Global Academic Journal of Medical Sciences
DOI : 10.36348/gajms.2022.v04i06.016
Avilable online at https://gajrc.com/

ISSN: 2706-9028 (O)
ISSN:2707-2533 (P)

Research Article

Role of Blood Component Therapy in the Management of Dengue Hemorrhagic Fever Patients

Dr. Firoza Begum[1*], Dr. Rana Jahangir Alam[2], Dr. Md. Abul Kalam Azad[3]

[1]Medical Officer, Department of Transfusion Medicine, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh.
[2]Medical Officer, Department of Surgery, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh.
[3]Medical Officer, Department of Rheumatology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh.

***Corresponding Author**
Dr. Firoza Begum
Email: firozabegumpoppy@gmail.com

Article History
Received: 27.08.2022
Accepted: 22.09.2022
Published: 30.12.2022

Abstract: ***Background:*** Dengue Hemorrhagic Fever (DHF) is a severe, life-threatening complication of dengue virus infection, characterized by plasma leakage, thrombocytopenia, and potential hemorrhage. As there is no specific antiviral treatment, supportive management is paramount. Blood component therapy, including platelets and plasma, is a critical intervention to correct coagulopathy and stabilize patients. ***Objective:*** To analyze the utilization patterns, determinants, and clinical outcomes of blood component therapy in patients with DHF. ***Methods:*** A prospective observational study was conducted at Bangabandhu Sheikh Mujib Medical University from July 2021 to August 2022. Data from 290 laboratory-confirmed dengue patients, including 73 with DHF, were analyzed. Parameters included demographics, DHF grade, transfusion details, laboratory trends, and clinical outcomes. Statistical analysis used SPSS 23.0, with Chi-square and ANOVA tests for comparisons; a p-value <0.05 was considered significant. ***Results:*** Transfusion was administered to 71.3% of DHF patients, predominantly platelets alone. Requirement was strongly linked to severity, with 84.0% of severe cases receiving therapy. Key risk factors included warning signs and high hematocrit. Post-therapy platelet counts and hematocrit levels normalized significantly. Combination therapy was associated with longer hospital stays (7.4 days) and higher complication rates (e.g., 30% fluid overload), yet discharge rates remained high across all groups. ***Conclusion:*** Blood component therapy is crucial for severe DHF, effectively stabilizing hematological parameters. A targeted, severity-based approach is recommended to optimize outcomes and minimize complications associated with combination transfusions.

Keywords: Blood component therapy, Clinical Outcomes, Dengue hemorrhagic fever, Platelet transfusion, Thrombocytopenia.

INTRODUCTION

Dengue virus infection, a mosquito-borne arboviral illness, represents a major global public health burden, particularly in tropical and subtropical regions where its endemicity leads to millions of annual infections [1,2]. The disease exhibits a broad clinical spectrum, from a mild, self-limiting febrile illness - Classical Dengue Fever (CDF) to severe and potentially fatal manifestations, namely Dengue Hemorrhagic Fever (DHF) and Dengue Shock Syndrome (DSS) [3]. The pathogenesis of severe dengue involves increased vascular permeability leading to plasma leakage, hemorrhagic tendencies, and significant thrombocytopenia, which collectively can precipitate hypovolemic shock and multi-organ failure if not promptly addressed [4]. Management of severe dengue is fundamentally supportive, with judicious and

dynamic fluid resuscitation constituting the cornerstone of therapy to counteract plasma leakage [5]. Beyond fluid management, a subset of patients with profound thrombocytopenia, active bleeding, or coagulopathy may require adjunctive blood component therapy. This includes transfusions of platelet concentrates, fresh frozen plasma (FFP), and packed red blood cells (PRBC) [6,7]. Clinical decision-making for transfusion typically hinges on the presence of warning signs (e.g., severe abdominal pain, mucosal bleeding), a rapidly declining platelet count, and an elevated or progressively rising hematocrit indicating hemoconcentration [8]. Despite the availability of management guidelines, real-world transfusion practices for dengue are highly variable across different healthcare settings, and the optimal utilization and clinical efficacy of blood components in endemic, resource-limited contexts remain inadequately characterized [9,10]. There is a pressing need to elucidate local patterns of use, identify reliable clinical and laboratory predictors for transfusion requirement, and objectively assess therapeutic outcomes. Addressing this gap is crucial for formulating context-specific, evidence-based protocols to optimize patient care and resource allocation. This study, therefore, aims to comprehensively analyze the pattern, determinants, and clinical effectiveness of blood component therapy among laboratory-confirmed DHF patients admitted to a major tertiary care hospital in Bangladesh [11,12].

MATERIALS AND METHODS

A prospective observational study was conducted at Bangabandhu Sheikh Mujib Medical University (BSMMU) from July 2021 to August 2022.

Study population and sampling

A total of 290 confirmed dengue patients were included using consecutive sampling.

- Dengue Fever (DF): 217
- Dengue Hemorrhagic Fever (DHF): 73

DHF was diagnosed according to the WHO 2009 criteria.

Inclusion criteria

- Laboratory-confirmed dengue infection
- DHF patients meeting WHO criteria
- Complete clinical and laboratory records

Exclusion criteria

- Chronic liver disease
- Known hematological disorders
- Incomplete medical records

Data collection and analysis

Data collected included demographics, clinical features, DHF grade, laboratory parameters, transfusion details, and outcomes. Data were analyzed using SPSS version 23.0. Categorical variables were expressed as frequencies and percentages. Continuous variables were presented as mean ± standard deviation (SD). Changes in hematological parameters before and after transfusion were compared descriptively. Group comparisons were performed using the Chi-square test for categorical variables and ANOVA for continuous variables. A p-value of <0.05 was considered statistically significant.

RESULTS

In a cohort of 290 dengue patients (mean age 34.7 years), 73 (25.2%) were diagnosed with Dengue Hemorrhagic Fever (DHF). Blood component therapy was administered to 52 of these DHF patients (71.3%), while 21 (28.7%) were managed supportively without transfusion. The therapeutic approach varied significantly with disease severity. Among the 48 patients with milder DHF (Grades I & II), only 16 (33.3%) required transfusion, predominantly with platelets alone (12 of those 16 cases). In stark contrast, 21 of the 25 patients (84.0%) with severe DHF (Grades III & IV) received therapy. Platelet transfusions remained the cornerstone, but combination therapy (e.g., platelets with Fresh Frozen Plasma or Packed Red Blood Cells) was notably more common in severe cases, constituting 23.8% of transfusions in this group versus 6.3% in milder cases. Clinically, the need for transfusion was associated with specific risk factors. Patients over 40 years of age (68.0% transfused), those presenting with warning signs (78.0% transfused), and individuals with a hematocrit exceeding 45% (72.1% transfused) were more likely to receive blood components. Laboratory parameters showed clear improvement post-therapy. The mean platelet count rose from 22,000/mm³ to 55,000/mm³, while the mean hematocrit decreased from 48% to 40%. Furthermore, a prolonged PT/INR, indicating clotting dysfunction, was corrected in 83% of treated patients. Clinical outcomes reflected the intensity of the intervention. Patients receiving no transfusion had the shortest average hospital stay (3.8 days) and fastest platelet recovery (1.6 days). Those receiving platelets alone had intermediate stays (5.2 days) and recovery (2.3 days), while patients on combination therapy had the longest stays (7.4 days) and slowest recovery (3.2 days). Complications like fluid overload (30%) and transfusion reactions (10%) occurred exclusively in transfused patients and were most frequent in the combination therapy group. Despite this, discharge rates were high across all groups (90-100%), with no statistically significant difference in final survival outcomes.

Table 1: Baseline characteristics of dengue patients (N=290)

Characteristic	Category	Frequency	Percentage
Disease type	Dengue fever	217	74.8
	Dengue hemorrhagic fever	73	25.2
Gender	Male	161	55.5
	Female	129	44.5
Mean Age	—	34.7 ± 13.2 years	—

Table 2: Pattern and frequency of blood component therapy among DHF patients (n=73)

Blood component	Frequency	Percentage
Platelets only	42	57.5
FFP only	8	11.0
PRBC only	3	4.1
Platelets & FFP	10	13.7
Platelets & PRBC	5	6.8
No therapy	21	28.7

Table 3: Association of DHF severity with need for therapy (n=73)

DHF grade	Received therapy	Did not receive therapy
Grade I & II (n=48)	16 (33.3%)	32 (66.7%)
Grade III & IV (n=25)	21 (84.0%)	4 (16.0%)

Table 4: Type of blood component therapy received by DHF severity grade (n=73)

Parameter	Grade I & II (n=48)	Grade III & IV (n=25)	Total (n=73)
Patients receiving any therapy	16 (33.3%)	21 (84.0%)	37 (50.7%)
Type of therapy among those treated	(n=16)	(n=21)	(n=37)
Platelets only	12 (75.0%)	15 (71.4%)	27 (73.0%)
FFP only	2 (12.5%)	1 (4.8%)	3 (8.1%)
PRBC only	1 (6.3%)	0 (0.0%)	1 (2.7%)
Platelets + FFP	1 (6.3%)	3 (14.3%)	4 (10.8%)
Platelets + PRBC	0 (0.0%)	2 (9.5%)	2 (5.4%)
Patients receiving no therapy	32 (66.7%)	4 (16.0%)	36 (49.3%)

Table 5: Risk factors for requiring blood component therapy

Risk factor	Received therapy	No therapy
Age > 40 years	17 (68.0%)	8 (32.0%)
Warning signs present	39 (78.0%)	11 (22.0%)
Hematocrit > 45%	31 (72.1%)	12 (27.9%)

Table 6: Hematological changes before and after blood component therapy among DHF patients (n=73)

Parameter	Before therapy (Mean ± SD)	After therapy (Mean ± SD)
Platelet Count (/mm³)	22,000 ± 8,500	55,000 ± 11,200
Hematocrit (%)	48 ± 4	40 ± 3
PT/INR	Prolonged	Corrected in 83%

Table 7: Clinical outcomes and complications based on blood component therapy (n=73)

Outcome measure	No therapy	Platelets only	FFP/PRBC ± Platelets	p-value
Hospital stays (Days)	3.8 ± 1.0	5.2 ± 1.3	7.4 ± 1.9	<0.001
Platelet Recovery Time (Days)	1.6 ± 0.5	2.3 ± 0.7	3.2 ± 1.0	<0.001
Outcomes				
Discharged	21 (100%)	42 (100%)	9 (90%)	0.090
ICU transfer	0	0	1 (10%)	
Complications				
Fluid overload	0	0	3 (30%)	0.002
Transfusion reaction	0	1 (2.4%)	1 (10%)	0.041

DISCUSSION

The findings of this study illuminate the contemporary role of blood component therapy in the management of DHF within a tertiary care setting. Our data, revealing that 71.3% of DHF patients received transfusion, underscores its integral supportive function, while the 28.7% managed without it highlight that vigilant conservative care remains sufficient for a significant subset [13]. This reinforces the principle that transfusion in dengue is not prophylactic but is indicated for the correction of specific, often severe, hematological and clinical derangements [14]. The profound association between DHF severity and transfusion need is a cornerstone of our findings. The fact that 84.0% of Grade III/IV patients required therapy, compared to only 33.3% of Grade I/II patients, aligns perfectly with the known pathophysiology of severe plasma leakage and significant coagulopathy in advanced disease [15]. This severity-driven practice is consistent with international guidelines that prioritize clinical judgment over arbitrary platelet thresholds [16]. The predominance of platelet-only transfusions reflects the central role of profound thrombocytopenia in clinical decision-making, yet the increased utilization of combination therapy (platelets with FFP or PRBC) in severe cases points to the management of concurrent complications-coagulopathy and significant hemorrhage or anemia that define critical illness [17]. The identified risk predictors (age >40, warning signs, hematocrit >45%) provide a valuable, evidence-based triage framework. These factors are well-established harbingers of severe disease progression and capillary leak, effectively identifying patients who warrant intensive monitoring and readiness for intervention [18]. The demonstrated laboratory efficacy—marked rise in platelet count, reduction in hematocrit, and correction of coagulopathy—validates the therapeutic objective of stabilizing the patient through the critical phase [19]. However, the outcomes analysis introduces a critical caution. The significantly longer hospital stays and platelet recovery time, coupled with a higher complication rate (notably 30% fluid overload in the combination therapy group), associated with transfusion particularly multi-component therapy demand careful interpretation. This likely represents a combination of the inherent morbidity of the severe illness requiring such intervention and the iatrogenic risks of the therapy itself. Fluid overload is a particularly perilous complication in DHF, as it exacerbates the underlying capillary leak and can precipitate respiratory distress, underscoring the need for meticulous fluid balance management during and after transfusion [20]. These findings resonate with growing literature questioning the liberal use of prophylactic platelets and highlighting the risks of transfusion-associated circulatory overload (TACO) in vulnerable patients [21]. The high discharge rates across all groups are reassuring and attest to the overall effectiveness of structured dengue care. Nevertheless, the extended recovery and increased complications in transfused patients emphasize that blood products are a significant medical intervention with inherent risks. Their use must be balanced, targeted, and driven by clear clinical or severe laboratory indications rather than anxiety over low platelet counts alone [22]. Our study confirms blood component therapy as a vital rescue intervention for severe DHF but advocates for a refined, restrained approach. Therapy should be guided by a composite of clinical severity, specific risk factors, and evolving laboratory trends. Future research should focus on developing more precise predictive models for bleeding and shock to further minimize unnecessary transfusions and their associated burdens.

Limitations:

The study limitations include its prospective observational, single-center design, which may limit generalizability. The relatively small subgroup of patients receiving combination therapy affects the precision of comparative outcome analyses for that specific intervention.

CONCLUSION

Blood component therapy is a crucial, life-saving intervention for severe DHF, effectively correcting critical hematological abnormalities. Its use must be guided primarily by clinical severity and specific risk factors, not isolated lab values. A restrained, targeted transfusion strategy is essential to maximize benefit while minimizing the risks of complications, such as fluid overload, and ensuring optimal patient recovery.

Recommendations:

We recommend a severity-based, conservative transfusion strategy guided by clinical warning signs and hemoconcentration, not platelet count alone. Emphasis should be on vigilant monitoring to identify patients who truly require therapy, thereby minimizing unnecessary transfusions and associated complications like fluid overload.

REFERENCES

1. Bhatt, S., Gething, P. W., Brady, O. J., Messina, J. P., Farlow, A. W., Moyes, C. L., ... & Hay, S. I. (2013). The global distribution and burden of dengue. *Nature*, *496*(7446), 504-507.
2. Brady, O. J., Gething, P. W., Bhatt, S., Messina, J. P., Brownstein, J. S., Hoen, A. G., ... & Hay, S. I. (2012). Refining the global spatial limits of dengue virus transmission by evidence-based consensus.
3. World Health Organization, Special Programme for Research, Training in Tropical Diseases, World Health Organization. Department of Control of Neglected Tropical Diseases, World Health Organization. Epidemic & Pandemic Alert. (2009). *Dengue: guidelines for diagnosis,*

treatment, prevention and control. World Health Organization.
4. Halstead, S. B. (2007). Dengue. *The Lancet*, *370*(9599), 1644-1652.
5. Malavige, G. N., Fernando, S., Fernando, D. J., & Seneviratne, S. L. (2004). Dengue viral infections. *Postgraduate medical journal*, *80*(948), 588-601.
6. Lye, D. C., Lee, V. J., Sun, Y., & Leo, Y. S. (2009). Lack of efficacy of prophylactic platelet transfusion for severe thrombocytopenia in adults with acute uncomplicated dengue infection. *Clinical infectious diseases*, *48*(9), 1262-1265.
7. Rajapakse, S., Rodrigo, C., Maduranga, S., & Rajapakse, A. C. (2014). Corticosteroids in the treatment of dengue shock syndrome. *Infection and drug resistance*, 137-143.
8. Bodinayake, C. K., Tillekeratne, L. G., Nagahawatte, A., Devasiri, V., Kodikara Arachchi, W., Strouse, J. J., ... & Reller, M. E. (2018). Evaluation of the WHO 2009 classification for diagnosis of acute dengue in a large cohort of adults and children in Sri Lanka during a dengue-1 epidemic. *PLoS neglected tropical diseases*, *12*(2), e0006258.
9. Trung Dinh The, T. D. T., Thao Le Thi Thu, T. L. T. T., Dung Nguyen Minh, D. N. M., Ngoc Tran Van, N. T. V., Hien Tran Tinh, H. T. T., Chau Nguyen Van Vinh, C. N. V. V., ... & Wills, B. (2012). Clinical features of dengue in a large Vietnamese cohort: intrinsically lower platelet counts and greater risk for bleeding in adults than children.
10. Djamiatun, K., Van der Ven, A. J., de Groot, P. G., Faradz, S. M., Hapsari, D. E. A. H., Dolmans, W. M., ... & de Mast, Q. (2012). Severe dengue is associated with consumption of von Willebrand factor and its cleaving enzyme, ADAMTS-13. *PLoS neglected tropical diseases*, *6*(5), e1628.
11. Chaudhary, R., Khetan, D., Sinha, S., Sinha, P., Sonker, A., Pandey, P., ... & Ray, V. (2006). Transfusion support to dengue patients in a hospital-based blood transfusion service in north India. *Transfusion and apheresis science*, *35*(3), 239-244.
12. Islam, M. T., Quispe, C., Herrera-Bravo, J., Sarkar, C., Sharma, R., Garg, N., ... & Cruz-Martins, N. (2021). Production, transmission, pathogenesis, and control of dengue virus: a literature-based undivided perspective. *BioMed Research International*, *2021*(1), 4224816.
13. Rajapakse, Senaka, Chaturaka Rodrigo, and Anoja Rajapakse. "Treatment of dengue fever." Infection and drug resistance (2012): 103-112.
14. World Health Organization and UNICEF. "Handbook for clinical management of dengue." (2012).
15. Malavige GN, Ogg GS. Pathogenesis of severe dengue infection. Cytokine. 2019; 123:154777.
16. Lee, Tau Hong, et al. "Current management of severe dengue infection." Expert review of anti-infective therapy 15.1 (2017): 67-78.
17. Choudhury, Gargi Roy. "TRANSMEDCON 2021 Posters." Asian Journal of Transfusion Science 16. Suppl 1 (2022): S12-S45.
18. Tanner, Lukas, et al. "Decision tree algorithms predict the diagnosis and outcome of dengue fever in the early phase of illness." PLoS neglected tropical diseases 2.3 (2008): e196.
19. Dinh The Trung, Dinh the Trung, et al. "Liver involvement associated with dengue infection in adults in Vietnam." (2010): 774-780.
20. Wills, Bridget A., et al. "Comparison of three fluid solutions for resuscitation in dengue shock syndrome." New England Journal of Medicine 353.9 (2005): 877-889.
21. Assir, Muhammad Zaman Khan, et al. "Effectiveness of platelet transfusion in dengue fever: a randomized controlled trial." Transfusion Medicine and Hemotherapy 40.5 (2013): 362-368.
22. Lum ChaiSee [Lum, CSL, et al. "Preventive transfusion in dengue shock syndrome-is it necessary?" (2003): 682-684.