International Journal of Contemporary Pediatrics
Tambekar H et al. Int J Contemp Pediatr. 2019 Mar;6(2):786-790
http://www.ijpediatrics.com
pISSN 2349-3283 | eISSN 2349-3291

DOI: http://dx.doi.org/10.18203/2349-3291.ijcp20190730

Original Research Article

Rational use of blood components in children with dengue by using WHO and NVBDC guidelines

Harish Tambekar[1]*, Sujata Sharma[2]

[1]Department of Pediatrics, SVNGMC, Yavatmal, Maharashtra, India
[2]Department of Pediatrics, LTMMC, Mumbai, Maharashtra, India

Received: 03 January 2019
Accepted: 31 January 2019

***Correspondence:**
Dr. Harish Tambekar,
E-mail: harishtambekar56@gmail.com

ABSTRACT

Background: Dengue fever has become a major public health concern. The disease is now endemic in more than 100 countries with very high case fatality rate and children are the most affected age group worldwide. During explosive outbreaks, there is sudden surge in demands of blood components. Hence the aim of present research was to study the rational use of blood components in children with dengue by using WHO 2012 and NVBDCP 2015 (GOI) guidelines.
Methods: Total 219 children of age <12 years, who has been diagnosed to have dengue and received blood component therapy during 12 months of study period, were included in the study. The transfusions of blood components [packed red cells (PRC), platelets and fresh frozen plasma (FFP)] were being given to the cases accordance to the WHO and NVBDCP guidelines. The patients' demographic data, diagnosis, details of blood component therapy used the reason for transfusion was recorded.
Results: Out of 219 children, 12(5.4%) children received platelet transfusion, 4(1.8%) children received PRC transfusion and 5(2.2%) children received FFP transfusion. One transfusion (4.7%) out of 12 platelet transfusion was inappropriate and all PRC and FFP transfusions were appropriate according to WHO and National Vector Born Disease Control Programme (GOI) guidelines.
Conclusions: The need for platelet transfusion is often overemphasized and the fact is that the platelet count alone is not a predictor of bleeding. Unnecessary and empirical use of platelets should be completely avoided.

Keywords: Blood component, Dengue fever, NVBDCP, Plasma, Platelets, Transfusion, WHO

INTRODUCTION

Dengue fever (DF) is the most rapidly spreading mosquito-borne viral disease worldwide. The South East Asian countries such as India, Indonesia, Myanmar and Thailand are at the highest risk of dengue accounting for nearly half of the global risk.[1] The average number of DF/DHF cases reported by the World Health Organization (WHO) has increased considerably in the past decades. In India, especially in Maharashtra the number of dengue cases reported in 2015 were about 4936 with 23 deaths, in 2016 were about 6792 with 33 deaths, in 2017 and till 25th Nov 2018 were about 7829 with 65 deaths and 9451 with 46 deaths respectively based on the data of NVBDCP.[2]

However, an estimated 500,000 people with severe dengue infection require hospitalization annually and 90% of them are children <5 years of age. Without proper treatment, the case fatality rate in severe dengue is more than 20% and with timely intervention, it can be reduced to <1%.[3] Bleeding and shock are the most dreaded

complications in children with dengue fever leading to high mortality.[4] The recent epidemics has seen changing pattern of presentation of dengue fever in children especially in the presence of coinfections such as enteric fever and malaria thereby making the clinical decision more difficult and often mislead the physician's initial impression.[5]

Fluid therapy is the key step in the management of dengue, increased capillary permeability, thrombocytopenia, coagulopathy and hemorrhagic manifestation, warrants packed red cell, platelets and fresh frozen plasma transfusions. Blood transfusion services constantly face challenges year after year during dengue outbreaks due to lack of evidence based guidelines for clinical use of blood components.[6] The demand for Platelets and Fresh Frozen Plasma is increasing due to more number of cases with severe dengue. Transfusion of blood components is associated with many adverse effects. If the management guidelines for use of blood components in dengue are not taken into consideration, it may lead to inappropriate use of blood components and complications arising out of it.[6] Therefore, authors decided to investigate the rational use of blood components in children with dengue by using WHO 2012 and NVBDCP 2015 (GOI) guidelines.

METHODS

This retrospective observational exploratory study was initiated after obtaining permission from the Institutional Ethics Committee. Waiver of consent was also obtained as ours being an observational study. There was no direct contact between the investigators and the participants or their guardians.

Inclusion criteria

- The study enrolled total 219 patients admitted in Pediatric ward and PICU of age 29 days to 12 years who has been diagnosed to have dengue and received blood component therapy during the period of 12 months.

Exclusion criteria

- Children with known case of anemia, thrombocytopenia, bleeding disorders and liver cell / renal failure were excluded from the study.

The management of dengue fever in children was done by blood component therapy. The transfusions of blood components were being given to the cases accordance to the WHO and NVBDCP guidelines. Being an exploratory study, no formal sample size calculations were carried out.

Authors considered only packed cells, platelets and fresh frozen plasma in current study as these are commonly transfused. The demographic data, diagnosis, number of bleeding episodes requiring PRBC transfusion, prevalence of thrombocytopenia and bleeding episodes requiring platelets and FFP transfusion was recorded. Proportion of inappropriate and appropriate transfusions among total transfusion episodes was calculated.

Statistical analysis

After data collection, data entry was done in Microsoft Excel. The qualitative data was represented in the form of frequency and percentage tables with the help of SPSS version 21. Quantitative data was presented with help of mean, standard deviation (SD), median and interquartile range (IQR). Comparison among various study parameters was done with the help one way ANOVA test. P value less than 0.05 is taken as level of significance.

RESULTS

A total 219 children were enrolled in the study, among them 116(53%) were males and 103(47%) were females. There was male preponderance with a male: female ratio of 1.12. The age wise distribution of patients was shown in Table 1.

Table 1: Age wise distribution of patients.

Age	Frequency	Percentage
Below 1 year	23	10.5
1 to 5 years	46	21
Above 5 years	150	68.5
Total	219	100

Fever was the most common presenting symptom seen in 100% of patients followed by vomiting, rash, abdominal pain and bleeding (Table 2). Among haemorrhagic manifestations (16.9% of children), malena was the most common (35.1%) form of bleeding, as shown in table 2. Total 118 (53.9%) patients were diagnosed to have dengue fever on clinical basis, 80 (36.5%) patients were positive for Rapid kit test for dengue NS1 and dengue IgM positivity seen in 21 (9.6%) patients.

Table 2: Clinical symptoms and type of bleeding in the study group (n=219).

Symptoms	Number	Percent
Fever	219	100
Vomiting	126	57.5
Rash	96	43.8
Pain in abdomen	84	38.4
Bleeding	37	16.9
Type of bleeding	**Frequency**	**Percent**
Malena	13	35.1
Conjunctival hemorrhage	8	21.6
Epistaxis	7	18.9
Hematemesis	7	18.9
Cerebral hemorrhage	1	2.7
Pulmonary hemorrhage	1	2.7

As per WHO classifications, 123(56%) patients manifested as dengue with warning signs, 50(23%) children as severe dengue and 46 (21%) as dengue without warning signs. Out of the severe dengue patients [50(22.8%) cases], 21 (42%) patients had bleeding and 38 (76%) cases had thrombocytopenia. 16(34.7%) patients with dengue with warning signs had bleeding manifestations.

High hematocrit levels were seen in patients having dengue with warning signs (53%) and severe dengue (50%) while lowest for dengue without warning signs (42%). The mean platelet counts on presentation were highest (188810) for dengue without warning signs while lowest for severe dengue (2000). On applying one way ANOVA test significant association was seen (p value 0.001).

Out of 219 children, 12(6.4%) children received platelet transfusion, 4(1.8%) children received PRC transfusion and 5(2.2%) children received FFP transfusion (Figure 1).

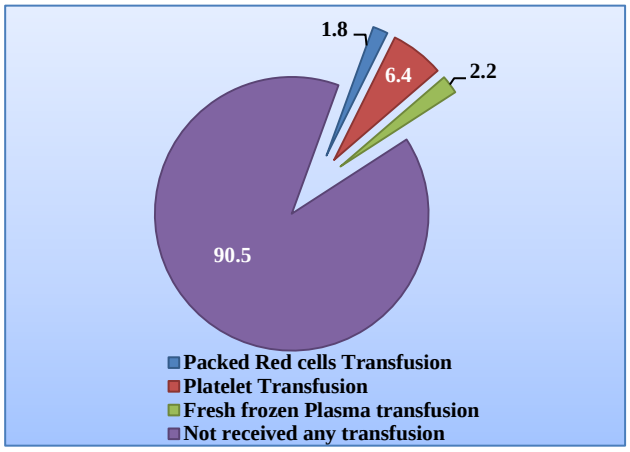

Figure 1: Requirement of blood components in study group.

The maximum platelet transfusion i.e. 6 was given between platelet counts 20000-50000, (Table 3). Patients who received PRC transfusion had 6.8 mean haemoglobin and patients who didn't receive PRC transfusion had 11.5 mean haemoglobin on admission.

Table 3: Relation of platelet transfusion with platelet counts on admission (n=219).

Platelet counts on admission	Number of platelet transfusion
<10000	0
10000-20000	2
20000-50000	6
50000-100000	3
>100000	1
Total	12

One transfusion (4.7%) out of 12 platelet transfusion was Inappropriate and all PRC and FFP transfusions were appropriate according to WHO and National Vector Born Disease Control Programme (GOI) guidelines. The majority of the patients (205; 93.6% patients) were discharge from the hospital while 5(2.3%) patients were died and 9(4.1%) took discharge against medical advice.

DISCUSSION

Dengue infection is a major public health problem in India, which is endemic in this area. Platelet transfusion is given in those patients who are either bleeding or have other hemorrhagic symptoms along with thrombocytopenia. There is perennial shortage of blood and blood components in most of the developing world. The resources are inadequate in terms of meeting the ever growing demand of blood components.[7]

In the present study children more than 5 years of age were the most commonly affected age group which was similar to the previous studies.[8,9] However, Pothapregada et al showed less than 5 years of age as the commonly affected age group, this co-incides with the previous data suggesting a bimodal peak of Dengue infection in age groups of less than 1 year and between 5 to 7 years.[5] But authors did not get another peak in children less than 1 year with only 10.5% of patients being infants. A male preponderance was seen with male to female ratio of 1.12:1 which was similar to other studies.[9,10] The present study was conducted over a period of around one year in a tertiary care hospital in Mumbai catering to urban and peri-urban slum areas. Authors observed a post monsoon peak in the number of children admitted in Hospital with dengue. Similar findings were observed in 2003 epidemic in Mumbai by Shah et al with a peak seen in the post monsoon period while Zaki et al observed a peak in the month of August after a bout of heavy rainfall in year 2005 in Mumbai.[11,12] The above finding could be explained by presence of ambient temperature and humidity during the monsoon favoring mosquito breeding.

Fever was the commonest presenting symptom seen in 100% of patients same as previous studies.[13,14] Out of 219 children, 118 children were diagnosed on clinical basis, according to WHO case definition. 101 Children were diagnosed by laboratory tests, among them 80(79.2%) children were dengue NS1 rapid test positive and 21(20.7%) children were dengue IgM positive. These findings were comparable with the study conducted by Chairulfatah et al.[15] The majority of patients [123(56%)] manifested as dengue with warning signs followed by severe dengue 50(23%) and dengue without warning signs. This was comparable to a study by Narvaez et al (2005-2010) which showed dengue without warning signs in 6.6% of patients, dengue with warning signs in 48.9% and severe dengue in 44.5%.[16] However, these results are not comparable with general population. This

is explained by high referral rate of critical patients from the peripheral hospital to the tertiary care hospital.

The most common mode of presentation of severe dengue infection was peripheral circulatory failure without bleeding, indicating a changing pattern of presentation. Bleeding manifestations were seen in 16.9% cases and was lower in comparison to the previous studies.[17] Bleeding manifestations were highly variable and did not always correlate with thrombocytopenia as it occurred even with normal platelet counts. The correlation between thrombocytopenia and bleeding was more common in severe dengue infection than non-severe dengue infection. The mechanism for bleeding manifestations is multifactorial in dengue fever and the factors such as thrombocytopenia, coagulation defects, vasculopathy and hepatic derangement act synergistically. Therefore, other causes of bleeding need to be evaluated before transfusing platelets.[4] In case of deranged coagulation profile, fresh frozen plasma was given instead of platelets.

In present study, the maximum bleeding manifestations 21(42%) were found in children with severe dengue, which was similar to the previous study.[18] There were no bleeding manifestations in children having dengue without warning signs. Authors observed and compare the trend of platelet in patients presented with bleeding to those without bleeding. The trend of platelet count of children presented with bleeding manifestation was below one lac/cumm consistently, these findings were similar to the study by Pothapregada et al.[5] Among 37 children who presented with bleeding, 10(27%) children received platelet transfusions. Platelet transfusions were avoided in minor bleeds with hemodynamically stable patients with thrombocytopenia. The mean hematocrit observed was 53 % (PCV) in children having dengue with warning signs and 50% in children having severe dengue. Children who had features of shock with rising hematocrit, not responding to crystalloids, received fresh frozen plasma or colloids and with falling hematocrit received Packed red cell transfusion.

Platelet transfusion was given in children with severe dengue infection associated with significant bleeding and with severe thrombocytopenia. Platelet transfusion was given in 12(5.4%) children, 4 children (1.8%) received packed red cell transfusion and 5 children (2.2%) received FFP transfusion. Eleven platelet transfusions and all PRC and FFP transfusions were appropriate according to WHO 2012 and NVBDCP (GOI) 2015 guidelines. The one platelet transfusion, given prophylactically without bleeding and not meeting guidelines was inappropriate. The need for platelet transfusion was much lower compared to the previous studies.[1,19] There were five deaths (2.3%) and 9 (4.1%) patients took discharge against medical advice. Similar outcome was found in the study conducted by Chairulfatah et al.[15]

CONCLUSION

The clinicians find the WHO guidelines for platelet transfusion not pragmatic enough to be followed, especially during the present times when there is an intense social pressure on the treating pediatricians by the parents and their relatives. The need for platelet transfusion is often overemphasized, but it is a myth and the fact is that the platelet count alone is not a predictor of bleeding. So, it is extremely important to be selective in giving platelet transfusion in children. The crux in the treatment of dengue patient is maintenance of good hydration, monitoring for any overt bleeding, periodic check on peripheral pulses, blood pressure, well supported with estimation of serial hematocrit and platelet counts and no panicking on seeing lower platelet counts.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Makroo RN, Raina V, Kumar P, Kanth RK. Role of platelet transfusion in the management of dengue patients in a tertiary care Hospital. Asian J Trans Sci. 2007;1(1):4-7.
2. Dengue/DHF situation in India: National Vector Borne Disease Control Programme (NVBDCP). Available at: http://nvbdcp.gov.in/index4.php?lang=1&level=0&linkid=431&lid=3715.
3. World Health Organization, Regional Office for South-East Asia. Comprehensive Guidelines forPrevention and Control of Dengue and Dengue Hemorrhagic Fever, Revised and Expanded Edition. WHO-SEARO 2011. (SEARO Technical Publication Series No. 60) 2011.
4. Shivbalan S, Anandnathan K, Balasubramanian S, Datta M, Amalraj E. Predictors of spontaneous bleeding in dengue. Indian J Pediatr. 2004;71(1):33-6.
5. Pothapregada S, Kamalakannan B, Thulasingham M, Sampath S. Clinically profiling pediatric patients with dengue. J Global Infect Dis. 2016;8(3):115-20.
6. Kaur P, Kaur G. Transfusion support in patients with dengue fever. International J Appl Basic Med Res. 2014;4(Suppl 1):S8.
7. Verma A, Agarwal P. Platelet utilization in the developing world: Strategies to optimize platelet transfusion practices. Transfus Apher Sci. 2009;41(2):145-9.
8. Aggarwal A, Chandra J, Aneja S, Patwari AK, Dutta AK. An epidemic of dengue hemorrhagic fever and dengue shock syndrome in children in Delhi. Indian Pediatr. 1998;35(8):727-32.
9. Mittal H, Faridi MMA, Arora SK, Patil R. Clinicohematological profile and platelet trends in

children with dengue during 2010 epidemic in North India. Indian J Pediatr. 2012;79(4):467-71.
10. Ahmed S, Arif F, Yahya Y, Rehman A, Abbas K, Ashraf S, et al. Dengue fever outbreak in Karachi 2006-a study of profile and outcome of children under 15 years of age. J Pak Med Assoc. 2008;58(1):4-8.
11. Shah I, Deshpande GC, Tardeja PN. Outbreak of dengue in Mumbai and predictive markers for dengue shock syndrome. J Trop Pediatr. 2004;50(5):301-5.
12. Zaki SA, Shanbag P. Clinical manifestations of dengue and leptospirosis in children in Mumbai: an observational study. Infect. 2010;38(4):285-91.
13. Prathyusha CV, Srinivasa Rao M, Sudarsini P, Uma Maheswara Rao K. Clinico-haematological profile and outcome of dengue fever in children. Int J Curr Microbiol App Sci. 2013;2(10):338-46.
14. Yudhishdran J, Navinan R, Ratnatilaka A, Jeyalakshmy S. Dengue haemorrhagic fever presenting with cholestatic hepatitis: two case reports and a review of literature. BMC Res Notes. 2014;7(1):568.
15. Chairulfatah A, Setiabudi D, Agoes R, Colebunders R. Thrombocytopenia and platelet transfusions in dengue haemorrhagic fever and dengue shock syndrome. Dengue Bull. 2003;27(27).
16. Narvaez F, Gutierrez G, Pérez MA, Elizondo D, Nuñez A, Balmaseda A, et al. Evaluation of the Traditional and Revised WHO Classifications of Dengue Disease Severity. PLoS Negl Trop Dis. 2011;5(11):e1397.
17. Ratageri VH, Shepur TA, Wari PK, Chavan SC, Mujahid IB, Yergolkar PN. Clinical profile and outcome of dengue fever cases. Indian J Pediatr. 2005;72(8):705-6.
18. Kulkarni N. Study on the effectiveness of transfusion program in dengue patients receiving platelet transfusion. IJBTI-Int J Blood Transfus Immunohematol. 2012;22:11-1.
19. Mahapatra S, Sahu A, Sahoo D, Patjoshi S, Parida P. Platelet transfusion in a dengue epidemic as per recent WHO classification. Int J Clin Trials. 2014;1(1):27-30.

Cite this article as: Tambekar H, Sharma S. Rational use of blood components in children with dengue by using WHO and NVBDC guidelines. Int J Contemp Pediatr 2019;6:786-90.