Original Article

Association of Clinical Parameters with Dengue Fever and Co-infection in a Tertiary Care Hospital

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Abstract

Background: *Dengue is becoming a more serious public health issue in Bangladesh. It consistently has a particularly harmful effect on this country almost every year. Patients with classic dengue typically exhibit fever, myalgia, arthralgia, retro-orbital discomfort and rash in the body. Additionally, hemorrhagic manifestations, with or without shock, can be seen in dengue infections. The aim of the study is to investigate the relationship of clinical parameters and laboratory findings with dengue and co-infected patients.* **Materials and Methods:** *The prospective observational study was conducted from July to December 2023 at the department of Paediatrics, Eastern Medical College and Hospital, Cumilla. The study comprised 197 patients aged 2 to 18 years admitted in this hospital with a fever lasting 84 hours or more and whose blood samples were positive for NS1 or IgM against dengue and screened for other co-infections. The study excluded patients with hemoglobinopathies, those who had received several transfusions, those suffering from chronic conditions and those who refused to participate.* **Results:** *Among 197 patients NS1 was positive in 175 (89%) samples and Dengue IgM was positive in 22 (11%) samples. Besides, among 197 cases 160 (81%) were diagnosed with dengue and 37 (19%) were diagnosed with co-infection. By gender, 68.75% were males and 31.25% were females in dengue cases. Vomiting, nausea and cough were significant features in dengue and co-infection. Urinary pus cell >10/HPF and Widal test titer ≥1:320 were statistically significant in the co-infection group.* **Conclusion:** *Dengue fever can affect children irrespective of their age or nutritional status. Dengue with co-infection was 19% in this study. This study re-emphasizes the fact that clinicians should be aware that co-infection with dengue and initiate appropriate therapy to decrease morbidity and mortality.*

Introduction

The dengue infection is an emerging health threat that poses significant global medical and public health concern. A person may be more susceptible to dengue due to factors such as their age, genetic makeup, nutritional health, the specific strain of the virus, and any existing secondary infections[1]. A viral infection, dengue causes flu-like symptoms, including piercing headaches, muscle and joint pains, fever and, in some cases, internal bleeding and death. The disease is transmitted to humans via the bite of an infected Aedes mosquito, and there is no specific treatment available. Dengue, also known as break bone fever, is endemic in more than 100 countries and every year, 100 million to 400 million people become infected, according to the World Health Organization (WHO)[2].

The most prevalent mosquito vectors for the transmission of the infection are Aedes aegypti and Aedes albopictus[3]. According to a report, dengue fever (DF) is estimated to affect 3.9 billion people worldwide out of which 70% burden exists in Asia[4]. Countries that are worst affected by the dengue virus are Pakistan, Bangladesh, India and Sri Lanka[5]. Dengue can lead to dengue haemorrhagic fever (DHF) and dengue shock syndrome (DSS)[6].

Clinical presentation of dengue fever has been observed to change with time since its first outbreak in 2000 in Bangladesh. Accurately predicting the early progression of dengue to a severe form is essential for effective patient triage and clinical management. But with increasing reports of co-infection, the situation has become worse. The vast overlapping spectrum of signs and symptoms of dengue and leptospirosis makes the clinical diagnosis challenging for treating physicians when the co-infection presents in acute form. It is important to differentiate these two diseases because early antibiotic therapy is crucial in leptospirosis, whereas dengue is treated symptomatically. Increased awareness about the presence of co-

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infection is necessary so that a high index of suspicion is maintained for early diagnosis[7].

Materials and Methods

The prospective observational study was conducted in the department of Paediatrics, Eastern Medical College & Hospital, Cumilla from July to December 2023. In this study, 197 Paediatric patients aged 2 to 18 years of age, admitted in this hospital word with complaints of fever for 84 hours or more and whose blood sample was positive for NS1 or IgM against dengue were included. The study excluded patients with hemoglobinopathies, those who had received multiple transfusions, individuals with chronic diseases, and those who were unwilling to participate. The study protocol was approved by the institutional ethical review board and written informed consent was obtained from parents of all participating children. Demographic data like age, gender, days of hospitalization, symptoms, duration of fever, type of dengue fever were recorded. The dengue patients were classified into four different types-UDF (Unusual Dengue Fever), DF (dengue fever), DHF (dengue haemorrhagic fever) and EDS (expanded dengue syndrome) according to Bangladesh's national guideline for clinical management of dengue syndrome and the data was documented accordingly. Clinical parameters like average systolic and diastolic blood pressure, temperature and platelet count of the patients were recorded as well on a day-to-day basis during their residence in the hospital. Co-infection was defined as patients whose serum samples were positive for both dengue and another laboratory parameter other than dengue infection. Clinical features and laboratory parameters were clarified and compared with patients having co-infection.

Results

Among 197 patients NS1 was positive in 175 (89%) samples and Dengue IgM was positive in 22 (11%) samples (Figure-1). The present study showed that among 197 cases 160 (81%) were diagnosed as dengue and 37 (19%) were diagnosed with co-infection (Figure II). The mean age was 8.82±4.34 years, by gender, 68.75% were males and 31.25% were Females in dengue cases. Vomiting, nausea and cough were significant features in dengue and co-infection (Table 1). Table 2 shows laboratory parameters Urinary pus cell >10 /HPF and Widal test titer ≥ 1:320 are statistically significant in the co-infection group.
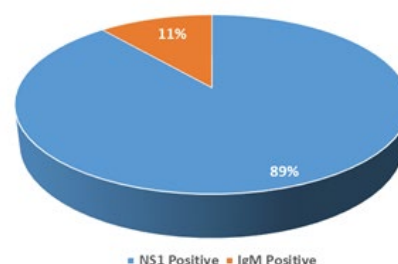
Figure-1: Method of diagnosis of dengue in the study population (n=197)
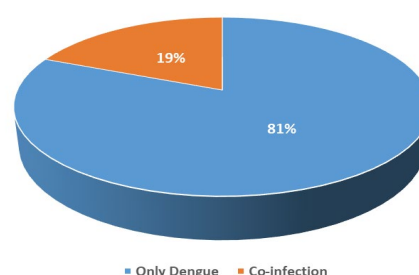
Figure-2: Distribution of only dengue and co-infection in the study cases (n=197)

Table-I: Demographic characteristics, clinical feature findings of the study cases (n=197)

Parameters	Dengue alone (n=160)	Dengue with Co-infection (n=37)	p-value
Gender			
Male, n (%)	110 (68.75)	23 (62.16)	0.42ns
Female, n (%)	50 (31.25)	14 (37.84)	
Age (years) (mean±SD)	8.82±4.34	7.96±3.9	0.74ns
Clinical features			
Duration of fever before admission (days)	5.20±1.37	5.81±1.46	0.79ns
Vomiting, n (%)	46 (28.75)	17 (45.50)	0.04s
Abdominal pain, n (%)	59 (36.88)	18 (48.65)	0.18ns
Headache, n (%)	82 (51.25)	25 (67.57)	0.07ns
Myalgia/arthralgia, n (%)	34 (21.25)	09 (24.32)	0.68ns
Nausea, n (%)	73 (45.63)	24 (64.86)	0.03s
Cough, n (%)	62 (38.75)	22 (59.46)	0.02s
Running nose, n (%)	67 (41.88)	21 (56.76)	1.0ns

p-value obtained from 't' test and $\chi 2$ test; s=significant; ns= non-significant

Table-II: Laboratory findings of the study cases (n=197)

Parameters	Dengue alone (n=160)	Co-infection (n=37)	p-value
Hemoglobin (g/dL)	12.4±1.7	12.3±1.2	0.793[ns]
Hematocrit	36.5±4.1	36.8±3.3	0.756[ns]
Leucocyte count ($\times 10^3$/mm^3)	6.91±3.2	8.17±3.9	0.239[ns]
Lymphocytes	48.5±7.3	46.7±6.5	0.317[ns]
Platelets ($\times 10^3$/mm^3)	98.2±26.8	87.3±25.6	0.025[s]
Albumin (g/dL)	4.32±0.51	4.21±0.43	0.395[ns]
S. AST (U/L)	38.5±29.7	35.6±19.5	0.656[ns]
S. ALT (U/L)	18.9±12.1	25.6±16.7	0.084[ns]
Urine pus cell >10 mm^3	05±03.12	11±29.72	<0.001[s]
Widal test level ≥1:320	21±13.12	13±35.13	0.001[s]

p-value obtained from $\chi 2$ test; s=significant; ns= non-significant

Discussion

Early detection of dengue viruses is not only necessary in the context of minimizing disease burden but also for controlling disease spread. Among various methods available for early detection, RT-PCR and non-structural protein 1 (NS1) antigen detection were widely used[8]. Among 197 patients, NS1 was positive in 175 (89%) samples and Dengue IgM was positive in 22 (11%) samples. A similar observation was found by Golhar, et al.[9] study where 89.1% dengue cases were diagnosed with NS1 antigen positive and 10.9% were diagnosed with IgM antibody positive. Alikunju, et al[10] studied the severity of dengue disease in which they found 91% of patients as NS1 positive with only 2% being IgG positive; that was like our study but without any significant correlation. However, Valero, et al.[11] found no significant correlation between disease severity and NS1 positivity.

The present study showed among 197 cases 160 (81%) were diagnosed as dengue and 37 (19%) were diagnosed as co-infection. Sachu, et al.[7] in their study found serological evidence of co-infection in 3.4% of the samples tested. Different studies around the world have reported co-infection ranging from as low as 1.3% to as high as 17.5%.[12-14] The mean age was 8.82±4.34 years, by gender, 68.75% were males and 31.25% were females in dengue cases. Clinical features of vomiting, nausea and cough were significant both in dengue and co-infection. Abdominal pain, headache and Myalgia/arthralgia also percentile higher in the co-infection group in comparison to dengue fever. In contrast to other common symptoms of dengue fever, individuals were more likely to have generalized body aches, abdominal pain and vomiting. This result was in accordance with a study conducted in Karachi, Pakistan[15]. Sachu, et al.[7] also differed from our observation that they found significant features of gum bleeding and rashes over the body.

In a study by Mahmood, et al.[16] myalgia was reported by 146 (26.9%) patients and the characteristics of pain were acute. In that study, 137

(25.3%) patients had a maculopapular skin rash, and 117 (21.6%) experienced itchy skin. Around 30% of patients reported abdominal pain, and approximately 20% experienced diarrhea. Over 60% had nausea and vomiting, while 45.9% suffered from headaches. In addition to these common symptoms, less frequent signs included retro-orbital pain in 27 (5.0%) patients and conjunctival suffusion in 14 (2.6%) patients. Mahato, et al.[17] study reported typhoid fever was observed in 18 (18.95%) in dengue positive patients whereas the present study observed enteric fever was found in 13.12% in only dengue and 35.13% in Dengue with co-infection patients. This was quite like our study.

Ahmed, et al.[18] also clinically identified 18 (24%), 41 (54%) and 17 (22%) cases of dengue fever, dengue with warning signs, and severe dengue, respectively. Among them, blood samples were collected from 22% of patients and 47% of these tested positive for DENV-1 RNA and they confirmed 32 malaria cases with 5 co-infections with dengue. Regarding laboratory parameters, this study showed thrombocytopenia was significantly related to dengue fever with co-infection cases [19,20]. Sachu, et al.[7], reported that thrombocytopenia, a key characteristic of dengue fever, was observed in 72.7% of the co-infection cases. Kumar, et al.[13] also reported thrombocytopenia was present in 64.7% of the co-infection cases. Deranged hepatic function was also seen among the co-infection cases in this study.

Conclusion

Dengue fever can affect children irrespective of their age or nutritional status. Dengue with co-infection was 19% in this study. This study re-emphasizes the fact that clinicians should be aware that co-infection with dengue and initiate appropriate therapy to decrease morbidity and mortality before the disease progresses.

Conflict of interest

The authors declared that they have no conflict of interest.

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