

Original Research Article

Utilization of fresh frozen plasma in a tertiary care hospital in central Kerala

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ABSTRACT

Background: The demand for blood and its components always exceeds the supply in our health care setting. Hence there is a need to prioritize the usage of these components. An audit makes this possible. The present study is conducted on utilization of Fresh frozen plasma which is one of the most requested blood components.

Methods: The study was conducted on the first 241 FFP transfusions during the study period of 1 year. Requisition forms for issuing FFP from various departments were reviewed and relevant data collected. Patients' case record was also retrieved to collect data related to the transfusion episodes. The data collected were compiled, coded and expressed using descriptive statistical tools like mean, mode, percentage and ratio using Microsoft Excel 2010.

Results: Most of the patients who underwent FFP transfusion were males and in the age group 60-70. Most of the requests for FFP issue came from Cardiothoracic department. Most common indication for FFP transfusion was raised PT INR. FFP units remained unutilized in CTVS, General surgery and general medicine. 20% of the received request forms were incompletely filled with the Clinical diagnosis and Indication for FFP being most frequently omitted information.

Conclusions: Various departments at Government Medical College, Kottayam are efficiently utilizing FFP. But more intervention is needed in addressing issues related to the sending of requisition forms and ensuring adequate usage of FFP to prevent its wastage.

Keywords: Fresh frozen plasma, Utilization, Transfusion

INTRODUCTION

The practice of blood transfusion is of relatively recent origin. Although it only became a practical possibility during and shortly after world war the concept of transfusion has a long history. The older history is based on traditional idea of blood as being living force of the body. Man must have recognized loss of blood was frequently associated with weakness and death. This was seen as Greeks and Romans committing suicide by letting open veins.

Blood and its components were recognized as having numerous mysterious properties. Early attempts to replace lost blood can be traced to ancient texts which shows that humans have recognized the basic principles of transfusion very early. Newer insights into the physiology and functions of blood components have led to the emergence of transfusion medicine as a discipline.

Fresh frozen plasma is one of the most requested blood components in our health care setting. The disparity between the supply and requirement has always been an

issue for all blood components. We are often under the constraints of time and work that we find it difficult to investigate whether these resources are efficiently utilized. The present study intends to demonstrate the pattern of utilization of FFP among various specialties and determine the efficiency of utilization in our institute.

METHODS

Type of study

Descriptive, cross sectional study.

Study period

18 months starting from the date of approval of IRB (January 2019 to June 2020).

Study setting

Department of Transfusion medicine, Government Medical College, Kottayam.

Study population

Patients undergoing FFP transfusion at Government Medical College, Kottayam during the study period.

Inclusion criteria

All cases undergoing Fresh Frozen Plasma transfusion at various departments in Government Medical College, Kottayam.

Exclusion criteria

Cases where clinical details are not available.

Sample size

$$\text{Sample size, } N = Z^2 \frac{pq}{d^2}$$

Where $Z_{\alpha} = 1.96$ at 95% CI, p = prevalence / proportion in previous study, $q = 100 - p$, d = precision / allowable error and “ p ” is taken as 32 % from previous study by Kaur et al which is the proportion of utilization by medicine specialty alone.

Taking allowable error as 6%.

$$\begin{aligned} \text{Sample size, } N &= Z^2 \frac{pq}{d^2} \\ &= (1.96)^2 \frac{32 \times 68}{(6 \times 6)^2} = 241 \end{aligned}$$

Calculated sample size is 241.

Sampling method

Continuous sampling.

Research hypothesis

There is efficient utilization of Fresh Frozen Plasma in various specialties at Government Medical College, Kottayam.

Study tools

Transfusion requisition form, cross matching register, issue register, stock record and case records.

Methodology

The data pertaining to the patients undergoing FFP transfusion was collected from the requisition forms sent from the respective departments. The detail of the transfusion episodes was retrieved from the case records of patients. The cross-match register and stock records at Blood Bank were cross checked. The collected data was compiled, tabulated, coded, analysed and described using statistical tools like mean, mode, percentage and ratio.

Study procedure

The study was conducted in the Department of Transfusion Medicine, Government Medical College, Kottayam. FFP was the most requested blood component in our hospital. After the IRB approval all clinical departments and the respective staff were informed telephonically of the study and asked to send duly filled requisition forms, documenting all the relevant details pertaining to the patient and indication for transfusion. They were also asked to document all episodes of transfusion being performed with regards to – time of beginning of transfusion, time of termination, number of units transfused, units remained unused and the reason, development of any transfusion reaction if any.

The requisition forms received at the Department of Transfusion Medicine during the study period were reviewed. The following data was collected – date, IP number, age, gender, clinical specialty, clinical diagnosis, indication for transfusion, number of units requested, number of units issued, blood group. the respective case sheets of the patients were seen to check the utilization of the issued units. The stock and cross matching register at blood bank was studied to collect data pertaining to stock and cross matches.

After collecting the data of 241 FFP transfusions during the study period it was tabulated and coded using Microsoft excel 2010 and the transfusion index was calculated using following equation. Transfusion index = number of units transfused/number of patients transfused.

Data management and analysis

After data collection it was compiled and analyzed in Microsoft Excel 2010 version. Descriptive statistical tools namely mean, mode, proportion, percentage were

used to describe the pattern of utilization of FFP among different specialties and to determine the efficiency of utilization of Fresh Frozen Plasma in various specialties. Also, various indications for FFP transfusion were tabulated.

RESULTS

The study included first FFP transfusions at various departments. Majority of the patients who underwent transfusion were males (61%) (Figure 1). Male:female ratio was 1.6:1. Maximum number of patients were in the age group 60-70 years (Figure 2), with mean age being 51.9 years.

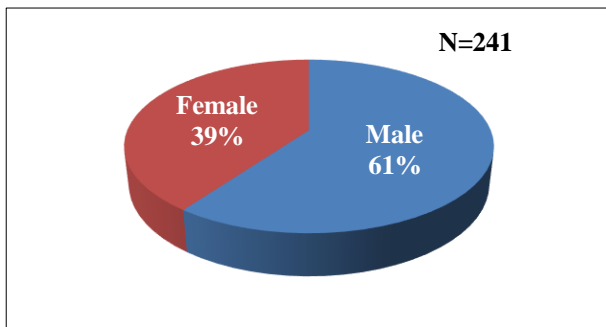


Figure 1: Gender wise distribution of patients who underwent FFP transfusion.

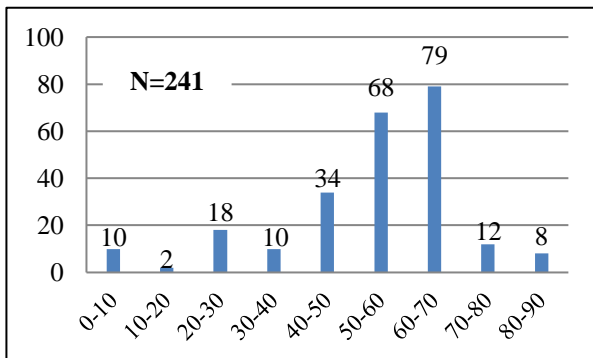


Figure 2: Age distribution of patients who underwent FFP transfusion.

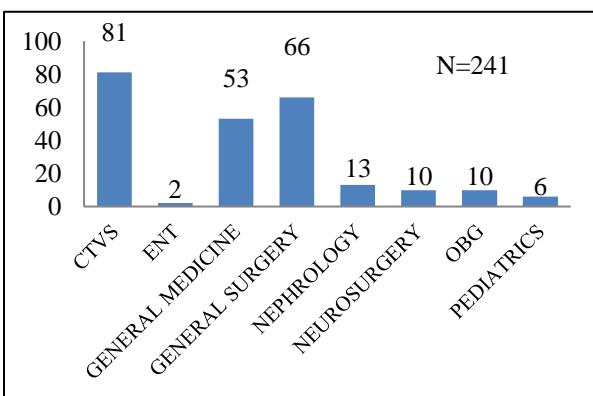


Figure 3: Specialty wise distribution of FFP usage.

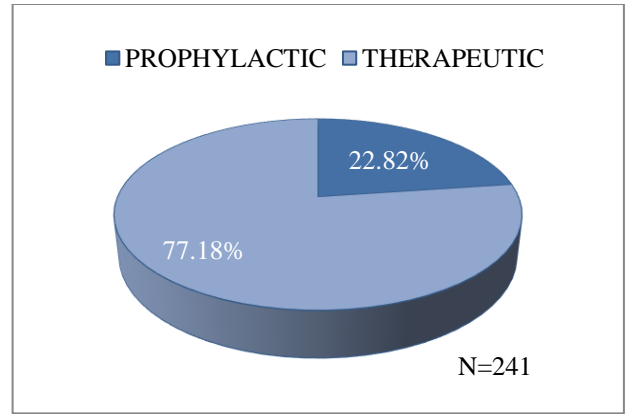


Figure 4: Distribution of indications based on therapeutic versus prophylactic.

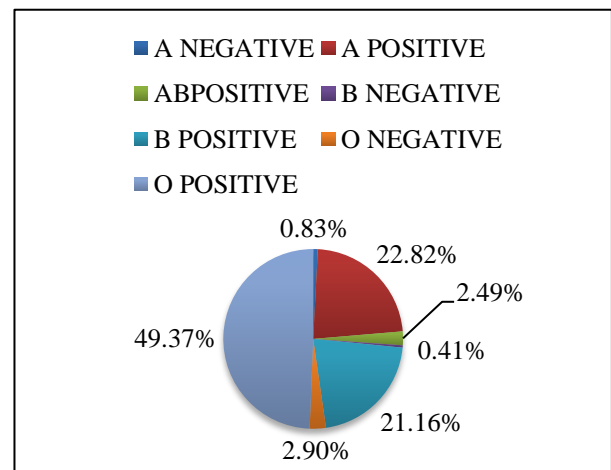


Figure 5: Blood groups of FFP issued.

The maximum number of requisitions came from the Cardiothoracic department. (Figure 3). FFP were requested for both surgical and medical indications. The most frequent indication was a raised PT INR (43.15%) (Table 1). 77% of the indications were therapeutic while 23% were prophylactic (Figure 6). Most number of requisitions came for Opositive blood group (49.3%) (Figure 5).

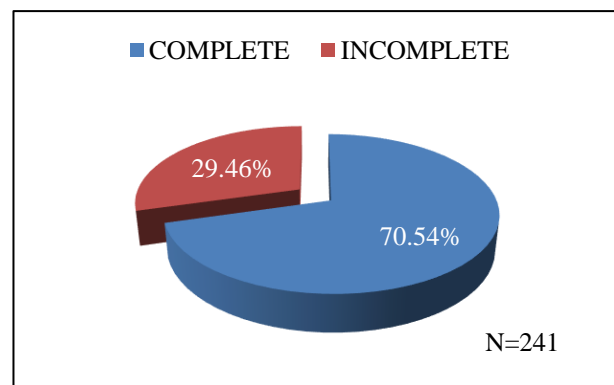


Figure 6: Distribution based on completion of request forms.

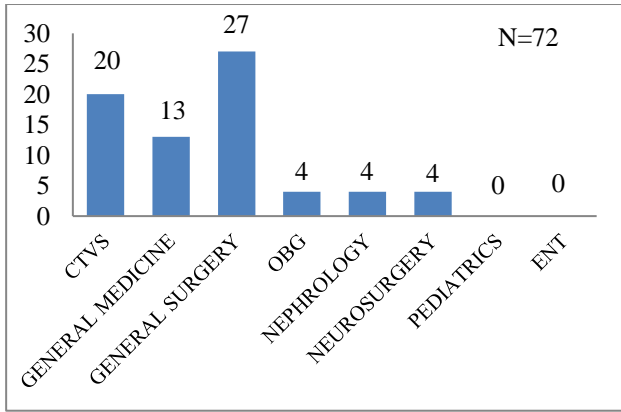


Figure 7: Distribution of incomplete requisition forms among different specialties.

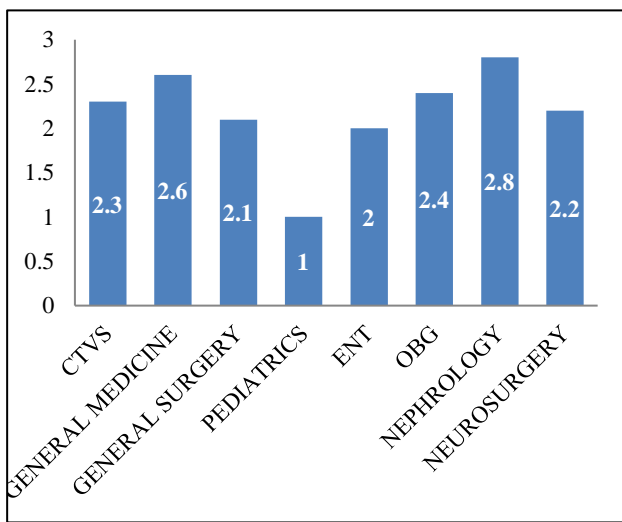


Figure 8: Transfusion index of different specialties.

FFP units remained unutilized in Cradiothoracic, General Medicine and General Surgery departments (Table 2). 70.54% of the requisition forms were complete while 29.46% were incomplete with respect to clinical indication and clinical diagnosis (Figure 6). The incomplete requisitions were more from General surgery followed by Cardiothoracic and General Medicine (Figure 7).

Table 1: Indications for FFP transfusion.

Indication (in alphabetical order)	Frequency	Percentage
Dialysis	15	6.22
DIC	18	7.47
High PT-INR	104	43.15
Hypoalbuminemia	45	18.67
Impending DIC	03	1.24
Peripoerative	12	4.98
Post surgery	24	9.96
Pre operative	11	4.57
Volume expansion	09	3.74
Grand total	241	100

Table 2: Distribution of unused and unused FFP units.

Specialty	Units issued	Units used
CTVS	199	186
General medicine	141	136
General surgery	139	138
Pediatrics	6	6
ENT	4	4
Obg	24	24
Nephrology	37	37
Neurosurgery	22	22

The overall transfusion index was 2.3, with maximum from Nephrology. All the departments have index more than or equal to 1 (Figure 8).

DISCUSSION

Demand for blood and blood components are increasing in all parts of the world. With latest technology, healthcare systems advancement and health coverage improvement, the demand for supply is increasing and moreover this demand is being driven by increasing improved and sophisticated surgical procedures. In many situations present health system is unable to meet the demand, on the other hand expansion of health coverage and improved health services will further increase the need and its supply.

Availability of adequate safe blood and blood products is a challenge that developing countries are struggling with for a long time especially when there is a scarcity of voluntary donors, poor storage facilities but also because of inappropriate blood ordering and utilization.¹⁻³ Many previous studies have reported over requisition of blood components and wastage.⁴⁻⁶

Blood and blood components are an indispensable part of patient management. While these transfusions can be lifesaving at times, like all therapeutic interventions it brings along its own share of side effects. Also, availability is a challenge due to paucity of voluntary donors, poor storage facilities and component preparation but also mainly because of inappropriate ordering and utilization.

Also, with various guidelines in place for transfusion of blood and components, non-adherence to these guidelines will result in non-judicious use of these precious resources. Several studies have highlighted the inappropriate usage of FFPs inspite of having standard guidelines.⁵ With all these concerns in mind a prospective audit on appropriate usage of FFP becomes imperative. Such studies will help outline the areas where improvements could be brought about so transfusions no longer remain injudicious

The present study was conducted on 241 consecutive FFP transfusions carried out in different specialties at Government Medical College, Kottayam, during study period of 18 months. FFP is the most frequently requested blood component in our hospital, hence its pattern of utilization was focused on in the study.

Before beginning the study all the residents and house surgeons of various departments were duly informed and directed to send fully filled requisition forms to the blood bank and educated as to how crucial this was in the routine practice.

Genderwise distribution

Out of the 241 patients who underwent FFP transfusions 61% were males and 39% were females. The male:female ratio was 1.6:1 which was comparable with similar studies.^{7,8}

Age wise distribution

The maximum number of patients fall in the age group of 60-70 years, which are also the majority of the population seeking medical help in a tertiary care setting. This also seems to depend upon the population demographics trend of the region studied and the prevalence of conditions that require transfusion. Studies by Prinja et al and Barot et al show comparable demographics.^{7,9}

Specialty wise distribution

The majority of the requisitions for FFP came from Surgical specialties (70.1%) compared to medical specialties (29.9%). Among the surgical specialties, maximum was from Cardiothoracic department followed by General Surgery. This is due to the fact that cardiothoracic department as a routine protocol ask for 3 units of FFP for all elective surgical cases like CABG. Among the medical specialty maximum were from General Medicine because it caters to the Hematological conditions.

In one study Choudhary et al as evaluation of FFP usage in tertiary hospital in Northern India reported that a total of 595 units of FFP were issued to 112 patients, of which 53 units (8.9%) were returned unused and the remaining 542 units (91.1%) were actually transfused. The mean patient age was 38.9 years with an M:F ratio 2.8:1. 17% of the patients were give FFP. Based on the published guidelines they found that appropriate usage of FFP was in 29.5% patients and inappropriate usage in 70.5%. Chronic liver disease followed by DIC were the most common appropriate indication for FFP transfusion. Bleeding related to surgery such as CVTS and others with normal coagulation profile were the most common inappropriate indication for which FFP was used. Medical specialties use FFP more judiciously than surgical specialties.⁵

The specialty wise distribution is comparable with similar studies because Cardiothoracic department, general medicine and other surgical specialties form largest consumers of FFP in any health care setting. Some of the departments like Urology and Surgical Oncology did not come under the perspective of this study because of the constraints of time and sample size and the distribution was random.

Indication

The most frequent indication for carrying out FFP transfusion was a raised PT INR followed by hypoalbuminemia. 77% of the transfusions were therapeutic while 23% were prophylactic. Therapeutic transfusion was carried out mostly in bleeding with deranged bleeding parameters and for chronic liver disease. While prophylactically it was given prior to Surgery or for bleeding in patients with sepsis. Most of the FFP requests are cross matched and prophylactic transfusions were in Surgical Department due to over ordering and anticipation of bleeding during surgery. FFP utilization in OBG department for patients with pregnancy related complications like post-partum hemorrhage and DIC is life-saving.

In Pediatrics the FFP is utilized in Neonatology for neonatal sepsis both prophylactically and therapeutically. Computerised transfusion guidelines and periodic audits reduce the inappropriate FFP transfusions. Excessive turnaround time for coagulation tests for proper guiding of FFP transfusion and confident trust of anesthetics and surgeons on FFP hemostatic effectiveness and surgeon's underestimation for magnitude of risk associated with FFP transfusion are some of the causes for over utilization. Other similar studies show elevated PT INR and deranged coagulation profile being most frequent indications.^{7,8}

Utilisation

FFP units remained unutilized in Cardiothoracic department, General Medicine and General Surgery as 13, 5 and 1 units respectively. There is a disparity in the number of units requested and the units transfused in these specialties. These 3 constitute the major load of FFP consumption. Most often the FFP units are ordered in excess but the transfusion is done according to the guidelines and the requirement at that particular instance and hence end up without transfusing all the units. Most of the Surgical departments FFP is requested as a protocol before the elective surgery due to anticipation for any bleeding during the surgery. Hence there is an obvious loss of resource and time of the work force. In addition peri operative transfusion of FFP before cardiopulmonary surgery exposes the patient to unnecessary risk without any beneficial effect and add Antithrombin III in the blood which can cause heparin rebound. The proportion of unused FFP units are higher than similar studies.⁷

Completion of requisition forms

The requisition forms were complete in 70.5% of cases while they were incomplete in 29.4% of cases. Incomplete requisition forms were received despite the instructions given to the doctors prior to the study. The incomplete requisition forms were only 3% in a study by Kansay et al.¹⁰

Incomplete requisition forms were received from General Surgery, Cardiothoracic department and General Medicine. They are also the departments utilizing the majority of the FFP units. The patient identifiers like name, age, gender, IP number, unit, blood group and number of units were duly filled in all the request forms which is to be appreciated because it prevents misidentification and related risks. While most frequent information omitted in the requisition forms were the clinical indication and investigation parameters which are crucial in determining the need and urgency of transfusion and deciding on the quantity to be issued and how fast it need to be done. Reason for sending incomplete forms is due to the increased work load and a lack of ample time. Hence there is a need to create more awareness regarding the various indications for specific component transfusion and the importance of filling the requisition forms completely especially the critical fields like indication and investigations.

Transfusion index

Borat et al and Mead et al conceptualized that a C:T ratio of 2.5 or below, Transfusion Probability of 30% or more and Transfusion index of more than 0.5 is considered indicative of efficient utilization of blood and blood components. They proposed preferential use of FFP for those patients who fulfill guidelines and have high pre transfusion INR. The study identified the generalized and widespread irrational use of FFP among various specialties.^{11,12}

Transfusion index of value 0.5 or more signifies efficient usage and indicate transfused number of units appropriateness. Over all transfusion index was 2.3. Specialty with maximum Nephrology (2.8). All specialties had a transfusion index of more than 1.

Studies from all over the world report report a high frequency of inappropriate utilization of FFP. These published reports have focused primarily on appropriateness of FFP transfusion to improve patient outcome.¹³⁻¹⁶ Very few studies have thrown light into monitoring of transfusion events.^{17,18} Clinical transfusion audit is a useful tool to identify current pattern of usage and areas of improvement.¹⁹

Limitations

In spite of repeated requests and information sought the clinical diagnosis and indication for FFP transfusion were

not provided by the clinicians. Since the duration of the study is small, utilized FFP by other major departments like Urosurgery and Surgical oncology could not be obtained. The indicators of efficient utilization is more meaningful when applied to blood components as whole rather than individual components.

CONCLUSION

Maximum utilization of FFP was in the age group 60-70 years. Maximum utilized department was CTVS. Majority of the indications were therapeutic rather than prophylactic. Maximum number of requisitions came for 2 units of FFP.O positive was the most requested blood group. Also, it was noted that 3.3% of issued FFP remained unutilized in and 29% of the received requisition forms were incomplete. The most common indication for FFP transfusion was raised PT INR. The overall transfusion index was 2.3. Overall, there was effective utilization of FFP by various departments though gaps exist regarding the completeness of requisition forms. Like FFP, similar study can be carried out for other blood components and the same compared. Multinodal studies of the nature will help in pinpointing the defects in the utilization of blood and its components and corrections to be made and in policy implementation. Similar studies can help in devising a MSBOS (Maximum Surgical Blood Order Schedule) for the Institute which prevents wastage of these precious resources.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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