Original Article

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Pathology Section

Utilisation of Fresh Frozen Plasma in a Tertiary Care Hospital

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ABSTRACT

Introduction: Fresh Frozen Plasma (FFP) is mainly used in the treatment of abnormal coagulation profile, the reversal of warfarin effect and trauma emergencies. Inappropriate FFP usage can cause adverse effects like excess volume replacement, anaphylaxis and Transfusion-Based Lung Injury (TRALI) in patients.

Aim: To focus on indications, appropriate and inappropriate usage of FFP in a tertiary care hospital.

Materials and Methods: This was a retrospective descriptional study of FFP's issued to the patients admitted to NRI General Hospital, Chinakakani, Andhra Pradesh, India, during the period from June 2017 to June 2019. All requisition forms for the issue of FFP, other blood components were collected and analysed from the blood bank. Following parameters were taken into consideration like age, the gender of the patient, blood group, clinical diagnosis, clinical indication, the speciality of requesting clinician, other blood components and number of FFP's transfused. Statistical data were expressed as frequencies and percentages.

Results: A total of 3644 FFP's were issued to 1904 patients, out of which 994 patients were males, and 910 patients were females.The highest number of FFP's were supplied to patients with active bleeding and least to patients undergoing therapeutic plasma exchange. The highest number of FFP's were issued to the Medicine department, followed by the General surgery department and 8.92% of FFP's were supplied to patients with Deranged Coagulation Profile (DCP), 85.93% to bleeding patients, 0.78% to patients with Disseminated Intravascular Coagulation (DIC) and 0.44% to patients undergoing therapeutic plasma exchange.

Conclusion: FFP transfusion is beneficial to patients with high pre-transfusion International Normalised Ratio (INR) value in comparison to patients with low pre-transfusion INR values. More clinical interventions, a proper compilation of requisition forms, maintenance of records, regular audit by hospital transfusion committee, formulation of guidelines regarding usage of FFP and regular academic meets are needed to improve the appropriate usage of FFP's and to minimise their inappropriate usage.

Keywords: Blood transfusion, Coagulopathy, International normalised ratio

INTRODUCTION

FFP contains stable coagulation factors, immunoglobulin and albumin [1]. The use of FFP is majorly indicated in patients with coagulopathy resulting from DIC who is undergoing invasive procedures or having an active bleed, in patients with liver failure with active bleed, in patients with Thrombotic Thrombocytopenic Purpura (TTP), the reversal of warfarin effect, inherited deficiencies of inhibitors of coagulation, massive blood transfusion and immunodeficiency [1-4].

Inappropriate request from clinicians and unnecessary use of FFP increases the risk of side effects like excess volume replacement, anaphylaxis, diseases transmitted through transfusion and TRALI in patients [5]. In recent times the, usage of FFP has increased significantly and it continues to increase. Most of the time FFP is used inappropriately without any scientific rationale [6]. Previous studies show substantial disparities between different hospitals and different clinical departments, regarding clinical indication for usage of FFP [1,2,5,6]. The present study focused on utilisation of FFP in various clinical conditions, to evaluate appropriate and inappropriate usage of FFP in a tertiary care hospital.

MATERIALS AND METHODS

Retrospective descriptional study where an audit of FFP issued to patients during study period of two years from June 2017 to June 2019 at NRI General Hospital, Chinakakani, Andhra Pradesh, India was done. The study protocol was approved by the hospital ethics committee before its commencement (IEC-NRIMC-119). All requisition forms for the issue of FFP, other blood components during the study period were included and analysed. Patients with missing data and Vitamin K infusion were excluded from the study.

Following parameters were taken into consideration like age, the gender of the patient, body weight, blood group, ABO compatibility, clinical diagnosis, clinical indication, the specialty of requesting clinician, number of FFP's transfused, pre-transfusion and post-transfusion (INR) values and pre-transfusion and post- transfusion Prothrombin Time (PT) values. All the above data were collected from records.

Fresh plasma was separated from the whole blood in less than 6-8 hours of collection and frozen at -30°C or lower. Before infusion, the FFP was thawed rapidly at 30-37°C in a water bath with a shaker. Products thawed were infused without delay to avoid bacterial proliferation. If it was used as a source of labile coagulation factors, it was used immediately, usually within six hours of thawing. If used for a purpose other than coagulation factor replacement, it was transfused within 24 hours after it was thawed and stored at 1-6°C.

Based on National Health and Medical Research Council and the Australasian Society for Blood Transfusion guidelines [7], FFP transfusion was categorised as appropriate and inappropriate usage. Infusion of 10-15 ml/kg body weight of the patient was considered an adequate dose [8].

STATISTICAL ANALYSIS

Data analysis was done using Microsoft Excel and Statistical Package for the Social Sciences (SPSS) 17 version and quantitative data were expressed as frequencies and percentages.

RESULTS

Out of 3644 FFP issued, the highest number of FFP's were supplied to patients among the age group of 50-59 years [Table/Fig-1]. A total of 1904 patients were included in the present study of which, 994 patients were males and 910 patients were females.

Age in years	Gender wise usage of FFP	
	Male	Female
0-9	57	52
10-19	197	150
20-29	238	225
30-39	303	192
40-49	478	304
50-59	439	452
60-69	198	151
70-79	99	83
80-89	10	16

[Table/Fig-1]: Age and gender wise usage of FFP.
FFP: Fresh Frozen Plasma

A total of 3644 FFP were supplied, out of which 2019 were supplied to male patients and 1625 were supplied to female patients [Table/Fig-1]. Out of 1904 patients, 1716 (90%) patients received other blood components, such as red cells and platelet concentrate concurrently, while 188 patients (10%) were given only FFP.

The highest number of FFP was supplied to patients with active bleeding and least to patients undergoing therapeutic plasma exchange [Table/Fig-2]. In the present study, all requisition forms submitted had an indication for FFP written on them.

Indication	Number of patients	Percentage
Deranged coagulation profile	170	8.92%
Bleeding patients	1626	85.93%
Disseminated intravascular coagulation	15	0.78%
Therapeutic plasma exchange	8	0.44%
Hypoproteinemia	9	0.04%
Hypovolemia	36	1.8%
Significant coagulopathy without any evidence of bleeding	21	1.1%
Liver disease without active bleed	19	0.99%
No diagnosis written	0	0
Total	1904	100

[Table/Fig-2]: Indications for Fresh Frozen Plasma (FFP).

The highest numbers of FFP were issued by the Medicine department, followed by the General Surgery department [Table/Fig-3].

Department	No. of FFP issued	Percentage
General Medicine	904	25%
Oncology	198	5.4%
Cardiology	261	7.2%
Urology	86	2.3%
Surgical Gastroenterology	39	1.0%
Nephrology	367	10.1%
Cardiothoracic and vascular surgery	392	10.8%
Obstetrics and Gynaecology	322	8.8%
General Surgery and Neurosurgery	635	17.3%
Orthopaediatrics	251	6.9%
Emergency trauma	189	5.2%

[Table/Fig-3]: Departmental audit of FFP issued.
FFP: Fresh Frozen Plasma

A 79.69% FFP's were issued to patients having INR values greater than 1.5 and 14.18% FFP's were issued to patients with INR values less than 1.5 and 6.13% FFP's were issued to patients with requisition form where no coagulation status was written [Table/Fig-4]. About 0.5% of FFP were returned without usage as FFP once thawed not stored at 1-6°C and not infused within 24 hours of thawing resulted in gradual decline in the activity of clotting factors, particularly factor V and factor VIII and hence FFP were discarded and rest were transfused. Out of 3644, FFP's supplied, 79.69% FFP's were transfused appropriately while 20.31% were transfused inappropriately. The response to plasma infusion was monitored and no adverse effects have been identified.

INR (on requisition form)	No. of FFP issued	Percentage	Category
>1.5	2904	79.69%	Appropriate usage
<1.5	517	14.18%	Inappropriate usage
No coagulation status	223	6.13%	Inappropriate usage

[Table/Fig-4]: Issue of FFP based on INR value written on requisition form.
INR-International normalised ratio; FFP: Fresh Frozen Plasma

DISCUSSION

FFP contains all of the clotting factors, fibrinogen (400 to 900 mg/unit), plasma proteins (particularly albumin), electrolytes, physiological anticoagulants (protein C, protein S, antithrombin, tissue factor pathway inhibitor) and added anticoagulants [9,10].

Inappropriate usage includes following indications like hypoproteinemia, hypovolemia, significant coagulopathy without any evidence of bleeding, bleeding or non-bleeding patients with PT/Partial Thrmboplastin Time (PTT) non-availability or within normal limits, liver disease with or without deranged PT/Activated Partial Thromboplastin Time (APTT) but no evidence of bleeding and with no indications. Clinical audit of usage of FFP is now considered an important and valid method for improving the utility of FFP. A clinical audit gives the percentage of appropriate and inappropriate usage of FFP.

Various other studies done by Makroo RN et al., noted the most common indication for an FFP issue were patients with surgical bleeding, followed by patients with liver disease and transplantation [11]. Lingegowda JB et al., noted maximum FFP issued by the surgery department and the most common indication was massive transfusion [12]. A study done by Prinja N et al., noted maximum FFP's were issued for blood cancer patients, cardiothoracic surgeries and the most common indication for FFP issue were patients with DCP followed by bleeding patients and DIC [1].

All the post-transfusion INR values and post- transfusion PT values assessed. Patients with high pre-transfusion INR value who also received red cells and platelet concentrates responded well with FFP transfusion compared to patients with low pre-transfusion INR values. FFP transfused to the patients with low INR values and no coagulation status was considered as inappropriate. All post-transfusion forms received. One immediate adverse transfusion reaction noted immediate action was taken and reported to the transfusion committee. In the present study, 79.69%, FFP were transfused appropriately while 20.31% were transfused inappropriately.

The present study was compared with other studies done on appropriate and inappropriate usage of FFP [Table/Fig-5] [1,6,12-15]. Inappropriate usage of FFP can be avoided by regular auditing by the Hospital Blood Transfusion Committee (HBTC), by following individual hospital guidelines relevant to patients need, by using FFP guided by near patient haemostatic testing and by conducting academic meets.

Given the results of the present study, HBTC has been formed, which has formulated the guidelines for use of FFP per the local requirements, regular audits, academic meets are being organised to emphasise on the appropriate use of FFP.

Authors	Appropriate	Inappropriate
Chatterjee M and Bharucha ZS [15]	61%	39%
Luk C et al., [14]	47%	53%
Hui CH et al., [13]	72%	28%
Shinagare SA et al., [6]	60.6%	39.4%
Lingegowda JB et al., [12]	59.36%	40.64%
Prinja N et al., [1]	62.33%	37.67%
Present study	76.69%	20.31%

[Table/Fig-5]: Comparison of present study with other studies [1,6,12-15].

Limitation(s)

It was a single centered, retrospective study. Low number of cases and missing patient information in the record files are few limitations of the present study.

CONCLUSION(S)

FFP transfusion is beneficial to patients with high pre-transfusion INR value in comparison to patients with low pre-transfusion INR values. Patients with active bleeding and DCP had benefitted from FFP administration. FFP can be life saving, if proper safety precautions are taken during processing, storage and infusion. More clinical interventions, a proper compilation of requisition forms, maintenance of records, regular audit by hospital transfusion committee, formulation of guidelines regarding usage of FFP and regular academic meets are needed to improve the appropriate usage of FFP's and to minimise their inappropriate usage.

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