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## A clinico-haematological evaluation of platelet transfusion's role in treating dengue fever

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### Abstract

**Background and Objectives:** A major public health concern, dengue fever is the most common viral disease spread by mosquitoes worldwide. One of the many reasons why dengue has a higher death and morbidity rate is because it changes coagulation and haematological markers.

**Materials and Methods:** From the pathology department at Madha Medical College and Research Institute in Chennai, Tamil Nadu, India, 48 febrile hospitalized patients who tested positive for IgM and/or NS1 were selected for this study. The participants were enrolled between October 2016 to October 2017. We looked at the clinical and biochemical consequences of platelet transfusion as well as its involvement. The variables were subjected to a statistical analysis.

**Results:** There was a history of fever, headache, myalgia, enlarged liver, and enlarged spleen in all 48 participants in this study. Pleural effusion impacted 16%, ascites affected 26%, and a rise in haematocrit affected 16%. Leukopenia affected 73% of patients, and a change in the neutrophil-to-lymphocyte ratio occurred in 27% of patients. It was clinically essential to administer a platelet transfusion to 86% of patients. Half of the patients received platelet transfusions. Approximately 54% of the cases required platelet transfusions ranging from 1 to 2 units. On the third day following a platelet transfusion, 53.49 percent of patients were 100% functional again.

**Conclusion:** If you experience fever, headache, thrombocytopenia, leukopenia, a reversal of the neutrophil lymphocyte ratio, ascitis, pleural effusion, and an elevated haematocrit, it is highly probable that you have dengue fever. Patients with moderate to severe thrombocytopenia have been found to benefit from platelet transfusions in their healing process.

**Keywords:** Dengue fever, leukopenia, thrombocytopenia, pleural effusion, platelet transfusion

### Introduction

The symptoms of dengue fever (DF) have been recognized for centuries, but it wasn't until 1943 that the Dengue virus was identified. The earliest records of dengue fever epidemics in the Americas, Asia, and Africa date back to 1779 and 1780. This virus and its vector, the mosquito, have been circulating in the tropics for at least 200 years, since epidemics on three continents occurred nearly simultaneously. At the time, DF was considered a tropical tourist disease that was mild and not fatal [1-3]. Since the transmission of a new serotype into a vulnerable population is contingent upon the virus and its mosquito vector surviving the long voyage, major epidemics usually occurred every 10-40 years [4, 5].

A dengue fever pandemic, which began in South East Asia after WWII and has now expanded globally, was centered there. Ever since then, dengue fever has increased its geographic range, both in terms of the viruses and the mosquitoes that transmit them, and epidemics caused by many serotypes have been more frequent [6, 7]. The field of dengue hemorrhagic fever epidemiology is undergoing fast change on a global scale. The narrative surrounding the Indians' encounter with this illness is captivating and interesting. There has been an uptick in the frequency of outbreaks of a particularly severe form of the disease called DHF in the past several years [8-10].

Hematological markers include hemoglobin (Hb), white blood cell (WBC) count, and WBC differential count can vary as a result of dengue fever. The most common symptom is an increase in hemoglobin concentration and a reduction in platelet count [11, 12]. In 1975 and 1980, the Technical Advisory Committee on Dengue Haemorrhagic Fever created guidelines for the Southeast Asian and Western Pacific regions. The World Health Organization (WHO) has updated these guidelines.

In order to be considered, one must exhibit four main symptoms. Illness development is influenced by both dengue virus-induced toxicity and aberrant immune over activation. Among the pathophysiological processes involved in dengue fever, the virus can induce coagulopathy and vasculopathy, decrease megakaryopoiesis, and cause early megakaryocyte progenitors to die of apoptosis [13, 14]. When the platelet count drops below the 1000-20,000 range when it is isolated, the risk of bleeding increases somewhat. An increased risk of bleeding occurs in patients who have infections in addition to coagulopathies, liver disease, platelet inhibitory medications, and infections. Patients who are otherwise stable should be considered for transfusions at least when their platelet count reaches 10,000 per microliter [15, 16].

As far as mosquito-borne diseases go, dengue fever has recently surpassed all others. Dengue fever is a serious health concern in the tropics and subtropics, where around 40% of the world's population resides. Dengue fever affects almost 100 million people annually, including 500,000 occurrences of DHF. Quick identification, treatment, and, when required, platelet transfusion are essential for reducing mortality and morbidity caused by illness [17, 18]. We aimed to determine whether there was a connection between dengue disease's hematological findings and its clinical progression as part of the study's objectives. This research aims to determine if platelet count may be used as a prognostic indication for dengue patients. For the purpose of monitoring platelet transfusion rates and outcomes in dengue patients who test positive for the virus [19, 20].

### Material and Methods

From the pathology department at Madha Medical College and Research Institute in Chennai, Tamil Nadu, India, 48 febrile hospitalized patients who tested positive for IgM and/or NS1 were selected for this study. The participants were enrolled between October 2016 to October 2017. We looked at the clinical and biochemical consequences of platelet transfusion as well as its involvement. The variables were subjected to a statistical analysis.

### Inclusion criteria

- Every patient with positive serology for dengue
- Have reached the age of 13.

### Exclusion criteria

- Dengue cases that are suspected but have a negative serology illnesses like typhoid or malaria
- Individuals that are uncooperative

### Results

Among the 48 dengue cases that were serologically positive, it was observed that 8 individuals fell within the age range of 14 to 20, 11 individuals fell within the age range of 21 to 30, 11 individuals fell within the age range of 31 to 40, 5 individuals fell within the age range of 41 to 50, 4 individuals fell within the age range of 51 to 60, 5 individuals fell within the age range of 61 to 70, and 4 individuals were found to be older than 70. The age range of

the majority of participants in my survey was 14 to 40, as indicated in Table 1.

**Table 1:** Patient age wise distributions

Age (Years)	Number
14-20	09
21-30	10
31-40	10
41-50	06
51-60	05
61-70	04
Above 70	04

### Gender distribution

In the conducted research, a slight male predominance was observed, with 25 men out of 48 cases and 23 females, as indicated in Table 2.

**Table 2:** Dispersion of patients by gender

Gender	Number	%
Male	23	42.00
Female	25	58.08

### Fever duration distribution

Among the 48 patients assessed, 12 had fever for a duration of five days, 8 had fever for six days, 11 had fever for seven days, 2 had fever for eight days, 3 had fever for nine days, and 1 had fever for ten days. The mean duration of fever seen in the study was 5-6 days, as indicated in Table 3.

**Table 3:** Patient distribution based on the length of fever

Duration of fever	Number
5 days	13
6 days	17
7 days	10
8 days	03
9 days	03
10 days	02
Total	48

### Musculoskeletal complaints distribution

In the examination of 48 instances, it was observed that 42 individuals exhibited symptoms of headaches, four individuals experienced myalgia, one individual encountered retro orbital discomfort, and one individual suffered arthralgia (Table 4).

**Table 4:** Patient distribution based on musculoskeletal complaints

Musculoskeletal complaints	Number
Headache	40
Retro orbital pain	03
Myalgia	03
Arthralgia	02

### Respiratory complaints distribution

Out of the patients examined, eight had an upper respiratory tract infection, whereas six had a lower respiratory tract infection (Table 5).

**Table 5:** Patient distribution based on respiratory complaints

Respiratory complaints	Number
Upper respiratory tract infection	06
Lower respiratory tract infection	08
Dyspnoea	00

### Distribution of gastrointestinal complaints

The study involved a total of 38 participants, of whom thirteen reported experiencing abdominal pain, nineteen reported vomiting, twenty-five exhibited splenomegaly, and twenty-five had hepatomegaly (Table 6).

**Table 6:** Patient distribution based on gastrointestinal complaints

Gastrointestinal complaints	Number
Abdominal pain	12
Vomiting	20
Diarrhoea	10
Hepatomegaly	23
Splenomegaly	24

### Distribution of hemorrhagic manifestations

Out of the 48 occurrences examined, only two individuals exhibited notable bleeding signs. A total of 40 participants did not exhibit any indications of bleeding, however 6 patients reported experiencing minor bleeding symptoms (Table 7).

**Table 7:** Patients are distributed according on hemorrhagic symptoms

Hemorrhagic manifestation	Number
Major	3
Minor	5
Absent	40

### Capillary leak distribution indicators

In the evaluation of 48 instances, it was observed that 7 cases exhibited indications of pleural effusion, 12 cases had evidence of ascitis, and 9 cases displayed signs of elevated haematocrit levels (Table 8).

**Table 8:** Patient distribution based on symptoms of capillary leak

Signs of capillary leak	Number
Pleural effusion	8
Ascites	10
Rise of hematocrit	10

Out of the total sample size of 48 instances examined, 28 cases were found to be positive for IgM, whilst 20 cases tested positive for both NS1 and IgM. Table 9.

**Table 9:** Patient distribution based on the results of the serological test

Serology examination	Number
NS1(Nonstructural protein -1)	0
IgM (Immunoglobulin M)	26
NS1+IgM	22

### Discussion

Dengue fever has far-reaching consequences on society's economy and health care systems, being the most widespread arboviral infection. Dengue fever can range from a moderate episode to dengue shock syndrome or dengue hemorrhagic fever, both of which can be fatal. For DHF and DSS in particular, the most significant component in attaining excellent results is early diagnosis and active care [21, 22].

The average age of the people who took part in our study was 36.84. The average age was 36 years old according to Nadeem MA *et al.* and 34.7 years old according to Tiwari KN *et al.* The 48 people who took part in our study were

split evenly between males and females. In contrast to the 556 instances included in the study by Nadeem MA *et al.*, which consisted of 390 men and 166 women, the current investigation found the inverse to be true. The gender distribution analysis carried out by Raju BJ *et al.* revealed that 121 patients were male and 79 were female out of a total of 200. Our study's male participants were more numerous than in previous ones [23, 24].

Headaches were reported by every single one of our patients. Many studies have examined the frequency of headaches; some examples include Raju BJ *et al.*, Lt. Col. Banerjee M *et al.*, Mandal KS *et al.*, Khan AH *et al.*, and Turbadkar D *et al.* Our study separated out from the others [28, 29] since headache was not a significant symptom in any of the others.

Dengue fever is commonly identified by this symptom. This symptom was observed in just seven out of forty-eight subjects in our study. Of the 200 dengue patients surveyed by Raju B J *et al.*, 26.5% reported experiencing retro orbital pain. Of the 48 patients we evaluated, 43 were found to have myalgia [30, 31].

Research by Raju BJ *et al.*, Lt. Col. Banerjee M *et al.*, Kariyawasam S *et al.*, 73, and Turbadkar D *et al.* found that 85.5% of patients experienced myalgia. Both the Tiwari KN *et al.* and the Khan AH *et al.* studies considered patients with myalgia. Raju BJ *et al.* discovered a prevalence of 16% in their research. We identified eight patients with LRT infections and six with URIs. Khan AH *et al.* discovered that URTIs accounted for 35% of the cases in their investigation. Fourteen patients presented with complaints of abdominal pain. Tiwari KN *et al.* (34% of patients) and Raju BJ *et al.* (55% incidence) both note that abdominal pain is a presenting symptom [30-32].

Fifteen of our patients reported these signs and symptoms. Raju BJ *et al.*, Khan A. H. *et al.*, and Tiwari K.N. *et al.* all noted that seven patients had diarrhea or loose stools. None of the other study groups experienced diarrhea. Hepatomegaly was observed in 26 of our individuals. Both the Raju BJ *et al.* and the Lt. Col. Banerjee M *et al.* studies found a 15% incidence rate. Spleens that were visibly enlarged were observed in twenty-four of our patients. Splenomegaly was seen in 7% of patients, according to Lt. Col. Banerjee M *et al.* Both DHF and DSS are characterized by capillary leak. Ascites, pleural effusion, and increases in hematocrit are the most common symptoms [33, 34].

Platelet transfusions were performed on 43 patients in our research group. Only moderate to severe thrombocytopenia can be used as an excuse. Platelet transfusions were most commonly administered for thrombocytopenia, according to a retrospective study carried out at four tertiary care hospitals in Delhi by Tiwari KN *et al.* Among the 230 individuals that tested positive for the virus, 130 needed platelet transfusions. The majority of instances did not involve hemorrhage but rather thrombocytopenia. For patients with platelet counts below 20,000 cells/cu.mm, multiple transfusions were administered, but 118 out of 232 patients with counts between 20,000 and 1,000,000 cells/cu.mm received a single unit of platelets, as per the research conducted by Kulkarni N. It was found that 51% of platelet transfusions are superfluous, and the ideal platelet count is 20,000 cells/cu.mm [33-35].

In our study, 27 patients received platelet transfusions ranging from 1 to 3 units, 5 to 6 units, 2 to 7 or 8 units, and 1 patient received more than 9 units. There are an average of

2.42 units of platelet transfusion volume. This is the usual duration of stay for patients who have received a platelet transfusion. Those who did not get a platelet transfusion had a median survival time of 5 days. Tiwari KN *et al.* found that 130 out of 230 dengue patients who tested positive for the virus had platelet transfusions, with the number of units ranging from 1 to 16. The average length of stay for patients who received a platelet transfusion was 4.9 days, while those who did not spent far longer. Kulkarni N. found that 64 patients with platelet counts below 20,000 cells/cu.mm required multiple transfusions, but 118 out of 232 patients with counts between 20,000 and 1,000,000 cells/cu.mm only required one unit of platelets. It was found that 51% of platelet transfusions are superfluous, and the ideal platelet count to give is 20,000 [35-38].

### Conclusion

Dengue hemorrhagic fever is becoming more common in the tropics and subtropics, and there is a real possibility that it could spread to temperate regions in this era of climate change and global warming. The disease has also become a truly global arboviral disease, with an increasing number of epidemics. Our study's primary objective was to examine the relationship between the clinical course and the haematological profile of dengue fever. Based on the findings of this study, it is crucial to screen and confirm the presence of dengue fever in patients with thrombocytopenia, leukopenia, and a reversed neutrophil lymphocyte ratio. Platelet transfusion, which was initiated in patients with moderate to severe thrombocytopenia, was another topic of focus in this study. Consequently, the frightening morbidity and mortality caused by dengue fever can be greatly reduced with early suspicion, screening, diagnosis, and quick treatment.

### Funding source

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### Conflict of interest

Nil.

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