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ORIGINAL ARTICLE

Dengue Score: Predictor of Plasma Leakage

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ABSTRACT

Background: Many biochemical and hematological changes occur in dengue infection, which is dependent on the clinical disease. The Dengue Score (DS) is a useful tool for anticipating plasma leakage. The platelet count, hematocrit (Hct), aspartate aminotransferase (AST) ratio and albumin is used for it.
Aim: To predict a score useful to detect dengue hemorrhagic fever.
Method: The study was retrospective observational. It is done in Dengue wards in Ghurki teaching hospital Lahore and Mayo Hospital Lahore. In the study 100 patients record was taken who were admitted from August 2021 to November 2021. A proforma was filled. SPSS 23 was used for statistical analysis of the data.
Results: The mean age was 38.32±13.713. Out of 100 patients 57(57%) were male while 43(43%) were female. 32 were included in dengue score (DS) ≤1, 33 were included in dengue score = 2 and 35 were included in dengue score ≥3. Ascites developed in 6 patients with DS ≤1, 24 with DS ═2, 31 with DS ≥3. Pleural effusion developed in 3 with DS ≤1, 20 with DS ═2, 21 with DS ≥3 so It showed significant association of effusion and ascites with DS = 2 and score ≥3.
Conclusion: Dengue score can be calculated by change in hemoconcentration, platelets, serum albumin and AST ratio so it can be used to predict plasma leakage which is part of dengue hemorrhagic fever.
Keywords: Dengue Score (DS), Plasma Leakage, Pleural effusion, Ascites

INTRODUCTION

Dengue is common vector borne viral illness. Dengue virus has been estimated to cause up to 390 million infections annually[1]. Over the last decades, dengue incidence has been increased. Currently in south Asian region it has become hyper-endemic for dengue virus serotypes/genotypes.

In clinical practice spectrum of dengue infection ranges from asymptomatic disease (dengue fever i.e., DF) to the severe disease with plasma leakage (dengue haemorrhagic fever i.e., DHF) and organ dysfunction (dengue shock syndrome i.e., DSS). It was observed that mortality ratio in patient with severe dengue disease in Thailand has gradually subsided from 13.7% in 1958 to 0.13% in 2018 on account of latest advancement[2].

To identify patients with severe dengue early detection of patients with plasma leakage is of utmost importance[3]. WHO made a criteria for plasma leakage. Hematocrit rise of more than 20%, lower albumin levels and presence of fluid in serous cavities signify it[4]. In contrast to lab values, ascites and/or pleural effusion presence is highly suggestive of plasma leakage. However, USG facility is not usually available in resource constrained areas[5].

There has been a work regarding diagnosing dengue hemorrhagic fever. Platelets less than 49,500/µL, increase in hematocrit more than 15%, serum albumin less than 3.49mg/dl and AST ratio more than 2.5 are very sensitive in diagnosing plasma leakage. These 4 parameters termed as dengue score[6]. There are two main add-ons i.e., platelet count and AST ratio from WHO guidelines.

This score can be more sensitive in diagnosing plasma leakage in infected patents. Still it needs approval[7]. It can be affected by disparity in features of different patients. Hence external authentication is needed[8] .

We led a study to corroborate the Dengue Score as an alternative to ultrasound in detecting severe dengue disease (DHF) in daily practice; it can be useful in resource limited areas where ultrasound facility is not available.

METHODS

The study is retrospective observational type. It was done in Dengue wards in Ghurki teaching hospital Lahore and Mayo Hospital Lahore from August to November 2021. Permission was taken from review board. Informed consent was submitted. A data of 100 patients was considered. Patients who were > 18 years of age with positive NS1 Antigen or IgM serology were included in study. Patients with fever, retro orbital pain, backache, lethargy and positive polymerase chain reaction (PCR) or Non Secretary (NS) 1 antigen or IgM serology were included. Complete blood count and liver function test was done. Platelets, hematocrit, AST and serum albumin was used to calculate the dengue score. Patients with negative tests for dengue fever were not included.
Data collection: Patients' data was taken including history details. Examination was done. Laboratory findings which include complete blood count, Hematocrit (HCT), Liver function tests including ALT, AST, and Serum Albumin were noted.
Data analysis: Data was assessed and analyzed by using SPSS 23. Mean age was calculated. Chi square test was used. *p* value ≤ 0.05 taken as significant.

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RESULTS

One hundre dengue patients record was taken. The mean age was 38.32±13.713. From 100 patients 57 (57%) were male and 43(43%) were female. 32 were included in dengue score ≤1, 33 were included in dengue score = 2 and 35 were included in dengue score ≥3. All four used to determine dengue score showed significant association with increase in dengue score and so with pleural effusion and ascites.

Table 1 Comparison of patients' laboratory data with dengue score

		DS			Total
		DS ≤1	DS=2	DS≥3	
Platelet count<50,000	Negative	23	4	2	29
	Positive	9	29	33	71
	Total	32	33	35	100
Serum albumin<3.49 mg/dl	Negative	31	25	6	62
	Positive	1	8	29	38
	Total	32	33	35	100
Ast ratio>2.51	Negative	27	9	2	38
	Positive	5	24	33	62
	Total	32	33	35	100
Hemoconcentration >15%	Negative	32	28	16	76
	Positive	0	5	19	24
	Total	32	33	35	100

Out of 100 patients, 6 with DS ≤1, 24 with DS =2, 31 with DS ≥3 developed ascites. *p* value is calculated which is less than 0.05. Pleural effusion developed in 3 with DS ≤1, 20 with DS =2, 21 with DS ≥3. *p* value is calculated which is less than 0.05. So p value showed significant association of effusion and ascites with dengue score = 2 and score ≥3 as displayed in table 2 and 3 respectively.

Table 2 Association of ascites with dengue score

	DS			
Effusion	**DS ≤1**	**DS =2**	**DS ≥3**	**Total**
No	26	9	4	39
Yes	6	24	31	61
Total	32	33	35	100

Table 3 Association of effusion with dengue score

	DS			
Effusion	**DS ≤1**	**DS =2**	**DS ≥3**	**Total**
No	29	13	14	56
Yes	3	20	21	44
Total	32	33	35	100

DISCUSSION

Dengue is hard to differentiate from the other viral infections as there are no definite clinical symptoms that aid in early diagnosis of the disease[13] except for polymerase chain reaction (PCR) or Non Secretary (NS) 1 antigen, and it is usually positive in first 48 hours. Many hematological and biochemical changes occur in dengue ailment which could be used to determine plasma leakage thus identify and treat dengue hemorrhagic fever early and so reduce morbidity and mortality.[14] In our study, we verified the Dengue Score. The tests were carry out, liver function tests i.e AST and Serum Albumin. USG was also done. From complete blood count, hematocrit and platelets were used. The amount of Hemoconcentration determined from minimum hematocrit during hospital stay[5]. Platelet count below 50,000/µL and serum albumin below 3.5g/dL are commonly used for assessment of plasma leakage.[15,16,17] The amount of hemoconcentration as well as AST also used. In aforementioned studies, there is difference in hemoconcentration amount in patients with ascites and effusion as compared to those without these findings[10,18] Suhendro Used albumin concentration less than 3.49 in the critical phase in his study[10]. This was associated with plasma leakage.

In Dengue Hemorrhagic Fever, hypoalbuminemia occur as a consequence of albumin loss due to plasma leakage. Pleural effusion and/or ascites also occur with same mechanism showing the association among both situations.[10,19] Thrombocytopenia is a chief sign of plasma leakage. Pleural effusions and/or ascites occur as a result of vascular endothelial growth factor (VEGF) which release due to platelets destruction as occur in dengue.[10,20,21]. This virus targets the liver cells[10]

AST raises more than ALT in dengue. Myocytes damage during this infection cause release of AST[10,22]

In our study, We took specific values and determined their association with dengue score. Platelets less than 50,000 , albumin less than 3.49, AST ratio more than 2.5 and hemoconcentration more than 15% gave a score of 1. DS equal and more than 2 significantly associated with pleural effusion and /or ascites. Both are part of dengue hemorrhagic fever. So we can determine plasma leakage even before doing ultrasound and thus decrease mortality. Suhendro suwarto developed the dengue score for detection of pleural effusion and ascites[15].

Grace angeline said the hematological and biochemical changes in dengue could be used to assess who develop plasma leakage and also the onset[14].

CONCLUSION

Dengue score is useful for detecting pleural effusion as well as ascites so we can predict dengue hemorrhagic fever.

Conflict of interests: none

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