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Original Research Article

Clinicopathological profile and awareness of dengue fever among hospitalized patients: a cross-sectional study in Bangladesh

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ABSTRACT

Background: Dengue fever is an important public health problem in Bangladesh, with recurrent outbreaks causing substantial morbidity and mortality. This study assessed the clinicopathological profile and dengue awareness among hospitalized patients.
Methods: A cross-sectional study was conducted among 300 hospitalized dengue patients at Chattagram Metropolitan Hospital Ltd, Chattogram, and Sir Salimullah Medical College Mitford Hospital, Dhaka, from February 2023 to July 2023. Data on socio-demographics, clinical presentations, laboratory parameters, comorbidities, hospital stay, and Dengue awareness were collected using a structured questionnaire. Awareness was assessed using a validated 12-item questionnaire, and associations with socio-demographic factors were analyzed using Pearson's chi-square test in SPSS version 26.
Results: Of 300 patients, 61.3% were male, with a mean age of 37.6±7.5 years. Fever was universal (100%), followed by headache (88.3%), skin rash (65.7%), and body ache (62.0%). Thrombocytopenia (<50×109/L) was the most common laboratory abnormality (84.7%), followed by leukopenia (55.7%). Elevated AST and ALT occurred in 45.0% and 36.7%, respectively. Adequate Dengue awareness was observed in 79.0%. Age<40 years and lower education were significantly associated with inadequate awareness (p=0.003 and p<0.001, respectively). Diabetes mellitus was the most common comorbidity (16.3%), and the case fatality rate was 1.3%.
Conclusions: Dengue predominantly affected young working-age males, with thrombocytopenia and hepatic involvement as prominent laboratory findings. Targeted health education, particularly for younger and less-educated patients, is needed to improve prevention, early recognition, and timely care-seeking.

Keywords: Dengue, Dengue virus, Awareness, Thrombocytopenia, Cross-sectional studies, Bangladesh

INTRODUCTION

Dengue fever is one of the fastest-spreading mosquito-borne viral diseases in the world, and it is a significant public health problem, especially in tropical and subtropical countries.[1] Dengue is a disease caused by any one of four serotypes of the dengue virus (DENV 1-4) and is transmitted mainly by the Aedes aegypti mosquito, which has experienced dramatic geographic expansion over the past few decades.[2] According to the World Health Organization (WHO), about 390 million people are infected with Dengue every year, and about 96 million of these people develop clinical disease.[3] The burden is disproportionately borne by South and Southeast Asia, where most cases and Dengue-associated deaths are reported.[4] Bangladesh is one of the most dengue-endemic countries in Asia, and successive outbreaks of increasing severity have been reported since the early 2000s.[5] The 2019 Dengue epidemic in Bangladesh was unprecedented, with more than 100,000 officially reported cases and nearly 200 deaths, the largest outbreak at that time.[6] The

rapid urbanization, high population density, poor waste management, and unplanned water storage have all contributed to the favorable breeding conditions for the Aedes vector in Bangladeshi cities, especially Dhaka.[7] In addition, the changing rainfall patterns and climate variability have prolonged the transmission season, making vector control more difficult.[8] Dengue illness can present from no symptoms to severe Dengue with plasma leakage, bleeding and multi-organ failure.[9] The classic clinical triad is fever, headache, retro-orbital pain, myalgia, arthralgia, and skin rash, and the most consistent hematological features are thrombocytopenia and leukopenia.[10] Involvement of the liver, as evidenced by increased serum transaminases, is now known to be a frequent complication, varying from simple elevation of transaminases to overt hepatitis.[11] Prompt clinical management and early identification of warning signs are key factors in determining patient outcomes in Dengue. In addition to the clinical aspect, community awareness is an important factor in the prevention and control of Dengue. The studies conducted in the region have consistently shown that sufficient knowledge of the transmission, symptoms and prevention of dengue can greatly decrease exposure to the *Aedes* vector.[12] Awareness is, however, highly variable by socio-demographic segments, and there are significant gaps in awareness among some population groups, such as the younger and less educated.[13] Therefore, it is crucial to understand the relationship between clinical presentation, pathological parameters, and patient awareness in order to create effective and contextually appropriate interventions.

This study aimed to evaluate the clinicopathological characteristics and assess the level of dengue awareness among hospitalized patients at a tertiary care center in Bangladesh.

METHODS

This cross-sectional study was carried out at two tertiary care hospitals in Bangladesh, Chattogram Metropolitan Hospital Ltd, Chattogram, and Sir Salimullah Medical College Mitford Hospital, Dhaka, from February 2023 to July 2023. Patients with confirmed Dengue fever (based on clinical features and serological testing (NS1 antigen and/or IgM/IgG antibody positivity) were recruited by purposive sampling, totaling 300 patients. Patients aged 11 years and older admitted to the hospital with confirmed Dengue were included in the study. Patients with incomplete medical records, patients who were diagnosed with other febrile illnesses at the same time, and patients who refused to participate were excluded from the study. Socio-demographic information such as age, gender, education level, occupation, and monthly income was collected. Clinical variables included were the presenting symptoms (fever, headache, skin rash, body ache, vomiting, anorexia, diarrhea, abdominal pain, bleeding manifestation, altered sensorium, lymphadenopathy, and retro-orbital pain), comorbidities (hypertension, diabetes mellitus, ischemic heart disease, chronic kidney disease, and multiple comorbidities), duration of hospital stay, and patient outcomes. Laboratory data including total leukocyte count, platelet count, liver enzymes (AST and ALT), serum sodium, serum albumin, and renal function tests were obtained from hospital records. The level of awareness about Dengue was assessed by a 12-item structured questionnaire, which included questions on the mode of transmission, identification of vectors, symptoms, prevention, mosquito breeding sites, duration of fever, treatment methods, and community responsibility. Responses were classified as adequate awareness (60% or more correct) or inadequate awareness (less than 60% correct). Data were coded and entered into SPSS version 26 and analyzed descriptively (frequency, percentage, mean, and standard deviation). The chi-square test was used to determine the association between socio-demographic factors and awareness levels, and a $p<0.001$ was considered statistically significant. The study protocol was reviewed and approved by the Research Review Committee (RRC) and Ethical Review Committee (ERC) of American International University- Bangladesh (AIUB) [Issue No. 07/2023]. Written informed consent was obtained from all participants or their legal guardians before enrollment. The study was conducted in accordance with the ethical principles of the Declaration of the Helsinki.

RESULTS

The socio-demographic data of the 300 patients enrolled in the study of Dengue are presented in Table 1. The majority were males (61.3%), and the mean age was 37.6±7.5 years, with the age group 21-40 years the most represented (53.6%). Most of the participants had completed their education up to graduate level or higher (64.0%), were working in service sector jobs (55.0%), and had an income of 20,000-40,000 BDT per month (47.0%).

The clinical features of the Dengue patients are summarized in Table 2. Fever was present in all 300 patients (100%), followed by headache (88.3%), skin rash (65.7%), body ache (62.0%), and vomiting (50.7%). Bleeding manifestations (12.0%), altered sensorium (10.7%), lymphadenopathy (5.7%), and retro-orbital pain (3.3%) were less common but clinically significant.

Pathological findings of the study population are summarized in Table 3. The most common abnormality was thrombocytopenia (<50×109/L) in 84.7% of patients, followed by leukopenia (<4.0×10⁹/L) in 55.7% including 45.0% had elevated AST, and 36.7% had elevated ALT. The most common metabolic disturbances were hyponatremia (28.0%), acute kidney injury (14.3%), and hypoalbuminemia (12.3%).

Clinical outcomes, comorbidities, hospital stay duration, and awareness levels are described in Table 4. The majority of patients were hospitalized for 4-10 days (47.0%) and 34.0% for over 10 days. Diabetes mellitus was the commonest comorbidity (16.3%), followed by hypertension (12.6%). Dengue awareness was found in 79.0% of patients, and 98.7% of patients were discharged after recovery, with a case fatality rate of 1.3%.

The association between socio-demographic factors and the level of awareness about Dengue is presented in Table 5. Younger patients (<40 years) were significantly more likely to have inadequate awareness (χ^2=11.56; p=0.003), and those with no education to undergraduate-level schooling (χ^2=67.8; p<0.001). There were no statistically significant associations between awareness level and gender, monthly income, or length of hospital stay.

Table 6 shows the patients' answers to 12 questions about awareness. Most correctly answered that mosquito bites were the mode of transmission (81.0%) and the Aedes mosquito was the vector (70.5%). A large percentage identified mosquito repellents (84.0%) and bed nets (75.0%) as preventive measures. However, only 52.0% correctly identified rest, hydration, and pain relievers as the recommended treatment for dengue fever.

Table 1: Socio-demographic profile of the study population, (n=300).

Variables	N	Percentage (%)
Gender		
Male	184	61.3
Female	116	38.7
Age (in years)		
11-20	38	12.6
21-40	161	53.6
41-60	83	27.6
>60	18	6.0
Education level		
No education	15	5.0
Undergraduate (includes secondary education)	93	31.0
Graduate and above	192	64.0
Occupation		
Service	165	55.0
Business	13	4.3
Housewife	79	26.3
Retired/unemployed	43	14.3
Monthly income		
<20,000 BDT	122	40.6
20,000-40,000 BDT	141	47.0
>40,000 BDT	37	12.3

Table 2: Clinical features of the study population.

Categories	N	Percentage (%)
Fever	300	100.0
Headache	265	88.3
Skin rash	197	65.7
Body ache	186	62.0
Vomiting	152	50.7
Anorexia	144	48.0
Diarrhea	65	21.7
Abdominal pain	58	19.3
Bleeding manifestation	36	12.0
Altered sensorium	32	10.7
Lymphadenopathy	17	5.7
Retro-orbital pain	10	3.3

Table 3: Pathological features of the study population.

Pathological changes	Category	N	Percentage (%)
Leukocyte count	<4.0×10⁹/L	167	55.7
	>4.0×10⁹/L	133	44.3
Platelet count	<50×109/L	254	84.7
	>50×109/L	46	15.3
Liver enzyme	AST raised	135	45.0
	ALT raised	110	36.7
Other pathological changes	Hyponatremia	84	28.0
	Hypoalbuminemia	37	12.3
	AKI	43	14.3

Table 4: Clinical characteristics, awareness level, hospital stay, outcomes of hospitalized dengue patients, (n=300).

Variables	Category	N (%)
Duration of hospital stay	<4 days	57 (19.0)
	4-10 days	141 (47.0)
	>10 days	102 (34.0)
Co-morbidity profile	Hypertension	38 (12.6)
	Diabetes mellitus	49 (16.3)
	Ischemic heart disease	11 (3.7)
	Chronic kidney disease	7 (2.3)
	Multiple co-morbidities	45 (15.0)
Awareness level about dengue	Adequate awareness	237 (79.0)
	Inadequate awareness	63 (21.0)
Patient outcome	Recovered/Discharged	296 (98.7)
	Death	4 (1.3)

Table 5: Association of socio-demographic factors and the awareness level among dengue patients.

Variables	Categories	Awareness level		Chi-square	P value
		Adequate	Inadequate		
Gender	Male	132 (55.7%)	52 (82.5%)	2.83	0.42
	Female	105 (44.3%)	11 (17.5%)		
Age (in years)	<40	147 (62.0%)	52 (82.5%)	11.56	0.003
	>40	90 (38.0%)	11 (17.5%)		
Education level	No education to undergraduate	67 (28.2%)	41 (65.1%)	67.8	<0.001
	Graduate and above	170 (71.8%)	22 (34.9%)		
Monthly income	<20,000 BDT	92 (38.8%)	30 (47.6%)	4.45	0.91
	>20,000 BDT	145 (61.1%)	33 (52.4%)		
Hospital stay duration	<10 days	153 (64.6%)	44 (69.8%)	2.16	0.67
	>10 days	84 (35.4%)	19 (30.3%)		

Table 6: Awareness response by the study population.

Awareness-related question	Response from patients	Percentage
What is the primary mode of dengue virus transmission?	Direct contact with an infected person	14.6%
	Consumption of contaminated water	4.4%
	Mosquito bite	81%
Which type of mosquito bite	Anopheles mosquito	19%
	Culex mosquito	11.5%
	Aedes mosquito	70.5%
Which of the following symptoms is commonly associated with dengue?	Rash and sore throat	24.6%
	Joint pain and muscle aches	65.4%
	Blurred vision and cough	10%
What is the most effective method to prevent Dengue?	Taking antibiotics	13%
	Drinking herbal teas	3%
	Using mosquito repellent	84%
Which is NOT a potential breeding site for *Aedes* mosquitoes?	Open drains with stagnant water	6.5%
	Flower vases	82.3%
	Unused tires	11.2%
Dengue fever is characterized by a sudden high fever that lasts for how many days?	1-2 days	19.4%
	3-4 days	73.3%
	5-7 days	7.3%
What type of environment is favorable for Aedes mosquito breeding?	Cold and snowy regions	4.6%
	Clean and well-maintained surroundings	18.2%
	Stagnant water and humid conditions	77.2%
What precautionary measures can help reduce the risk?	Leaving windows and doors open	6%
	Wearing dark-colored clothing	19%
	Using bed nets and screens	75%
What is the recommended treatment for Dengue fever?	Antibiotics	23.7%
	Antiviral drugs	24.3%
	Rest, hydration, and pain relievers	52%

Continued.

Awareness-related question	Response from patients	Percentage
What is the best time to apply mosquito repellent to prevent Dengue?	Morning	13%
	Afternoon	13.4%
	Evening	73.6%
What is the most effective way to contribute to Dengue prevention in your community?	Using more plastic containers	10%
	Discarding trash in open spaces	9.5%
	Properly covering water storage containers	80.5%
How can community involvement help control Dengue outbreaks?	By avoiding outdoor activities entirely	7%
	By ignoring potential mosquito breeding sites	14.8%
	By raising awareness and eliminating breeding sites	78.2%

DISCUSSION

This cross-sectional study demonstrated clinicopathological and awareness profiles of the Dengue patients admitted to hospitals in Bangladesh. This study showed a male predominance (61.3%), which is similar to the findings reported by Kumar et al which can be due to higher exposure of working-age males to Aedes mosquitoes outside their homes.[14] The mean age of 37.6±7.5 years, with 53.6% of patients in the age group 21-40 years, suggests that Dengue is a disease of the economically active population, which has a significant socioeconomic impact in Bangladesh.[15] The most common presenting symptom was fever (100%), followed by headache (88.3%) and skin rash (65.7%), which is consistent with the classical Dengue triad mentioned in the WHO guidelines and supported by clinical studies conducted in the region.[16] Bleeding manifestations and altered sensorium (12% and 10.7%, respectively) indicated severe Dengue presentations that required intensive monitoring.[17] The relatively low prevalence of retro-orbital pain (3.3%) in this group may be due to underreporting because of the prevalence of other more prominent symptoms. Thrombocytopenia ($<50\times10^9$/L) was the most common laboratory abnormality, observed in 84.7% of patients, which is similar to the results of several studies in South and Southeast Asian countries that have reported platelet depletion as a characteristic of dengue infection.[18] The immunosuppressive hematological pattern typical of Dengue was also confirmed by leukopenia in 55.7% of the participants.[19] Elevated AST (45%) and ALT (36.7%) levels indicate the hepatotropic nature of the Dengue virus and its ability to cause significant transaminase elevation even in non-severe cases.[20] Other significant complications included hyponatremia (28%) and acute kidney injury (14.3%), highlighting the importance of careful monitoring of electrolytes and renal function during hospitalization.[21] The most common comorbidities were diabetes mellitus (16.3%) and hypertension (12.6%), which is consistent with the general trend of the population of patients in the study being middle-aged and the growing prevalence of non-communicable diseases in Bangladesh. It is well established that severe Dengue and complications are exacerbated by the presence of comorbid conditions.[22] The overall case fatality rate of 1.3% is similar to the range reported from tertiary care hospitals in similar endemic areas, highlighting the need for early diagnosis and prompt clinical management.[23] In terms of awareness about Dengue, 79% of the patients had good knowledge, which is relatively high compared to the community-based studies, probably due to the fact that patients admitted to the hospital had previous direct experience with the disease.[24] However, the significant association between younger age (<40 years) and poor awareness (p=0.003) is a key finding. Younger people may not seek formal health information sources as often or may not perceive themselves as being at risk, making them more susceptible to delayed care-seeking.[25] Therefore, using targeted and education-level-appropriate communication strategies, especially for the less educated and younger population segments, is crucial in any effective Dengue prevention programme in Bangladesh.

Limitations

This hospital-based cross-sectional study was conducted in two tertiary care hospitals; therefore, the findings may not be generalizable to the entire Bangladeshi population. In addition, the cross-sectional design precludes causal inference, and self-reported awareness data may be subject to recall and social desirability bias.

CONCLUSION

This study demonstrated that Dengue fever predominantly affected young working-age adults, particularly males, and was characterized by thrombocytopenia, leukopenia, and hepatic involvement. Although overall awareness was satisfactory, younger and less-educated patients had significantly lower awareness levels. These findings support the need for targeted health education and strengthened public health interventions to improve Dengue prevention, promote early healthcare-seeking behavior, and reduce disease burden in Bangladesh.

Recommendations

Further multi-center prospective studies across different geographical areas of Bangladesh are recommended to better define the epidemiology of Dengue, while community-based interventional programme should be designed and tested in younger and less-educated populations to assess their effectiveness in raising awareness and prevention of dengue.

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