, 26 patients had UTI, 13 patients had enteric fever, 7 patients had RTI, 2 patients had pneumonic consolidation and one patient had cellulitis. The result showed that 21.8% of dengue shock syndrome, 15.4% of dengue hemorrhagic fever, and 16.7% of dengue fever patients were treated with antibiotics.

Most (94.8%) of the admitted dengue patients were treated with IV fluids (p value=0.01) and only 5.2% of patients were treated without IV fluid. The age group had a significant relation (p=0.05) for requiring IV fluid; 98.5% of patients of the age group more than 60 years needed IV fluid, and 97.3 % of the age group 31-45 needed IV fluid. Due to the scarcity of IV fluid during the peak season of dengue, patients were managed with different types of fluids. 42% of patients were given only normal saline, and 28.3% were given 5% DNS only. 94.4% of female and 95.1% of male patients needed IV fluids. Regarding in-hospital complications; a total of 8.6% (81) patients had complications. Age group had an effect on complication though not statistically significant (P=0.834). Of those who belonged to the age group 46-60, 10.3% of patients developed complications. Complications are bleeding manifestations, ascites, pleural effusion, severe abdominal pain, acalculous cholecystitis, intestinal obstruction, electrolyte imbalance, and mumps. Six patients required blood transfusionsdue to active bleeding, severe anemia, and thrombocytopenia during in-hospital stay.

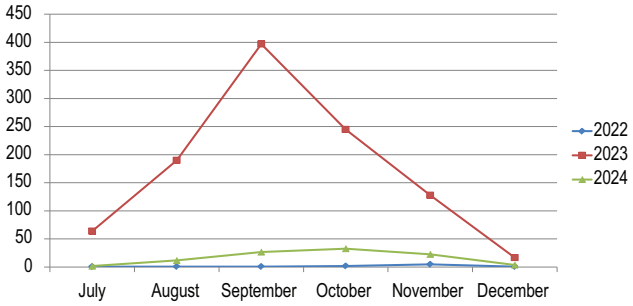

Fig.-2: *The upsurge of dengue outbreaks in recent years at Mohammadpur Upazila health complex.*

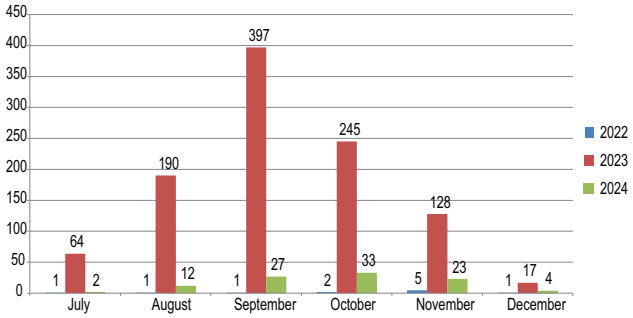

Fig.-3: *Numbers of dengue cases detected at Upazila Health Complex in recent years*

Discussion:

In 2023, Bangladesh experienced its worst dengue outbreak. My study place also had the outbreak of dengue in the year 2023. In 2022 from July to December only 11 patients (0.2% of total admitted) were confirmed dengue and in 2024 only 101 patients (1.5% of total admitted) were dengue patients but in 2023 total of 1041(940 were confirmed and 101 were clinical dengue) patients (14% of total admitted) were treated as dengue patients.

In 2023 the highest number of dengue cases with the highest admission for the confirmed disease (n-940)

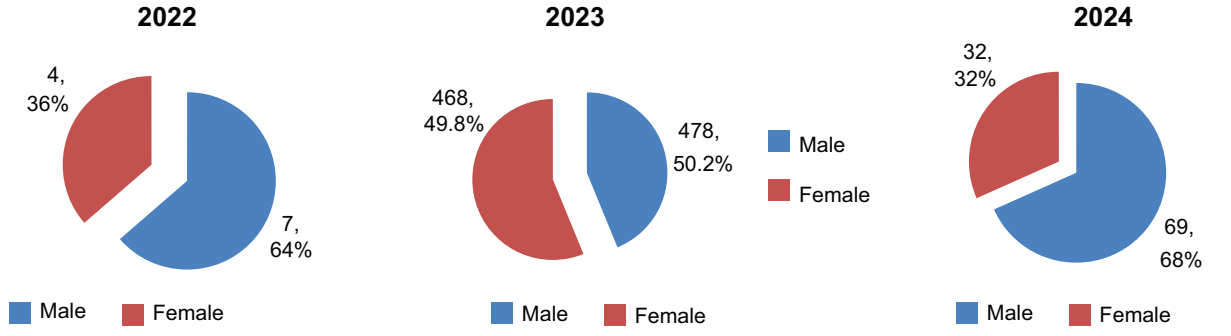

Fig 4: *Number of dengue (Confirmed-940 and clinical-101) patients in recent years at UHC, Mohammadpur,Magura.*

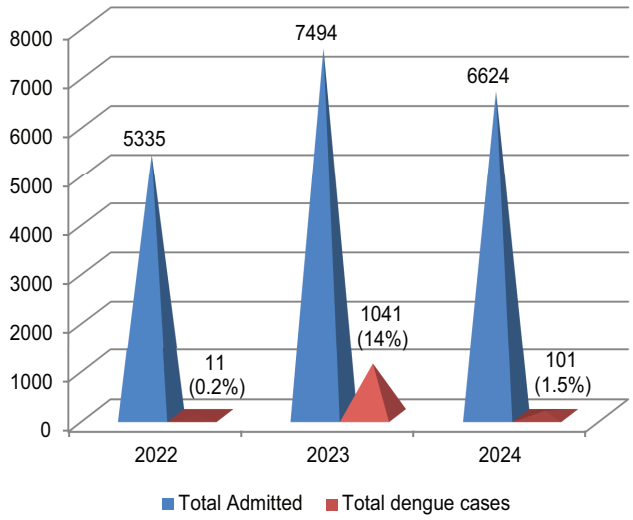

Fig.-5: *Number of dengue patients (confirmed-940 and clinical-101) in relation to total admitted patients (July to December) at UHC, Mohammadpur, Magura*

and the peak admission was in September and October, reflecting the similar finding of our national data of DHIS2 (District Health Information System). According to a review article by Samad et all showedthatthe young adults were predominantly affected by dengue in Bangladesh.[13]My study also showed that age groups 15-30 years are most affected (35.5%) followed by age group 31-45 years(28%) and age group >60 years are least affected(7%). Another study showed middle age group (21 to 30 years) was the most affected group followed by the 11 to 20 years age group and 31 to 40 years age group respectively and the older individuals (> 70 years) were found to be the least affected age group.[1]A study published in the BIRDEM journal showed that 7% had severe dengue[2] and my study found 16.5% had severe dengue classified as dengue hemorrhagic fever(1.5%) and dengue shock syndrome(15%).DSS was reported in up to 10% of cases (2023) compared to only 0.6% in the first outbreak in 2000- according to a review article on Dengue trends in Bangladesh by Samad et all.[13]The proportion of males was persistently higher in all outbreaks but the recent outbreak is characterized by the presence of more female cases than the previous outbreaks. Trend analysis supports contracted male presence over time and it is statistically significant ($p = 0.0073$).[3] Male predominance is also found in Indian studies and my study shows males predominance (52.8%).

Though antibiotics are not helpful for dengue patientsa published article showed 547 (17.8%) out of 3078 patients that received antibiotics. In 10 (0.32%) cases the indication was due to recurrent shock and in 537 (17.5%) patients the indications of antibiotic administration were presumed concurrent bacterial infection.[4]Our study shows 17.4% (164)were treated with antibiotics though it is a primary healthcare level where overuse of antibiotics is common. The most common causes of antibiotic use were secondary infection and severe forms of dengue fever.Regarding hospital stay, a study found out of 532 patients, two-thirds (72.6%) had stayed d"3 days while one-third (27.4%) had stayed greater than 3 days[5] and my study also shows most of the patients (64.15%) stayed less than 3 days. Male patients had more hospital stays than female patients.

Conclusion:

Dengue fever is no more an urban disease. Recently dengue presented as a fatal disease in Bangladesh and spreading to wide range non endemic areas of our country. Dengue fever is spreading to rural areas and affecting male and females equally. Young patients are mostly affected. Recent outbreak in rural areas presented with unusual presentation of systemic and abdominal symptoms. Commodities did not significantly affect the outcome in respect of hospital stay and severity

Limitations:

Study limitations include its observational nature. Additionally, patients admitted at different times of clinical presentation and outcomes of referred patients are not evaluated.

Conflict of Interest:

The authors stated that there is no conflict of interest in this study

Funding:

No funding was received for conducting this study.

Ethical consideration:

The Institutional Authority/ institutional review board has approved this study and verbal informed consent was taken verbally from the patients.

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