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Original Article

Biochemical and Hematological Profiles among Dengue Patients in a Study in Northern Part of Bangladesh

Md. Nuruzzaman[1], Md. Shakhawat Hossain[2], A.K.M Shaheduzzaman[3], Md. Mokhlesur Rahman sarker[3], Md. Abdul Ohab[3], Md. Mahfuj-ul-Anwar[5], Md. Masudur Rahman Khan[4], Md. Helal Miah[5], Md. Mahfuzer Rahman[6]

Abstract:

Background: Dengue is a tropical viral disease caused by various strains of Dengue virus. Dengue is upsurging due to increasing Ades mosquitoes in overcrowded area. The diagnosis of dengue fever is based on clinical and laboratory results like blood count, platelet count, tourniquet test, prothrombin time and serum creatinine and virological tests. **Objectives:** This study was aimed to determine the biochemical and hematological parameters of patients with dengue fever to increase the sensitivity of the laboratory tests to enrich our current management strategy. **Methods:** This was a multicenter hospital based cross sectional study held in two tertiary medical college hospitals in northern part of Bangladesh; Rangpur Medical college hospital and M Abdur Rahim medical college, Dinajpur. All the patients who were admitted with laboratory confirmed dengue case from June 2019 to October 2019 were included in this study. **Results:** Out of total 160 patients, majority of the patients were between 21-40 years of age group (57%) and were male (75%). It was found that, 84(52.5%) patients have leucopenia and 130(81%) patients have low platelet count. serum creatinine and blood urea levels were raised in 9.4% and 5% of the patients respectively. Among liver function status, higher levels of ALT in 23.8% and AST in 7.5% were found among the study subjects. **Conclusion:** Awareness of clinical findings, as well as laboratory results like hematological and biochemical parameters would be the most important guide to management and prognosis of dengue.

Key words: Dengue fever, Hematological parameters, Biochemical results

Introduction:

Dengue is a tropical viral disease caused by various strains of Dengue virus of the flaviviridae family and transmitted by the bite of different species of female Aedes ageptimosquitoes. More than three hundred thousand cases of dengue hemorrhagic fever (DHF) were diagnosed each year resulting in 24,000 deaths per year South-East Asia[1,2]. WHO declared dengue fever as a potential threat among ten diseases for 2019 and recent outbreaks in many countries confirm this observation.The WHO in 2008 recommends a new classification of dengue fever (DF). This new classification mentioned dengue into 3types: 1) dengue without warning signs (D-W),2) dengue with warning signs (D+W) and 3) severe dengue fever[3,4]. Dengue is a self-limiting infection which causes a spectrum of illness ranging from asymptomatic to life threatening dengue shock syndrome. It may presents with common symptoms with other viral infections, most of which are either undiagnosed or under reported[5]. DF varies in symptoms and severity of disease according to age, geography, season of epidemic and host factors. In the few recent

1. Associate Professor, Dept. of Medicine M Abdur Rahim Medical College, Dinajpur
2. Assistant Professor, Dept. of Gastroenterology Rangpur Medical College, Rangpur
3. Associate Professor, Dept. of Medicine Rangpur Medical College, Rangpur
4. Associate Professor, Dept. of Gastroenterology, Bangabandhu Sheikh Mujib Medical University Dhaka, Bangladesh
5. Assistant Professor, Dept. of Medicine Rangpur Medical College, Rangpur
6. Professor, Dept. of Medicine Rangpur Medical College, Rangpur

outbreaks, it was observed that new and atypical features are increasing[6]. The global prevalence of dengue fever has increased in the few recent years, particularly in the Americans, Western Pacific and South-East Asian regions[7]. The diagnosis of dengue fever is based on clinical and laboratory results. Among laboratory data there are blood count, platelet count, tourniquet test, prothrombin time (PT), activated partial thromboplastin time (APTT), liver function tests and serum creatinine and virological tests like PCR for viral RNA, NS1 and IgG and IGM for Dengue antibody[8]. This study was aimed to determine the biochemical and hematological parameters of patients with DF in order to increase the sensitivity of the laboratory tests in the critical patients and to identify laboratory tests that may indicate this evolution in Bangladesh to enrich our current management strategy.

Methods:

This was a cross sectional study held on 160 patients who were admitted in M Abdur Rahim Medical college hospital, Dinajpur and Rangpur Medical College Hospital in Bangladesh. All the patients who were admitted with confirmed dengue case from June 2019 to October 2019 were included in this study.Patients with current pregnancy, bleeding disorders, liver disease, malaria and leptospirosis were excluded from the study to maintain uniformity. After taking history and full clinical examination by respective physician some investigations were performed to all patients: complete blood count, platelet count, RBS, Serum creatinine, Liver function test: serum bilirubin, ALT, AST, alkaline phosphatase, Ultrasound of Abdomen of all patients; Chest X Ray and ECG of patients who complaints of chest pain or dyspnea.

All patients were given daily follow up for new change till discharge from hospital. Data were collected using a self-structured questionnaire containing demographic variables and investigations data. Blood counts, LFT's, ultrasonogram report and CXR report were recorded. Data were analyzed by statistical software SPSS version 23.0. Ethical approval was taken from the corresponding authority of both Medical college hospitals.

Results:

In this multicenter study, 63 patients were from (Table I) M Abdur Rahim medical college hospital, Dinajpur and rest 97 patients were from Rangpur medical college hospital. Out of total 160 patients, majority of the patients were between 21-40 years of age group (57%) and predominant study subjects were male 120(75%).Out of 160 patients, 28(18 %) had different comorbidity like DM, hypertension, asthma and CLD (Table II).

Table I: Distribution of the study subjects according to source of data (N=160)

Hospital	Frequency (n)	Percentage (%)
M Abdur Rahim Medical College Hospital, Dinajpur	63	39.4
Rangpur Medical College Hospital	97	60.6

Table II: Distribution of the study subjects according to co-morbidity (N=160)

Co-morbidity	Frequency (n)	Percentage (%)
DM	13	8.1
HTN	8	5.0
CLD	2	1.3
Asthma	5	3.1

Nearly all patients had fever and most of them presented with general symptoms. However, a good number of people also suffered from less common symptoms like abdominal pain, chest pain and cough etc.

Table III: Distribution of the study subjects according to severity of disease (N=160)

Disease Severity	Frequency (n)	Percentage (%)
Dengue fever	151	94.3%
DHF	7	4.35
DSS	2	1.25

DHF: Dengue hemorrhagic fever, DSS: Dengue shock syndrome

In this epidemic we noticed that more than half of the patients; 84(52.5%) patients have leucopenia and 130(81 %) patients have low platelet count.

Table IV: Total count of WBC of the study subjects (N=160)

TC of WBC	Frequency (n)	Percentage (%)
<4000	84	52.5
4000-11000	63	39.4
>11000	13	8.1

Table V: Platelet count of the study subjects (N=160)

Platelet count (mg/L)	Frequency (n)	Percentage (%)
>150,000	30	18.8
50,000-150,000	104	65.0
20,000-50,000	21	13.1
<20,000	5	3.1

Table VI: Distribution of the study subjects according to Biochemical Reports (N=160)

	Frequency (n)	Percentage (%)
ALT (elevated)	38	23.8
AST (elevated)	12	7.5
Blood urea (elevated)	8	5.0
S. Creatinine (elevated)	15	9.4
Electrolyte imbalance	15	9.4
Serum albumin(Low)	20	12.5

Abnormal liver function status is seen among 50(30%) of dengue patients (Table IV, V).

Discussion:

Dengue is an emerging disease, increasing day by day, especially in developing countries. It's endemic area and epidemic seasons are also changing every years. Clinical presentation and disease course are also changing from previous reports. All these changes make the diagnosis of dengue a notorious challenge especially in early periods of disease. Dengue fever is similar to other viral infections due to nonspecific symptoms in earlystage except for polymerase chain reaction (PCR) or NS-1 antigen, which should be done in first 48 hours[9]. In this hospital based study, we studied 160 dengue infected patients admitted in both medical college hospital within our study period during 2019 dengue outbreak in Bangladesh.We observed the clinical and biochemical parameters to predict the risk groups. In this study, male were predominantly affected (75%). This study is very similar to a study conducted by Antony et al. conducted in India on 2014[10]. Another study by Ruel Perez also shows that in Manila, Philippines, males were more affected to dengue fever than females on 2011[11]. Another study in Bangladesh by Azad et al. also found male preponderance in 2006[12]. However, a South American study conducted by Kaplan et al. showed in their study that females were more infected than males[13].

Hematological profiles of the study subjects showed that, leucopenia was observed in 52.5% of the study subjects which is consistent with the present study which is consistent with the other studies in different parts of the world. Kinjal et al. found 56.9% and Mohammed et al. found lecopenia in 50 % of their cases in India[14,15]. In Butt et al., out of 104 patients, 55(52.8%) had leukopenia[16]. The proposed mechanism of leucopenia may be viral bone marrow suppression. Thrombocytopenia is another common finding in dengue fever, which might be due to decreased platelets synthesis as aresult of bone marrow suppression by virus and another mechanism may be due to binding of platelets with dengue antigens and complement mediated destruction of platelets[17,18]. In our study we found 81.25% patients presented with thrombocytopenia. Studies by Cherian et al.[19] Singh et al.[20] and Khan et al.[21] showed the incidence of thrombocytopenia in 94.7%, 61.39% and 81.4%, respectively. These findings correlate with our study. Bleeding manifestations was seen predominant in patients with thrombocytopenia than that of normal platelet count. The association between thrombocytopenia and bleeding manifestations has been proved to be statistically significant ($p<0.2$).

In this study serum creatinine and blood urea levels were raised in 9.4% and 5% of the patients respectively. These could be due to damage on the glomerular and tubular cells by virus or as a result of immune complex mediated tissue injury[22]. Other study findings like, Ferede et al. 2018 found serum creatinine and blood urea level 19.6% and 14.7% respectively, which are higher than our study[23].

This study reveals higher levels of ALT in 23.8% and AST in 7.5% of the cases. This is lower than other studies elsewhere that reported ALT and AST higher levels in 39.2% and 68.5% of the cases, respectively[24]. Another study showed elevated AST in 72.7% and ALT in 27.3% of cases elsewhere[25]. The ALT is predominantly associated with hepatocytes, with some activity in skeletal and cardiac muscle. Whereas AST is found in RBC, renal and brain tissue, skeletal and cardiac muscle and is usually elevated due

to damage of those tissues and response to hepatic damage[26]. In most cases, the high levels of ALT and AST show the degree of hepatocellular damage, lengthening the clinical course of the illness; but does not correlates with prognosis of the disease[27,28].

Conclusion:

Dengue is such a disease which has no specific antiviral or vaccine yet to be invented. So, prevention of spread and early diagnosis is the mainstay of successful management.Awareness of clinical findings, as well as laboratory results like hematological and biochemical parameters, are the most important guide to management and prognosis of dengue. As it is a tropical disease, every year we face an outbreak of dengue fever during beginning of rainy season. In our study thrombocytopenia, leucopenia and elevated ALT were identified as the most common findings. Thus, these findings should guide physicians on the probability of dengue infection in this area.

References:

1. Banerjee M, Chatterjee T, Choudhary GS, Srinivas V, Kataria VK. Dengue: A clinicohematological profile. MJAFI. 2008; 64(4):333-336.
2. Prathyusha CV, Rao SM, Sudarsini P, Rao KUM. Clinico-hematological profile and outcome of dengue fever in children. Int J CurrMicrobiol App Sci. 2013; 2(10):338-346.
3. Dengue: Guidelines for Diagnosis, Treatment, Prevention and Control: New Edition. Geneva:2009.
4. National Guideline for clinical management of Dengue Syndrome, CDC,DGHS,MOH&FW, Bangladesh, Fourth Edition, 2018.
5. Dutta P, Khan SA, Borah J, Mahanta J. Demographic and clinical features of patients with dengue in Northeastern region of India: A retrospective cross sectional study during 2009-2011. J Virol Microbiol. 2012. DOI:10.5171/2012. 786298.
6. Kyle JL and Harris E. Global spread and persistence of dengue. Annual Review of Microbiology. 2008;62:71–92.
7. Khan AH, Hayat AS, Masood N, Solangi NM, Shaikh TZ. Frequency and clinical presentation of dengue fever at tertiary care hospital of Hyderabad/ Jamshoro. JLUMHS. 2010; 9(2):88-94.
8. Paula DSO, Fonseca BA. Dengue: A review of the laboratory tests a clinician must know to achieve a correct diagnosis. Braz J Infect Dis. 2004; 8(6):390-398.
9. Francisca RFGA, Rumelia PG, Maria HDP, Daniella ML, Ivo CB. Dengue: profile of haematological and biochemical dynamics. Rev Bras HematolHemoter. 2012; 34(1):134-136.
10. Antony J, Celine TM. A descriptive study on dengue fever reported in a Medical College Hospital. Sahel Med J. 2014; 17:83-86.
11. Perez R. Males more prone to dengue than females-DOH. Inquirer news.Inquirer.net September 6th, 2011.Available from:https:// newsinfo.inquirer.net.
12. Azad AK, Mohammad H, Billal A, Saha AK and Ahemd T. Clinical presentation of dengue in 150 admitted cases in Dhaka medical college hospital." Journalofmedicine. 2006; 7:1:3-9.
13. Kaplan JE, Eliason DA, Moore M, Sather GE, Schonberger LB, Cabrera-CoelloL, et al. Epidemiologic investigations of dengue infection in Mexico,1980. Am J Epidemol.1983; 117:335-343.
14. Kinjal P, Dipanki P.Hematological Parameters DV. Its Utility in Dengue Fever: A Prospective Study. Int J Sci Res. 2016; 5:1077-1079.
15. Mohd Y, Shamim A. Evaluation of clinico-hematological and biochemical changes in dengue fever at CIMSH Lucknow. Ijcmr.2017; 4:1527-1529.
16. Butt N, Abbassi A, Munir SM, Ahmad SM, Sheikh QH. Haematological and biochemical indicators for the early diagnosis of dengue viral infection.J Coll Physicians Surg Pak. 2008; 18:282-285.
17. Lin C, Lei H, Liu C, Liu H, Yeh T, Wang S. Generation of IgM anti-platelet autoamibody in dengue patients. J Med Virol. 2001; 63:143-149.
18. Jameel T, Mehmood K, Mujaba G, Choudhry N, Afzal N, Paul R. Changing haematological parameters in dengue viral infections. J Ayub Med Coll Abbottabad. 2012; 24:3-6.
19. Cherian T, Ponnuraj E, Kuruvilla T, Kirubakaran C, John TJ, Raghupathy P. An epidemic of dengue haemorrhagic fever & dengue shock syndrome in & around Vellore.Indian J Med Res. 1994; 100:51-56.
20. Singh NP, Jhamb R, Agarwal SK, Gaiha M, Dewan R, Daga MK, et al. The 2003 outbreak of Dengue fever in Delhi, India.Southeast Asian J Trop Med Public Health.2005; 36:1174-1178.

21. Khan E, Hasan R, Mehraj J, Mahmood S. Genetic diversity of dengue virus and associated clinical severity during periodic epidemics in South East Asia. Karachi, Pakistan. Curr Top Trop Med. 2006; 12:91-105.

22. Glassock R. Immune complex-induced glomerular injury in viral diseases: an overview. Kidney Int Suppl. 1991; 35:55–57.

23. Ferede G, Tiruneh M, Abate E, Wondimeneh Y, Gadisa E, Howe R, Aseffa A and Tessema B. A study of clinical, hematological, and biochemical profiles of patients with dengue viral infections in Northwest Ethiopia: implications for patient management.BMC Inf Dis. 2018; 18:616; https: // doi.org/10.1186/s12879-018-3557-z.

24. Mariappan T. Current emerging situation of dengue in India. Trop Doct. 2013; 43:116-119

25. Spoorti V, Yugandhar R, Prabhakar K. Study of clinical and laboratory profile of dengue fever patients. Eur J Pharm Med Res. 2016; 3:613-616.

26. Wahid S, Sanusi S, Zawawi M. A comparison of the pattern of liver involvement in dengue hemorrhagic fever with classic dengue fever.Southeast Asian j trop med public health. 2000; 31:259-263.

27. Souza LJ, Alves JG, Nogueira RM, GicovateNeto C, Bastos DA, Siqueira EW, et al. Aminotransferase changes and acute hepatitis in patients with dengue fever: analysis of 1,585 cases. Braz J Infect Dis. 2004; 8(2):156-163.

28. Souza LJ, Coelho JM, Silva EJ, Abukater M, Almeida FC, Fonte AS, Souza LA. Acute hepatitis due to dengue virus in a chronic hepatitis patient. Braz J Infect Dis. 2008; 12(5):456-459.