Original Article

EFFECTIVENESS OF PLATELET TRANSFUSION IN DENGUE PATIENTS IN A TERTIARY CARE HOSPITAL

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ABSTRACT

Objective: Dengue has been emerging as rapidly spreading and dreaded mosquito-borne disease caused by the bite of Aedes Aegypti Mosquito. Clinical features are variable and presents with Dengue fever or Dengue Hemorrhagic fever or more severe Dengue shock syndrome. Thrombocytopenia is presenting feature in all Dengue cases and some often presents with bleeding. Platelet transfusions are given in patients with haemorrhagic symptoms. While medical fraternity globally recognizes the role of platelet transfusion in the management of hospitalized dengue patients the exact indications and situations in which these are to be transfused may vary. Since there is inherent risk associated with the transfusion of blood/blood-component, it is imperative for each institution (or country) to lay their own criteria for transfusion of these blood components. The present study was conducted to lay precise criteria and transfusion trigger for platelet transfusion in our setup.

Methods: The present study was conducted on 225 serologically confirmed dengue patients admitted at sawaimansign Hospitals between 1" of August to 30th of November 2022. Clinical data, reports of hematological investigation, platelets requirements and data obtained from SHealth services.

Results: In the serologically confirmed cases, the prevalence of thrombocytopenia (count less than 100,000/cumm) was 84.88% on admission and bleeding was recorded in 22 (9.7%) patients. About 96 (42.6%) patients of dengue cases received platelet transfusion. Among them 47 (20.88%) patients had a platelet count<20,000/cumm, 43 (19.11%) had a platelet count in the range of 21-40.000/cumm, while 6 (2.66%) patients had the platelet count in between 41 and 50.000/cumm. Out of 49 patients with a platelet count>20,000/cumm, 18 patients had hemorrhagic manifestations such as petechiae, gum-bleeding, epistaxis, etc., which necessitates the use of platelet transfusion. However, 31 patients received inappropriate platelet transfusion.

Conclusion: This study suggests that bleeding occurs more often in patients with severe thrombocytopenia. High-risk patients having platelet count<20,000/cumm and risk of bleeding require urgent platelet transfusion. Patients with a platelet count 21-40,000/cumm are in moderate risk and require platelet transfusion only if they have any haemorrhagic manifestations and other superadded conditions.

Keywords: Platelet transfusion, Dengue

INTRODUCTION

Dengue is the most rapidly spreading mosquito borne viral disease in world and an estimated 50 million dengue infections occur annually [1]. The south East Asian countries like India, Indonesia, Myanmar and Thailand are at highest risk of Dengue Fever/Dengue Haemorrhagic Fever. Dengue is viral disease caused by dengue virus with four serotypes DEN-1 to DEN-4 of flavivirus family transmitted through Aedes Aegypti mosquito [2]. A platelet count of less than 100,000/µl is one of the diagnostic criteria for dengue haemorrhagic fever [4]. However, severe thrombocytopenia can be seen in both dengue fever and dengue haemorrhagic fever. There is a significant negative correlation between disease severity and platelet count [5]. Although low platelet count and hypofibrinogenemia are the two most prominent haemostatic defects responsible for bleeding in dengue infection [6], thrombocytopenia and coagulation abnormalities do not reliably predict bleeding in dengue infection [7, 8]. Causes of thrombocytopenia include both bone marrow suppression and platelet destruction. Immune complex-mediated platelet destruction is probably the most important factor contributing to thrombocytopenia in dengue infection.

The present study thus aims to study the effectiveness of platelet transfusions in management of dengue patients with Dengue haemorrhagic fever and Dengue shock syndromes and their treatment outcome dengue patients with Dengue haemorrhagic fever and Dengue shock syndromes and their treatment outcome.

MATERIALS AND METHODS

This was a retrospective study conducted at SMS Medical college hospital, Jaipur, on adult patients with dengue fever confirmed positive by dengue serological Rapid test kits. The cases were diagnosed and categorized as per WHO criteria into 1) Dengue fever 2) Dengue Haemorrhagic fever and 3) Dengue shock syndrome based on severity of disease, bleeding manifestations, haematocrit and thrombocytopenia. The age of patient, duration of fever before admission, result of dengue serological test, haematocrit, platelet count on admission during hospitalization, Presence of haemorrhagic manifestation like petechiae, hematemesis, melena, gum bleeding were recorded. DGHS guidelines for indication, dose and monitoring of response for platelet transfusion were followed.

Blood samples were collected in EDTA anticoagulated vials, and platelet counts were measured by automated count analyzer. In order to avoid pseudo-thrombocytopenia, citrated samples were used to repeat platelet counts if EDTA-induced platelet clumping was seen [13]. Platelet counts were obtained at baseline (P0), 24 h (P24), and 72 h (P72) for all patients. Additionally, platelet counts were also obtained within 10 min to 1 h post transfusion (P1) for the treatment group (fig. 1).

Corrected count increment (CCI) was determined using the following formula:

$$CCI = (PPI \times BSA\ (m2)) \times 1011/\text{number of platelets transfused} \quad .... (1)$$

PPI represents the post-transfusion platelet increment (post-transfusion platelet count minus pre-transfusion platelet count), and

BSA is the body surface area measured in square meters. We used Mosteller formula for calculating BSA.

We measured PPI and CCI at 10 min to 1 h post-transfusion in the treatment group. Based on their responsiveness to platelet transfusion, patients in the treatment group were further divided into responders and non-responders. Patients with PPI*10,000/µl and/or CCI*5,000/µl 1 h post-transfusion were considered responders; the rest were considered. s. Patients having platelet count>20,000 per µl. in the absence of bleeding manifestations were considered to have received inappropriate platelet transfusion.

RESULTS

Of the 242 clinically suspected dengue patients, 225 were positive for anti-dengue IgM antibodies. Among the of 225 serologically positive dengue cases, 199 (88.4%), 21 (9.3%) od 5 (2.2%) were classified as DF, DHF and DSS, respectively accolg to WHO classification. The involvement of all age groups, especially an adult predominance, was observed. The mean age of the dengue patient was 27 y and the most belonged to the 21-30 y age group, which included 73 patients (32.44%), [fig. 1]. Platelet count of<100,000/cumm was detected in 191 (84.88%) patients and haematocrit value of>45% was observed in 32 patients (14.22%) at the time of admission. Hemorrhagic manifestations were present in 34 (15.11%) patients of dengue infection, which mainly included petechiae-21 (9.3%) patients, epistaxis-6 (2.7%) patients, haematemesis-5 (2.22%) patients, melaena-3 (1.33%) patients, gum bleeding-8 (3.55%) patients. Bleeding occurred more often in patients with severe thrombocytopenia and was frequent when the platelet count was below 20,000/cumm [table 1]. About 96 among the 225 serologically confirmed patients (42.60%) received platelet transfusion therapy. Among them 58 patients were male and 38 patients were female. About 79 (39.69%) of the 199 patients with dengue fever required platelet transfusion. Similarly among the 21 DHF patients, 15 (71.42%) patients and out of 5 DSS patients only 2 (40%) patients required platelet transfusion.

All the 10 patients having platelet count<10,000/cumm had received platelet transfusion. Out of 40 patients having platelet count in between 11-20,000/cumm, 37 patients received platelet transfusion whereas 43 patients out of 77 had received platelet transfusion that were having the platelet count in the range of 21-40,000/cumm. 6 patients having platelet count in the range of 41-100,000/cumm received platelet transfusion. None of the 19 (8.4%) patients having platelet count>100,000/cumm, received platelet transfusion. Out of 49 patients having platelet count>20,000/cumm, and receiving platelet transfusion, 18 patients had haemorrhagic manifestations while 31 patients had no haemorrhagic manifestations.

Most of the patients receiving platelet transfusion recovered completely and were discharged within 2-5 d of their last platelet transfusion. The platelet count had picked up considerably and the average platelet count of the patients at discharge who received platelet transfusion were 95,000/cumm.

Besides platelet transfusion, FFP and PRC were also transfused to the dengue patients. Out of 12 patients who were transfused with FFP, seven had abnormal PT/PTT, INR and four patients were transfused with FFPs along with platelet transfusion. Five dengue patients had received PRC transfusion whose hemoglobin level was<8.0 gm/dl.

During the study period there were 50 patients whose platelet count was<20,000/cumm. Out of these, 47 were given platelet transfusions and there were three patients with a platelet count between 15,000/cumm and 20,000 who did not bleed and improved without any transfusion.

There was one patient who was suffering from falciparum malaria along with dengue fever. Only two patients died during hospitalization (mortality being 0.88%). One had additional clinical manifestations like septicaemia, while the other had severe bleeding with multi-organ failure and both belonged to 31-40 y age group.

DISCUSSION

Dengue fever is a major public health problem in India. This study showed that the majority of dengue cases were adult with the largest proportion in the age group of 21-30 y. This is in accordance with the findings of Pervin *et al.* Thrombocytopenia was found in 84.88% of the confirmed cases on admission. This prevalence is comparable with the findings of Chairulfatah *et al.* who found a similar incidence of 83% in hospitalized dengue patients. Bleeding occur significantly more often in patients with severe thrombocytopenia most often in patients with a platelet count less than 20,000/cumm which is similar to the finding of Shivbalan *et al.* but Chairulfatah *et al.* found significant bleeding in patients with thrombocyte count less than 15,000/cumm. Bleeding during DHF may result from a combination of factors such as thrombocytopenia, coagulation defects and vasculopathy [2]. Therefore before platelet transfusion coagulation profile should be done to rule out the cause of bleeding.

The DHS guidelines stipulate that platelet transfusion should be given to patients with platelet count<20,000/cumm. In our study, 47 of the 97 patients receiving platelet transfusion followed the norms laid down by DHS for the hospitalized dengue patients. 49 patients had a platelet count greater than 20,000/cumm, 18 out of whom had hemorrhagic manifestations like petechiae, gum bleeding, epistaxis, etc. that necessitated the use of platelet transfusion. However, 31 (13.77%) patients received inappropriate platelet transfusion. Kumar *et al.* had found 56.2% of inappropriate platelet transfusion during dengue epidemics in Delhi during 1999. Many times the prescription for this blood component are not based on medical rationale, but as a response to an intense social pressure on the treating physicians by the patients and their relatives

All the patients of DSS required platelet support. Two patients in age group of 31-40 y were not given platelets as they died soon after admission. None of the DHF patients<20 y required platelets. The transfusion of platelets in DF was more in patients above the age of 11 than below 11 y as the possibility of repeat infections was higher.

Dengue patients can be categorized into the four categories based on their platelet count at the time of admission:

1. High risk

2. Moderate risk

3. Low risk

4. No risk

High risk patient

The patients belonging to this group have platelet count <20,000/cumm and they are at high risk of bleeding. Such patients by the rule of the thumb should be receiving prophylactic platelet transfusion. The patients in this category whose platelet count is less than 10,000/cumm have even a greater risk and need to be prioritized in case of an epidemic or, in case of limited resources.

Moderate risk

All the patients whose platelet count is in between 21-40,000/cumm belong to moderate risk category. The patients of this risk group should be transfused with platelet only if they have any haemorrhagic symptoms.

Low risk

Those patients whose platelet count>40,000/cumm but<100,000/cumm for the age and sex should be observed and monitored carefully but should not receive unnecessary platelet transfusion because of the risk of transmission of blood borne infection (with no benefit of platelet transfusion).

No risk category

Patients falling in this category usually have the platelet count>100,000/cumm. They should never be transfused with platelet and should be managed on intravenous fluids and supportive therapy.

CONCLUSION

All hospitalized dengue patients can be categorized into the high, moderate, low and no risk patients based on their platelet count at

the time of hospitalization. The high-risk patients should be given priority and the treating physician should take decision for platelet transfusion. Moderate risk patients should be observed carefully and platelet is transfused only if they have any haemorrhagic manifestations. Low risk patients should not be given platelet transfusion and should be managed on intravenous fluids and supportive therapy.

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AUTHORS CONTRIBUTIONS

All the authors have contributed equally.

CONFLICT OF INTERESTS

Declared none

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