Correlation study between platelet count, leukocyte count, nonhemorrhagic complications, and duration of hospital stay in dengue fever with thrombocytopenia

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ABSTRACT

Introduction: Dengue is one of the common diseases presenting as fever with thrombocytopenia, also causing significant morbidity and complications. Objectives: Though the correlation between platelet count, bleeding manifestations and hemorrhagic complications has been extensively studied, less is known about the correlation between platelet count and non hemorrhagic complications. This study was done to see the correlation between platelet count and non hemorrhagic complications, duration of hospital stay and additive effect of leucopenia with thrombocytopenia on complications. Methods: Our study is prospective observational study done on 99 patients who had dengue fever with thrombocytopenia. Correlations were obtained using scatter plot and SPSS software trial version. Results: Transaminitis (12.12%) was the most common complication followed by acute renal injury (2%). In our study we found that, as the platelet count decreased the complication rate increased (P = 0.0006). In our study duration of hospital increased (P is 0.00597) with decreasing platelet count when compared to other study where there was no correlation between the two. There was no correlation between thrombocytopenia with leucopenia and complications (P is 0.292), similar to other study. Conclusion: Platelet count can be used to predict the complication and duration of hospital stay and hence better use of resources.

Keywords: Dengue fever, nonhemorrhagic complications, platelet count

Introduction

Dengue fever is caused by small single-stranded RNA virus belonging to Flaviviridae. Dengue virus is transmitted to humans through the bites of infected Aedes mosquitoes, principally Aedes aegypti. This mosquito is a tropical and subtropical species widely distributed around the world. Dengue is characterized by leucopenia followed by thrombocytopenia.[1]

Data from different sources suggest that endothelial cell activation could mediate plasma leakage.[2,3] Plasma leakage is thought to be associated with functional rather than destructive effects on endothelial cells.

Activation of infected monocytes and T-cells, the complement system and the production of mediators, monokines, cytokines, and soluble receptors may also be involved in endothelial cell dysfunction.

Thrombocytopenia may be associated with alterations in megakaryopoieses by the infection of human hematopoietic cells and impaired progenitor cell growth, resulting in platelet dysfunction (platelet activation and aggregation), increased destruction or consumption (peripheral sequestration and consumption). Hemorrhage may be a consequence of the thrombocytopenia and associated platelet dysfunction or disseminated intravascular coagulation.

The disease progresses in three phases - febrile phase, critical phase, recovery phase, complications develop during the critical phase.[4]

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Warning signs include pain abdomen or tenderness, persistent vomiting, mucosal bleeds, lethargy, restlessness, hepatomegaly, increasing hematocrit with decreasing platelet count, and clinical signs of fluid accumulation.

During the early stages of the disease, virus isolation, nucleic acid, or antigen detection can be used to diagnose the infection. At the end of the acute phase of infection, serology is the method of choice for diagnosis [Figure 1]. Antibody response to infection differs according to the immune status of the host.

Patients who are ambulatory and who can accept fluids orally can be sent home, with daily monitoring by the care provider.

Patients with dengue with warning signs should be managed with normal saline, at the rate 5–7 ml/kg/h for first 1–2 h, 3–5 ml/kg/h for next 2–4 h, 2–3 ml/kg/h according to the clinical response.

Treatment of hemorrhagic complications includes whole blood or packed cell transfusions. Platelet or fresh frozen plasma infusions should be given only if bleeding is not being controlled by whole blood transfusions.

This study was done to see the correlation between platelet count and nonhemorrhagic complications, duration of hospital stay and additive effect of leukopenia with thrombocytopenia on complications.

**Aims and objectives**

- To study the correlation between platelet count and nonhemorrhagic complication rate
- To study the effect of leukopenia in patients with thrombocytopenia on complications
- To study the correlation between platelet count and duration of hospital stay.

**Materials and Methods**

The study was done in Kamineni Hospitals a Tertiary Care Hospital with bed strength of 300. Data were collected from patients attending outpatient and inpatient services in Department of General Medicine. The patients of both sexes aged >18 years. Patients admitted with fever and found to have thrombocytopenia are included in the study. Data were collected from 99 patients after obtaining consent in due format. Data are collected by using interview, physical examination, radiological examination, sputum examination, and laboratory data.

**Observation and Results**

**Complications associated with dengue fever in our study**

Various nonhemorrhagic complications were known to occur in patients having dengue with thrombocytopenia. Of 99 patients in our study, 11 patients had hepatitis (11.11%), 12 patients had transaminitis (12.12%), two patients had acute kidney injury (2%). Other complications found were acute respiratory distress syndrome (ARDS) (2%), meningoencephalitis (1%) [Table 1].

**Correlation between platelet count and complications**

The mean platelet count was 0.79 lakhs/cumm. The relationship between platelet count and number of complications was studied. There was a negative correlation between platelet count and complications rate (P = 0.0006). This indicates that lower the platelet count more are the complications. The same correlation is shown in scatter plot [Figure 2].

**Correlation between thrombocytopenia and leukopenia with complications**

In our study, 44 patients had leukopenia. The relationship between leukopenia and platelet count was studied. Leukopenia with thrombocytopenia showed a positive correlation but was not statistically significant (P is 0.292). This suggests that platelet count may not have any relation with leukocyte count. The same correlation is shown in scatter plot [Figure 3].

**Correlation between platelet count and duration of hospital stay**

The average duration of hospital stay was 3.96 days. There was a negative correlation between platelet count and duration of hospital stay and it was statistically significant (P is 0.00597). This suggests that as platelet count decreases the duration of hospital stay increases. The possible explanation could be that as per above correlation number of complications is increasing with lower platelet count, hence increased duration of hospital stay. Further studies to predict the platelet count during the early phase of the disease and hence the complications are required. The same correlation is shown in scatter plot [Figure 4].

**Discussion**

In our study, out of 99 patients, 28 patients had nonhemorrhagic complications. Forty-four patients had leukopenia. A study by Ahmed et al., leukopenia was observed in 43%. A study by Dhoooria et al., (2008) in children leukopenia was observed in 26% of cases. In a study by Cam et al., 2001 encephalopathy occurred in 0.5% of patients with Dengue hemorrhagic fever (DHF). In a study by Dhoooria et al., two patients in his study had ARDS, both of which expired. Dengue associated ARDS is associated with a high mortality. In a study Dhoooria et al., hepatic dysfunction was seen in 14.8%.

| Complication                        | Dengu |
|-------------------------------------|-------|
| Hepatitis                           | 11    |
| Transaminitis                       | 12    |
| Acute kidney injury                 | 2     |
| Acute respiratory distress syndrome | 2     |
| Meningoencephalitis                 | 1     |
World Health Organization defined severe dengue as presence of one or more of the following: (i) Plasma leakage that may lead to shock (dengue shock) and/or fluid accumulation, with or without respiratory distress, and/or (ii) severe bleeding, and/or (iii) severe organ impairment. Relationship between platelet count and bleeding manifestations has been extensively evaluated. Raikar et al. showed in his study that bleeding manifestations are not related to platelet count. The relationship between platelet count and nonhemorrhagic complications is less studied.

Patient with lower platelet count was found to have higher chances of nonhemorrhagic complications including ARDS and encephalopathy. In our study, there was a statistically significant positive correlation between platelet count and complications. As the platelet counts decreased complications rate increased.

Ibrahim et al. in his study showed that there was no correlation between initial platelet counts and age, use of intravenous fluids, or length of hospital stay. In our study, there was statistically significant negative correlation between platelet count and duration of hospital stay, as the platelet count decreased duration of hospital stay increased.

Prathyusha et al. in her study at eluru showed that with increasing severity of leukopenia there is increased the incidence of hemorrhagic manifestations including petechiae (P value 0.023). However, she found no significant association of leukopenia with significant bleeding manifestations. In our study, there was no statistically significant correlation between leukopenia and complications rate in patients with dengue with thrombocytopenia.

Conclusion
Platelet count can be used to predict complication rate in a patient admitted with dengue fever. Though leukopenia is seen early in the disease there is no significant correlation to complication (nonhemorrhagic) rate. Platelet count can be used to predict the duration of hospital stay hence disease burden and resource requirements.

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Conflicts of interest
There are no conflicts of interest.

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