

Platelets transfusion in dengue patients

Abstract

Objective: To investigate the role of platelet transfusion in dengue patients.

Study design: Cross sectional prospective.

Place and duration: Study was carried out at Combined Military Hospital Malir Cantonment Karachi from Oct 2019 to July 2022

Materials and methods: All the patients who were confirmed cases of Dengue by serology tests either by NS1 antigen, IgM or both were included in the study. Clinical features were analyzed and need for blood product was assessed, specifically platelet transfusion.

Results: Out of 2000 dengue patients, 202 (10.1%) presented with some sort of haemorrhagic manifestations. 82 (4.1%) patients were transfused with platelets. 160 random donor platelets and 65 single donor platelets were transfused. Reaction rate was 3.11% and minimum reactions occurred when single donor platelets were used.

Keywords: dengue virus, thrombocytopenia, platelet transfusion, random donor platelets, single donor platelets

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Introduction

Dengue is a widespread mosquito borne disease, endemic in more than 100 countries and is of major public health care concern.¹ Our country frequently experiences outbreak of this disease in different regions.¹ Weather condition of Pakistan, overcrowding, bad sanitation and inadequate control of mosquito breeding leads to frequent outbreaks of dengue fever throughout the country. It was somewhat controlled during high prevalence of covid 19, probably due to lockdown or quarantine policies, again had a great surge in later half of 2021. Karachi, due to its moderate climatic conditions and poor sanitation, favors growth of mosquitos and spread of this vector borne disease.¹ Patients of dengue present with wide range of symptoms, generally patients recover early but a small number of patients land into complications including dengue haemorrhagic fever (DHF) and dengue shock syndrome DSS. It is usually the second infection which has more complications in comparison to primary infections due to hyper immune response which occurs due to prior sensitization.¹

A small number of the patients present with various bleeding manifestation, the causes are usually multifactorial: vasculopathy, thrombocytopenia, platelet dysfunction, prolonged thrombin (TT), prothrombin (PT) and activated partial thromboplastin (aPTT) time are contributory factors. These tests are performed to assess the coagulation status of the patient. Now new bedside tests such as thromboelastometry may give early information about the bleeding tendency in these patients and it is emerging as new test modality for dengue patients.² Thrombocytopenia is most important, consistent and significant finding which may lead to bleeding tendency.² Many factors are responsible for decreasing the platelet count. In early stage of disease bone marrow hypo-cellularity is the main cause, followed by immune mediated destruction.³ Blood products can be lifesaving in severe dengue infection with bleeding manifestations.² However, use of prophylactic platelet transfusion is on increase in our country. Doctors, patients and their attendants feel safe with platelet being transfused to the dengue patients without realizing its side effects on patients and burden on health care/ blood bank, so non-essential use of platelets transfusion is on the rise.

Materials and methods

This study was conducted on confirmed dengue patients who visited CMH Malir from October 2019 to July 2022. Confirmation of the dengue patients were done by using the Immuno-chromatographic Kit (Merux USA), based on the principle of lateral flow chromatography. Detection of Dengue NS1 antigen, IgM and IgG antibodies were done and recorded. The study was approved by Department of Research and Ethics committees CMH Malir (READ-IREAB 88/2022/Trg/ERC). Patients who had previous history of thrombocytopenia due to any reason i.e. immune thrombocytopenia, aplastic anaemia, liver disease, kidney disease etc. were excluded from this study.

Detailed history of all the patients were taken after taking informed consent. Every patient was clinically examined and significant findings were noted. Information was collected regarding age, gender, clinical symptoms especially hemorrhagic manifestations, thrombocytopenia and requirement of platelet transfusion and endorsed on proforma.

Blood Samples of confirmed dengue patients were collected in EDTA to perform complete blood counts and slides were made to confirm platelet count by microscopy.

Reports of Blood CP, manual platelet count, dengue serology, platelet requirements and data obtained from daily follow-up were analyzed.

A total of 2000 samples were collected from the patients of confirmed dengue infection. Sample size was calculated using WHO sample size calculator keeping:

Confidence level: 99%

Anticipated population proportion: 0.65²

Absolute precision required: 0.06

Sample size n=993

Descriptive statistics were calculated for both qualitative and quantitative variables.

Random donor platelets were made from whole blood donation as a part of routine component preparation and are stored at 22°- 24°C on platelet agitator. These platelets were readily available for the use. Single donor platelets were freshly made using Haemonetics MCS model 9000. Careful selection of donor was made following AABB guidelines for collection of platelets from single donor. Donors were counseled in detail, procedure was explained to them and after taking consent, platelets were collected.

Results

Study was conducted on 2000 confirmed dengue patients diagnosed during October 2019 to July 2022. Among these positive dengue cases, 1790 (89.5%) patients were classified as dengue fever (DF), 202 (10.1%) as dengue haemorrhagic fever (DHF) and 8 (0.4%) were classified as dengue shock syndrome (DSS), respectively according to WHO classification. Majority of our patient were serving and retired military personals and their families from all age groups and civil persons living in cantonment area. The involvement of all age groups, especially an adult predominance was observed. The mean age of the dengue patient was 27 years and most of the patients belonged to 21-30 year age group, which included 73 patients (32.44%). Youngest patient was 9 months of age and oldest was 81 years. Male to female ratio was 3:1. Platelet count of < 100,000/cumm was detected in 1700 (85.0%) patients and Haematocrit value of >45% was observed in 284 patients (14.22%) at the time of admission.

Dengue Shock syndrome developed in eight patients. One of the female patient 26 years of age, developed cardiac effusion during her stay in our hospital. She was referred to cardiology setup for further treatment. Another 45 year old man developed widespread serous effusions including ascites and pleural effusion. Unfortunately he could not survive. Another 35 year old male with no previous comorbid died on the same day of admission. An elderly 73 years of age with history of cardiac disease, hypertension and diabetes myelitis with dengue infection progressed to multiorgan dysfunction and could not survive. Hemorrhagic manifestations were present in 202 (10.1%) patients of dengue infection. Overlapping signs were more common. Out of these patients most common presentation was petechial rash present in 80 (34.6%) patients and gum bleeding in 55 (27.22%) patients followed by epistaxis 30 (14.85%). Hematuria in 15 (7.4) hematemesis 5 (2.47%), melena-3 (1.5%) patients. Bleeding occurred more often in patients with severe thrombocytopenia and was frequent when the platelet count was below 20,000/cumm. Two children, one year old developed petechial haemorrhages even at the platelet count of 40,000/cumm.

Most of the patients had uneventful recovery, average time of discharge of admitted patients from the hospital was 4-5 days. 82 (4.1%) patients were transfused with platelets. A total of 160 random units of platelets were transfused and 65 single donor mega units. Most of the transfusion was done at the platelet count lower than 20,000 cumm on first to third day of admission. Only 0.3% (06) patients had platelet count between 20,000 and 40,000, who received platelets as they had other comorbidities too. One patient with platelet count of 41,000 cumm with 20 weeks of pregnancy had mild haematuria and was transfused with mega unit of platelets, she had smooth recovery and no adverse effect occurred on baby. None of the patient had transfusion at the platelet count above 41,000 cumm. Average time of platelet recovery of admitted patient was five days. No serious adverse effect of platelet transfusion was observed in any patient. Out of 225 total units (160+65), only 7 patients (3.11%) had high grade fever following platelet transfusion, which was settled by antipyretics. Culture were taken from blood samples as well as from

platelet bag but both showed no growth. No other complications was observed due to platelet transfusion. Most of the patients with side effects were transfused with random donor platelets. Very minimum transfusion reactions were observed with single donor platelets transfused. No serious adverse effects were noted in donors. However; for single donor donation, four donors refused to donate platelets after installation of kit. Two donors had the feeling of sinking heart and donation was stopped. One donor refused for the completion of the procedure. A total of 65 SDP (single donor platelets) were made and transfused to dengue patients.

Discussion

Dengue infection is on the constant rise since the first case that was reported in 1985.² The moment a patient is diagnosed as a case of dengue, the next investigation which is advised is always the platelet count. If it turns out to be low, panic and apprehension arises in patients as well as in doctors, which leads to the unnecessary burden on the blood bank. Some of the patients start taking herbal treatments to improve their platelet counts. A number of studies are now being conducted to support this theory and finding as alternative to platelet transfusion; as a pilot study was conducted by Sathyapalan which showed improvement in platelet count when papaya leaves are used.² A total of 82 (4.1%) patients were transfused in our study which is much lower as compared to other national and international studies. This evidence is supported by systemic review performed by Senaka which suggest that platelet transfusion should not be given in patients with thrombocytopenia without any symptoms or with mild bleeding. Furthermore there was inadequate evidence of platelet transfusion contributing to any good/harm in patients with bleeding in dengue patients. Many studies prove that a very high percentage of patients are transfused with platelets which is not justified. In the study by Makroo, 13.7 % of platelet transfusion were inappropriate out of 42.0% in total transfusions¹. Similarly Kulkarni reported 51% out of 78.4% inappropriate platelet transfusion.³ In our study, all the patients with platelet count of less than 10,000cumm were transfused similar to the studies of Makroo, Kulkarni and Sethi et al.⁴ and majority of patients with platelet count between 10-2000cumm. Sri Lankan guidelines on dengue also suggest no benefit of platelet transfusion is present in patients with platelet count of less than 10,000/ul.³

Our study also shows that despite the platelet transfusion, no significant difference was noted in bleeding episodes. This is also supported in the study conducted by Lee et al.⁵ and Assir et al.⁶ which showed that disease course was not effected by platelet transfusion. Platelet transfusion could not prevent disease progression to severe bleeding and was also unable to effectively control and shorten the bleeding episode. It only led to increase hospital stay of patients.³

Some of the studies also suggest that platelet transfusion may cause potential harm rather than having any benefit. Platelets are stored at room temperature on constant agitator which provides the ideal conditions for growth of bacteria; sepsis and bacteremia are known side effects after platelet transfusion. Efforts have been made to use pathogen reduced platelet transfusion but still no satisfactory data is present to show superiority of UVC treated versus not treated platelet transfusion³ In our study, rate of platelet related transfusion reaction was low (3.11%), as compared to other studies, the reason could be less number of the patients being transfused or more use of mega units as compared to random platelet units being transfused, similar results are also evident in the study performed by Kansay S et al.⁷ Sethi et al.⁴ study shows adverse reaction rate of 5.3% and Khan Assir et al.⁶ as 7% including life threatening transfusion related acute lung injury (TRALI)³ In one of the study conducted in India, showed very severe

panophthalmitis and left eye endophthalmitis following platelet transfusion in dengue patients.³ The cause of high reaction rate was suggested as hyper immune response, however, the rate of reaction was much lower when single donor apheresis units were used. More sustained response is obtained using the single donor platelets but it is not always possible to use them. However, transfusion of single donor units is not very easy. It increases the cost of treatment and requires specialized machines and kit along with technical staff who is trained in making single donor platelets. It also requires the donor who fits into the criteria of single donor donation and is willing to spend the significant time in duration of donation. This leads to loss of large number of donors. Although patients were counseled and reassured but still few donors refuse to donate.

Conclusion

Modern blood banks should be equipped with the facilities of platelet preparation and their storage. Moreover, single donor platelets should be the first choice to be transfused to the patients requiring platelets, whenever available.

Average hospital stay with or without platelet transfusion was almost the same.⁸⁻²²

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Conflicts of interest

The author declares that there is no conflict of interest.

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