



Original Research Article

A study on the usefulness of band form count as a marker of severity in dengue fever

Rajeswari Kathiah^{1,*}, K Kala²¹Dept. of Pathology, ESIC Medical College & PGIMS, Chennai, Tamil Nadu, India²Dr Kamakshi Memorial Hospitals, Chennai, Tamil Nadu, India

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ABSTRACT

Background: Dengue fever is a mosquito borne tropical disease caused by dengue virus. Clinical features of dengue fever are varied and ranges from asymptomatic to life threatening shock and death. A set of investigations is used in the monitoring of the disease apart from the tests done for confirmation. No single test is the gold standard in the evaluation of dengue patients that can be used as marker of clinical severity and fatality. Aim of this study is to evaluate the usefulness of band form count as a marker of severity in dengue fever.

Materials and Methods: Peripheral smears are made for all dengue cases confirmed with Immunochromatography test for NS1, IgM and IgG. The cases were categorised in to clinically stable dengue fever patients and severe dengue based on their clinical findings. The band form count was done by manual differential count. The correlation between band form count and clinical severity was assessed. A total of 124 cases were studied that included 23 cases of severe dengue.

Results: A significant relationship between band form count and clinical severity was obtained. 22/23 cases of severe hemorrhagic fever had significant increase in band form count of above 20%. All the other cases diagnosed as dengue fever had band form count <10%.

Conclusion: Hence, band form count can be used in the set of investigations used in the evaluation of patients with dengue fever to assess the severity of the disease. Considering its role in assessing the severity, further research is required to evaluate the usefulness in the evaluation and management of patients with severe dengue.

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1. Introduction

Dengue fever is a mosquito borne viral disease, occurring in tropical and subtropical regions of the world, transmitted by the bite of Aedes mosquitoes. Since the Second World War, Dengue has become a global problem and is now common in more than 120 countries, mainly in Southeast Asia, South Asia and South America.¹ About 390 million people are infected every year and approximately 40,000 die.² The oldest descriptions of an outbreak of dengue fever date from 1779,³ but its viral cause and spread were understood only by the early 20th century.⁴ In 2019, a significant

increase in the number of cases was noted. Dengue fever is classified as a neglected tropical disease by the World Health Organization (WHO) which also ranked dengue as one of the top ten threats to global health in 2019.⁵

Dengue fever is a self-limited disease with a mortality rate of less than 1%, if detected early and managed appropriately. When treated, severe dengue (the severe form of the disease as the name says) has a mortality rate of 2-5%, but when left undetected or untreated, the mortality rate is as high as 20 – 25%. Infection with one serotype of dengue confers lifelong homotypic immunity to that particular serotype and a variable period (approximately 2 years) of partial heterotypic immunity to other serotypes, but an individual can eventually be infected by all 4 serotypes.

* Corresponding author.

E-mail address: drkraj@yahoo.co.in (R. Kathiah).

Many serotypes can be in circulation of an individual during an epidemic.⁶

The clinical picture of Dengue fever can range from asymptomatic form to life threatening hemorrhage and shock. The two hematological tests that are done in the evaluation and monitoring of dengue patients are hematocrit and platelet count.⁷ There are not enough studies done on the presence of bandemia in dengue and its usefulness as a marker of severity of the disease.

2. Objectives

The study was carried out to evaluate the presence of bandemia in dengue fever and to assess its usefulness as a marker of disease severity.

3. Materials and Methods

This cross-sectional study was done in the hematology laboratory of department of Pathology for a period of one year. All dengue positive cases confirmed by Immunochromatography test for NS1, IgM and IgG were included.

Peripheral smears were made for all the cases for which EDTA anticoagulated blood samples were sent. Manual differential counts were done on all the smears stained with Leishman stain using oil immersion objective of light microscope. Cases were segregated in to two groups based on their clinical features (as decided by the treating physicians) as dengue fever and severe dengue fever.

Data was entered and analyzed using SBSS Version 20 software. Band form count above 10% was kept as a criterion. Band form count of both the categories was done, recorded and compared using Chi-squared test. The p-value less than 0.05 were considered statistically significant.

4. Results

Out of the total 124 cases included in the study, 23 cases (18.5%) were clinically categorised as severe dengue. There were totally 58 males and 66 females. Of the total 23 cases of severe dengue patients, 13 were males and the remaining 10 were females. Among the 23 cases of severe dengue, 22 cases (95.7%) had significant increase in band form count above 15%. The remaining one case had 9% band form count. All the other cases clinically categorised as dengue fever had band forms less than 10%.

5. Discussion

In the vast majority of the patients, initial phase of dengue infection may be asymptomatic in 50%-90% patients, may result in a nonspecific febrile illness, or may produce the symptom complex of classic dengue fever (DF). Classic dengue fever is characterised by rapid onset of high fever, headache, retro-orbital pain, diffuse myalgia, weakness,

vomiting, sore throat and a centrifugal maculopapular rash. The intensity of the pain is the reason for the term “break bone fever” to describe dengue.

A small fraction of persons who have previously been infected by one dengue serotype develop bleeding and endothelial leakage upon infection with another dengue serotype. This is termed severe dengue (previously referred to as dengue hemorrhagic fever and dengue shock syndrome, reclassified in 2009 by the WHO).

Severe dengue has also been referred to as dengue vasculopathy as vascular leakage in these patients is the cause for hemoconcentration and serous effusions in severe dengue patients and can lead to circulatory collapse. This, in combination with severe hemorrhagic complications, can lead to a clinical state referred to as shock syndrome, which carries a greater fatality risk than bleeding per se.⁸

As the signs and symptoms of dengue fever are nonspecific, laboratory confirmation of dengue infection is essential. The diagnosis of dengue fever may be confirmed by microbiological laboratory testing, which can be done by virus isolation in cell cultures, nucleic acid detection by PCR, viral antigen detection (such as for NS1) or specific antibodies (serology).⁹ In dengue fever, laboratory tests are not only required for the confirmation, but also needed for the monitoring of the disease severity, especially with the onset of complications.

In patients with severe dengue, the following laboratory features may be present:

1. Increased hematocrit level due to plasma extravasation and/or third-space fluid loss
2. Hypoproteinemia
3. Prolonged prothrombin time
4. Prolonged activated partial thromboplastin time
5. Decreased fibrinogen
6. Increased amount of fibrin split products

Characteristic hematological findings in dengue fever are increased PCV, thrombocytopenia (platelet count < 100 x 10⁹/L) and leukopenia. An increase in hematocrit level greater than 20% is a sign of hemoconcentration and is a predictor of shock. The hematocrit level should be closely monitored for the early recognition of severe dengue. Very few studies have mentioned the existence of bandemia in dengue fever.

Bandemia (band form count > 15%) refers to the presence of excess or increased levels of band cells released by the bone marrow into the blood and thus overlaps with the concept of left shift. The mechanism of bandemia is believed to be due to the increased levels of cytokines (IL-1 and TNF) which intensify the release of cells from the postmitotic reserve pool in the bone marrow. Bandemia is a common finding in sepsis and severe bacterial infection and is also a laboratory criterion for severity in many diseases like necrotizing enterocolitis, neonatal sepsis, etc;¹⁰ The

existence and role of bandemia in dengue fever is not yet identified and established.

Our study revealed the presence of bandemia in every case of clinically severe dengue. The same patients also had elevated hematocrit and reduced platelet count as expected laboratory parameters. Examining a peripheral smear for the presence band forms and counting their numbers would certainly add value to the disease monitoring as every case of severe dengue is associated with bandemia.

6. Conclusion

There is significant association between band form count and clinical severity in dengue fever, as band form count of >15% is associated with severe dengue fever. Our study has succinctly elaborated that bandemia is consistently associated with severe dengue cases and hence can be utilised in the monitoring of the disease as a marker of disease severity. However, larger clinical studies are needed to establish the role of band form count in the evaluation and management of severe dengue cases.

7. Source of Funding

None.

8. Conflict of Interest

The authors declare that there is no conflict of interest.

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Author biography

Rajeswari Kathiah, Associate Professor

K Kala, Consultant Pathologist

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