

Devising a Prognostic Predictive Scale Based on Lactate Dehydrogenase Levels in Dengue

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Abstract

Aims and Objectives: To find a predictive scale for the duration of stay in the hospital in patients of dengue with no previous comorbidities, at a tertiary care centre. **Materials and Methods:** All patients consenting to be a part of the treatment were subjected to a detailed history and physical examination. The diagnosis of dengue was confirmed by either Dengue NS1 antigen or IgM Dengue serology (ELISA). Thereafter, their general condition and investigations such as the platelet counts were closely monitored. Lactate dehydrogenase (LDH) levels were done on the day of minimum platelet counts. The duration of symptom onset, date of admission, and duration of hospital stay were recorded. They were discharged when their platelet count showed significant increase in three consecutive samples. **Results:** On statistical analyses, the mean number of days to discharge from the date of testing LDH was 2.43 ± 1.10 days ($P = 0.0001$, $r = 0.8178$). The mean number of days to discharge calculated by LDH in dengue (LID) scale was 2.43 ± 1.04 days and the mean number of days to actual discharge from the date of testing LDH was 2.43 ± 1.10 days ($P = 1$). **Conclusion:** A possible date of discharge could be determined accurately by the levels of LDH tested at the time of the lowest platelet count. Using this LID scale, discharge date can be predicted.

Key words: Dengue, discharge date, lactate dehydrogenase, LDH in dengue scale

INTRODUCTION

In the past decades, incidence of dengue has grown rapidly. The current estimate by World Health Organization (WHO) is 50–100 million cases of dengue infection per year.^[1] The name dengue was derived from the Swahili word for “bone breaking fever” or the Spanish word for “the walk of a dandy.”^[2] It is a self-limited arboviral infection characterized by fever with rash, joint pains, nausea, vomiting, headache, and retroorbital pain. Several theories have been established in the etiopathogenesis of thrombocytopenia in dengue patients, which includes release of inflammatory mediators, complement components, and cytokines such as IL2, IL6, IL8, IL10, TNF- α , and IFN- γ leading to damage of vascular endothelial cells, which in turn results in increase in the capillary permeability, consequent plasma leakage, and, hence, thrombocytopenia.^[1] The course of illness is divided into three phases – febrile, critical, and recovery phase. The critical phase occurs toward the late febrile phase (after 3rd day of fever) or around defervescence (usually between 3rd and 5th day of illness but may go up to the 7th day) and the patient may manifest with thrombocytopenia and

increase in hematocrit. Critical phase may progress to serious manifestations like dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS). As per WHO 2007 criteria, patients may be labeled as having dengue fever (DF), DHF, DSS. As per the new terminology recommended by WHO in 2009, the cases are classified into dengue without warning signs, dengue with warning signs (abdominal pain/persistent vomiting/mucosal bleed/increase in hematocrit with decrease in platelet count), and severe dengue (severe plasma leakage, severe bleeding, and severe organ involvement).^[3]

The disease activity is estimated by the platelet counts and the complete blood counts including the hematocrit. The plasma leakage in DHF/DSS can lead to rise in hematocrit values and if

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How to cite this article: Mittal SH, Mittal S, Govil T. Devising a prognostic predictive scale based on lactate dehydrogenase levels in dengue. *Astrocyte* 2015;2:69-71.

Access this article online

Quick Response Code:



Website:
www.astrocyte.in

DOI:
10.4103/2349-0977.172679

the rise is above 20% of the baseline levels, it indicates impending DHF/DSS. The disease severity may vary from mild fever, which does not require hospitalization, to severe disease with features of DHF/DSS, which may require intensive care for the patient. Several discharge criteria have also been established for optimum patient care and to avoid unnecessary prolonged hospitalization.

MATERIALS AND METHODS

A prospective study was done from May 2012 to May 2013 in a tertiary care hospital in north India. Written consent was taken before including the subject to the study. The study included 300 patients who consented to be a part of the study. The patients were subjected to detailed history and clinical examination. The diagnosis of dengue was confirmed by either Dengue NS1 antigen or IgM Dengue serology (ELISA). The patients were subjected to routine investigations. The platelet counts were closely monitored. Lactate dehydrogenase (LDH) levels were done on the day of minimum platelet counts. The duration of symptom onset, date of admission, and duration of hospital stay were recorded.

An estimate of date of discharge was calculated based on the levels of LDH on the day of least platelet count using LDH in dengue (LID) scale [Table 1]. The calculated date of discharge based on the LDH levels was then compared with the actual date of discharge of the patient from hospital. They were discharged when their platelet count showed significant rises in three consecutive samples.

Cases showing only IgG positivity and patients with concomitant diseases such as diabetes, cardiac disease, renal disease, hematological disorders, acquired immune deficiency syndrome, and malignancy were excluded from this study.

Statistical analysis was done using acceptable statistical tests. *P* value was calculated by Chi-square test. *R* value was calculated by Pearson correlation coefficient.

RESULTS

The mean age of the cases was 30.5 years. Male to female ratio was 29:1. The mean of least platelet count reached during the disease course was $53353.33 \pm 43169.36/\text{cumm}$. The mean number of days of illness onset prior to admission was 5.87 ± 3.46 days while the mean duration of illness was 10.63 ± 3.27 days.

The number of patients that were found to be in febrile phase was 10. A total of 174 patients were in critical phase of the

illness. The patients in convalescence stage were 116. The mean LDH in febrile phase was 550.33 IU/L. The mean LDH in critical phase of the illness was 748.68 IU/L. The mean LDH in the convalescence stage was 406.23 IU/L.

The mean LDH levels on the day of least platelet count was 608.87 ± 228.67 IU/L and the mean number of days to discharge from the date of testing LDH was 2.43 ± 1.10 days ($P = 0.0001$, $r = 0.8178$).

The mean number of days to discharge calculated by LID scale was 2.43 ± 1.04 days and the mean number of days to actual discharge from the date of testing LDH was 2.43 ± 1.10 days ($P = 1$).

DISCUSSION

In this study, the mean age of dengue patients was 30.5 years. This was found to be concordant with the study by Cecilia, who found that most of the dengue cases were in the age group of 21–30 years.^[2] The present study showed that dengue is more common in males than in females (M: F – 29:1). This is concordant with the other studies done on epidemiology of dengue.^[4] The mean duration of illness in our study was 10.63 ± 3.27 days, which were found to be concordant with previous studies.

On review of literature, Sirikutt and Kalayanarooj compared LDH levels in patients of dengue with the other febrile illnesses and they found that the LDH levels were higher in dengue patients and the LDH levels correlated with the disease severity.^[5,6] The rise in LDH levels in severe disease has been attributed to skeletal muscle damage and/or liver damage.^[6] Based on these findings, in the present study, we measured LDH levels on the day of least platelet count.

We performed a study on newly diagnosed dengue cases and based on platelet counts and LDH levels, calculated an estimate of duration of stay in the hospital (using the LID scale). This was compared with the actual duration to discharge from the date of sending of the LDH test. Our results showed a significant correlation ($P < 0.001$, $r = 0.8178$) between the LDH levels with the time to discharge thereafter.

Our review of literature revealed that no study has been done on LDH levels as an estimate of duration of hospital stay in dengue cases. Based on the results of the present study, we conclude that the date of discharge can be estimated from the LDH levels done on the day of least platelet count using this LID scale.

CONCLUSION

We, in a tertiary care hospital in north India, performed the study on newly diagnosed dengue cases to evaluate LDH as a predictor of discharge for the patient. We observed a correlation between the LDH levels and the time of discharge from the hospital. On this basis, we formulated a LID scale [Table 1]. Based on this LID scale, physicians can predict the time to

Table 1: The Lactate Dehydrogenase in Dengue Scale

LDH at the lowest platelet count	No. of days for platelet count to rise
<400	1-2
400-600	2-3
600-800	3-4
>800	≥4

discharge (with discharge criteria being three consecutive rises in platelet levels). In a developing country with limited health resources, it is important to be able to predict the possible date of discharge. This will also help the treating physicians to counsel the anxious patients and their families in a more scientific manner.

Limitations

The study has a limited number of patients compared with the incidence of the illness. The correlation with higher levels of LDH may be studied further.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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