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Original Article

Prevalence of Hypoalbuminemia in Critical Dengue Patients of ICU in Tertiary Care Hospital

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ABSTRACT

Introduction: *Dengue is a mosquito-borne viral disease endemic in many countries in the tropics and sub-tropics. The disease affects mainly children, but in recent years it has become more of an adult disease. This study aimed to assess the prevalence of hypoalbuminemia in critical dengue patients in the ICU.* ***Methods and materials:*** *This cross-sectional observational study was conducted at Tertiary Care Hospital in Dhaka, Bangladesh from June 2019 to June 2020. Purposively, a total of 100 serologically diagnosed dengue patients admitted to the ICU were included in this study. Data were collected in a preformed data collection sheet prospectively and a descriptive analysis was done in this study.* ***Result:*** *In this study, most patients (53%) were from the 25-30 years age group, with a male preponderance (67%) who mostly belonged to middle-class families (41%). All patients had a fever, followed by, abdominal pain (81%), respiratory distress (73%), mucosal bleeding (59%), and vomiting (39%). The prevalence of hypoalbuminemia was found 72% while thrombocytopenia was observed in 59% of the cases. Clinical signs revealed that most patients developed Acute Respiratory Distress Syndrome (ARDS) (74%), followed by ascites (68%), pleural effusion (53%), and hepatomegaly (21%).* ***Conclusion:*** *Hypoalbuminemia, liver dysfunction, Acute Respiratory Distress Syndrome (ARDS), and thrombocytopenia are common and critical features of dengue infection. Early diagnosis and intervention are vital in preventing complications and fatalities.*

Keywords*: Dengue, Prevalence, Hypoalbuminemia, ICU, Thrombocytopenia*

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INTRODUCTION

Dengue virus infection is a prevalent viral-induced hemorrhagic disorder affecting approximately two-fifths of the world's population in tropical and subtropical regions, putting an estimated 500,000 people at risk of requiring hospitalization each year [1,2]. While many dengue virus infections present with no symptoms, they can manifest in a wide range of clinical presentations, from mild febrile illness to severe and even fatal disease [3]. The recent reclassification of dengue by the World Health Organization (WHO) now categorizes patients as having either dengue or severe dengue [4,5]. Severe dengue is characterized by thrombocytopenia, spontaneous hemorrhages, and gradual plasma leakage that can ultimately lead to shock [6]. The WHO previously distinguished three categories of dengue infections: (i) classical dengue fever (DF), (ii) dengue hemorrhagic fever (DHF), and (iii) dengue shock syndrome (DSS). Classical DF usually presents as a mild flu-like illness, while DHF and DSS are potentially fatal conditions that, when combined, are referred to as severe dengue [7]. Dengue fever has been associated with various atypical manifestations, affecting organs such as the heart, nervous system, and liver, resulting in conditions like myocarditis, encephalitis, and hepatitis. As a result, acute dengue infection often goes unnoticed until the appearance of more severe forms of the disease [8]. Unusual gastrointestinal manifestations, including hepatitis, acute pancreatitis, gastrointestinal bleeding, hepatomegaly, acute parotitis, ascites, and more, have become increasingly common due to factors like rapid urbanization, population growth, and inadequate sanitation measures [9,10]. During dengue infection, hypoalbuminemia and proteinuria are commonly observed. Proteins up to the size of albumin are preferentially lost, suggesting a subtle but significant alteration in the filtration properties of the glycocalyx [11]. Identifying plasma leakage in individuals with dengue, particularly in cases of dengue hemorrhagic fever (DHF), is crucial for assessing the risk of developing severe dengue. Hypoalbuminemia, a component of the Dengue Score, has been identified as a factor contributing to fluid accumulation, making it a potential surrogate marker for severe plasma leakage [12]. Laboratory tests can uncover a spectrum of abnormalities including leukopenia, thrombocytopenia, hypoalbuminemia, elevated levels of aminotransferases and creatinine, and proteinuria. When dengue infection is clinically suspected, laboratory confirmation is typically achieved through the use of enzyme-linked immunosorbent assays to detect dengue virus envelope protein (E) or non-structural protein 1-specific IgM and IgG antibody levels, or reverse transcriptase polymerase chain reaction to measure dengue-specific nucleic acids [13]. Plasma leakage is the primary cause of mortality and morbidity in DHF patients, yet a comprehensive assessment of the natural course and frequency of hypoalbuminemia in these cases remains incomplete.

OBJECTIVE

General Objective

- To assess the prevalence of hypoalbuminemia in critical dengue patients.

Specific Objectives

- To assess the socio-demographic characteristics of the study participants.
- To identify the presenting features exhibited by the study subjects.

- To determine the clinical signs observed in the patient population.

METHODS & MATERIALS

This cross-sectional observational study was carried out at the Tertiary Care Hospital in Dhaka, Bangladesh. The study enrolled a total of 100 patients with serologically confirmed dengue infection who were admitted to the Intensive Care Unit (ICU) between June 2019 and June 2020. Informed written consent was obtained from all patients. Strict confidentiality of all data was maintained, and it was exclusively utilized for the study's intended purposes. The selection of participants was done using a purposive sampling technique.

Inclusion criteria

- Patients with dengue Hemorrhagic fever (DHF) and dengue shock syndrome (DSS) according to WHO guidelines.
- Patients >20 years old.
- Patients who had given consent to participate in the study.

Exclusion criteria

- Patients who had pre-existing critical illness.
- Patients who did not give consent to participate in the study.

Patients were diagnosed with dengue infection based on the presence of a high-grade fever for several days, and the diagnosis was serologically confirmed through the detection of either the NS1 antigen or IgM ELISA. Standard laboratory tests, including complete blood counts (CBC), liver function tests, creatinine, electrolytes, calcium, and C-reactive protein (CRP), were performed for all cases. Additionally, in suspected cases of secondary bacterial infection, blood cultures and sensitivities were conducted. Chest X-rays (CXR) and ultrasound scans of the entire abdomen were performed to assess the presence of pleural effusion, consolidation, and ascites. Data were systematically collected using a pre-designed data collection sheet in a prospective manner. A descriptive analysis was conducted, and the study findings were presented in the form of tables and pie charts.

RESULTS

In this study, the largest portion of participants (53%) fell within the 25-30 years age group, followed by the 31-36 years age group (30%), with most of them being male (67%). The socioeconomic status of the study participants varied, with 29% classified as low, 41% as middle, and 30% as high. This distribution highlights the diverse socioeconomic backgrounds of the individuals included in the study. The distribution of presenting features among the study participants revealed that fever was present in 100% of the cases. Vomiting was reported in 40% of the cases, while 80% presented with respiratory distress and abdominal pain. Additionally, 60% of the participants had mucosal bleeding as one of their presenting features. In the study, clinical signs included hepatomegaly in 21% of cases, pleural effusion in 53%, ascites in 68%, and a substantial 74% with acute respiratory distress syndrome (ARDS). The distribution of laboratory findings among the study participants was as follows: 52% had anemia, while 59% showed thrombocytopenia. Elevated serum transaminase levels were found in 42% of the cases. A significant

proportion, 72%, had hypoalbuminemia, and 33% presented with coagulopathy.

Table I: Age and gender distribution of participants (N=100)

Variables	n	%
Age (Year)		
25-30	53	53.0
31-36	30	30.0
>36	17	17.0
Gender		
Male	67	67.0
Female	33	33.0

Table II: Socioeconomic status of participants

Socioeconomic status	n	%
Low	29	29.0
Middle	41	41.0
High	30	30.0

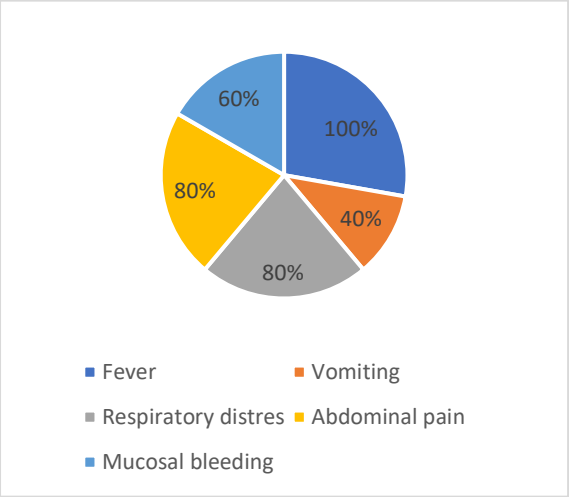

Figure 1: Presenting features distribution

Table III: Clinical signs distribution

Clinical signs	n	%
Hepatomegaly	21	21.0
Pleural effusion	53	53.0
Ascites	68	68.0
ARDS	74	74.0

ARDS: Acute respiratory distress syndrome

Table IV: Distribution of laboratory findings

Laboratory findings	n	%
Anemia	52	52.0
Thrombocytopenia	59	59.0
Elevated serum transaminase	42	42.0
Hypoalbuminemia	72	72.0
Coagulopathy	33	33.0

DISCUSSION

The majority of the patients (53, 53.0%) were in the 25-30 years age group, followed by, (30, 30.0%) 31-36 years age group, with a male preponderance (67, 67.0%), who mostly belonged to a middle-class families (41, 41%). A study by Prattay KM et al. showed that the majority of the dengue patients were between 18–40 years of age which is in concordance with several recent investigations conducted in various South-Asian countries including Bangladesh, Singapore, Sri Lanka, and India [14]. Anker et al. conducted a study and an excess of males was found among reported dengue cases ≥ 15 years of age. This pattern was observed consistently over several years across six culturally and economically diverse countries [15]. Prasith N et al also found a male predominance [16]. In another study in Thailand, affected adults over 15 years of age comprise 30–40% of dengue cases [17]. All (100, 100.0%) patients had fever, followed by, abdominal pain (81, 81.0%), respiratory distress (73, 73.0%), mucosal bleeding

(59, 59.0%), and vomiting (39, 39.0%). Regarding clinical signs, the majority of the patients (74, 74.0%) developed ARDS (Acute respiratory distress syndrome), followed by, ascites (68, 68.0%), pleural effusion (53, 53%), and hepatomegaly (21, 21.0%). The majority of the patients had hypoalbuminemia (72, 72.0%), followed by thrombocytopenia (59, 59.0%). Hasan MJ conducted a study in Bangladesh and found, thrombocytopenia was present in 66.1% of cases. Fever (100%) was common for all. Gastrointestinal (GIT) features, including abdominal pain (86.5%), anorexia and/or vomiting (69.6%), and Diarrhea (> 3 motions/day) (26.2%) were more frequent than typical rash and other pain symptoms. Hypotension was present in approximately a quarter of patients (25%). GIT features (anorexia, nausea, and/or vomiting) and hypotension were also common [18]. In another study by Rafi A. et al the most common clinical presentation was fever followed by headache and myalgia. Vomiting and abdominal pain were the most prevalent warning signs. The common hematological findings on admission were leukopenia (63.3%), thrombocytopenia (30.4%), and increased hematocrit (26.6%). Raised serum ALT or AST was observed in 14.1% of cases. Signs of plasma leakage (pleural effusion, respiratory distress, ascites, rise of hematocrit >20% during hospital stay) and hepatic or renal involvement (serum ALT >42UI/L or serum creatinine >1.2 mg/dL) on admission were mostly associated with severe dengue [19]. Concerning the prevalence of hypoalbuminemia, Mazuumder W et al found it about 19.4%, though their study population was not critically ill dengue patients in the ICU [20]. In the study of Swamy AM et al., hypoalbuminemia was found in 50.8% of their study subjects [21]. The incidence of hypoalbuminemia was 44.1% in a study by Kumar S. et al. They also stated that hypoalbuminemia is a significant predictor of mortality and morbidity in critically ill patients [22]. Sugunan S et a. conducted a retrospective study among children who died due to Dengue during outbreaks. Hypoalbuminemia at admission was seen in 26 (89%) patients [23]. Nonetheless, the number of studies conducted involving analyses on daily platelet count, Hct (hematocrit) count, and blood pressure of dengue patients is scarce worldwide. Hence, it is crucially important to analyze the clinical manifestations of dengue endemic in recent years and co-relate the disease severity with these changing patterns to develop and modify an optimum guideline for the early and appropriate detection and management of the disease which in turn may significantly reduce the sufferings of the patients and lessen the economic burden of the nation thereby.

Limitations of the study

This study's constraints are evident as it was exclusively conducted within a single hospital, and the sample size was limited in scope. Consequently, the outcomes may not accurately reflect the broader community. The study's findings should be interpreted with the understanding that they may not be universally applicable to the entire community due to these inherent limitations.

CONCLUSION

Hypoalbuminemia emerges as a frequent occurrence in dengue infection and can significantly exacerbate shock, signifying a critical phase of the disease. Liver dysfunction and the onset of Acute Respiratory Distress Syndrome (ARDS) are also commonly observed in patients

infected with the dengue virus. This liver involvement can range from mild elevations in transaminase levels to the severe condition of fulminant liver failure. Thrombocytopenia, or low platelet count, is another characteristic feature in patients with critical dengue. Thus, early diagnosis and swift intervention play a pivotal role in averting complications and preventing fatalities associated with this infectious disease.

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Ethical approval: The study was approved by the institutional ethics committee.

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