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Original Research Paper

Pathology

"STUDY OF BLOOD COMPONENT UTILIZATION IN PATIENT WITH DISSEMINATED INTRAVASCULAR COAGULATION AT TERTIARY CARE CENTRE"

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ABSTRACT **Background:** Disseminated intravascular coagulation (DIC) is a life-threatening syndrome characterised by systemic intravascular activation of coagulation leading to the widespread deposition of fibrin and leads to microvascular and macrovascular clotting and, ultimately resulting in multiple organ dysfunction syndrome (MODS). **Methods:** A Prospective observational study of 200 cases of DIC was conducted in the blood bank of svp hospital, over a period of 29 months. The parameters used for analysis were age, sex, Hb, cause of DIC and number of units of RCC, FFP, PRC and cryoprecipitate. **Results:** Transfusion of FFP (60%) was the highest in number and the highest requirement of blood component observed within the 19-40 years age group. Most common condition which was associated to was DIC Septicaemia (35.5%). **Conclusion:** Therapeutic transfusion of component is one of the most important parts of DIC management.

KEYWORDS : DIC, Blood components, utilization, Transfusion.

INTRODUCTION

Disseminated intravascular coagulation (DIC) is a life-threatening syndrome characterized by systemic intravascular activation of coagulation, leading to the widespread deposition of fibrin and leads to microvascular and macrovascular clotting and, ultimately resulting in multiple organ dysfunction syndrome (MODS). DIC is also known as "consumptive coagulopathy" because during the coagulation process, consumption of coagulation factors and aggregation of platelets occur resulting in reduced levels of both procoagulant and anticoagulant clotting proteins which leads to increased bleeding risk. So, patients with DIC may have both thromboembolic events and hemorrhage together.[1,3]

- **Etiology:** Multiple medical conditions like sepsis, severe infections, trauma, obstetric causes,Organ destruction e.g pancreatitis and malignancies

DIC can present either acutely or chronically, and it can be subclinical.[2]

- **Clinical Manifestations Of Dic:** Bleeding, especially oozing from sites of trauma, catheters, or drains, Thrombocytopenia, Prolonged PT and aPTT, Low plasma fibrinogen, antithrombin, protein C and S, Elevated plasma D-dimer and thrombin time, Reduced levels of procoagulant factors such as factors VII, X, V, and II (prothrombin)[6,10]

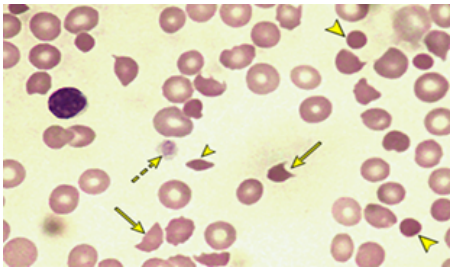

Figure:I Microangiopathic changes on peripheral blood smear seen in DIC

- **Role Of Blood Components In Dic:** Blood components are life saving in patients with DIC.

Important and basic blood components like; whole blood, FFP, RCC, platelets, cryoprecipitates.[7] Other blood components like Prothrombin complex concentrates (PCCs), rFVIIa (Eptacog alfa activated, Recombinant FVIIa and von Willebrand factor.[4,5]

Components	Storage	Transport	Expiry	Indications
Whole blood	In a blood bank refrigerator at 2 °C to 6 °C	Can be transported for the next 24 h if maintained at 1 °C to 10 °C during transport	35 days in a closed system, 24 h in an open system	Acute blood loss Exchange transfusion Massive transfusion
Packed red cells	In a blood bank refrigerator at 2 °C to 6 °C	Can be transported for the next 24 h if maintained at 1 °C to 10 °C during transport	35 days in a closed system, 24 h in an open system	Chronic, symptomatic anemia Acute blood loss
Fresh frozen plasma	In a plasma freezer at below -30 °C	Transported in frozen state	1 year	Multiple factor deficiencies Severe liver disease Warfarin reversal
Platelet concentrate	In a platelet incubator with agitator at 20 °C to 24 °C with continuous gentle agitation	20 °C to 24 °C	5 days in a closed system, 4 h in an open system	Bleeding due to low platelet count or impaired function
Cryoprecipitate	In a freezer at below -30 °C	Below -30 °C	1 year	Fibrinogen deficiency Dysfibrinogenemia Trauma Disseminated intravascular coagulation

Figure: II: Storage, shelf life and indication of various blood components[8,9]

MATERIAL AND METHODS:

A study of 200 cases of DIC was conducted in the blood bank of svp hospital, smt. NHL municipal medical college, Ahmedabad over a period of 29 months from August 2020 to December 2022.This study is Prospective observational study. The parameters used for analysis were age, sex, Hb, cause of DIC and number of units of RCC, FFP, PRC and cryoprecipitate used.

RESULT AND OBSERVATIONS:

Table: I Year wise total blood component utilization

Year	RCC	FFP	PRC	CRYPPT	Total Products used
2020	21	56	15	4	96
2021	170	540	143	45	898
2022	165	480	124	30	799
	356	1076	282	79	1793

Maximum number of blood components were used in the year 2021 (Table:I) In the all 29 months; Transfusion of FFP [1076(60%)] was the highest in number followed by red cell concentrate (RCC) [356(20%)];followed by PRC [282(16%)]. Transfusion of cryoprecipitate was observed the least [79(4%)].

Table: II-sex wise utilization of blood components

SEX	Mean ± SD Hb (g/dL)	RCC	FFP	PRC	CRYPPT	COMPONENTS (TOTAL)	CASES
MALE	9.59 ± 1.59	161	558	157	20	896	102
FEMALE	8.81 ± 1.84	195	518	125	59	897	98
TOTAL	9.21 ± 1.84	356	1076	282	79	1793	200

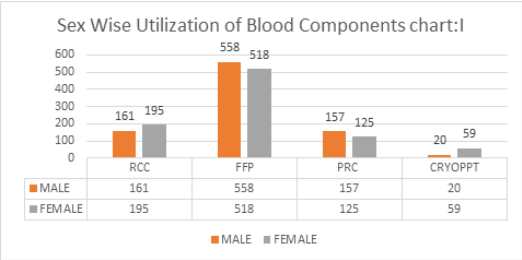

Chart: I: Sex wise utilization of blood components.

Table:II and chart:I ; show number of blood units used for male and female patients. FFP was used in the highest amount in the both sexes. The requirement for blood in DIC was comparable in both the sexes ($p > 0.5$)meaning that the number of blood components used in male and female were almost same.The "t" test showed significantly low Hb in females as compared to males ($p < 0.005$).

Table: III- Age wise utilization of blood components

Age in Year	Mean ± SD (Hb) g/L	RCC	FFP	PRC	CRYPPT	Total components	Total cases	Blood unit/case
≤1	11.8 ± 2.35	06	24	07	01	38	06 (3%)	6
2 to 18	10.65 ± 1.71	06	21	16	00	43	06 (3%)	7
19 to 40	8.87 ± 1.90	158	460	124	52	794	78 (39%)	10
41 to 60	9.32 ± 1.37	88	275	64	12	439	54 (27%)	8
>60	9.13 ± 1.87	98	296	71	14	479	56 (28%)	9
		356	1076	282	79	**1793**	**200(100%)**	

Table: III show age wise requirement of blood components per case. The highest percentage of cases (39 %) was observed in the 19 to 40 year category followed by >60 years (28%). Infants required minimum units/case (6 units/case) while maximum units/case, were needed for 19-40 years age group (10 units/case). Mean Hb values were comparable in all age groups except ≤1 year (infant) category in which significantly higher mean Hb was observed by t test. Comparison of Hb levels by t test between infants up to 1 year age and remaining age groups shows significant difference ($p < 0.005$).

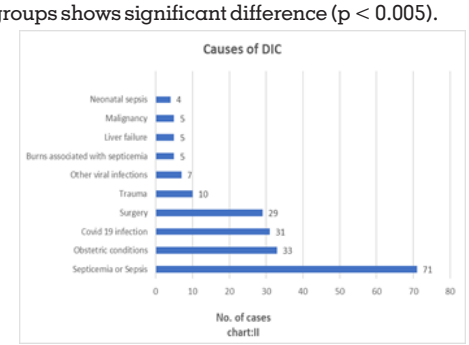

Chart: II- Show frequency distribution of causes of DIC

Above chart is showing most common condition which was associated to was DIC Septicaemia71(35.5%) followed by obstetric causes 33(16.5%) followed by covid 19 infection 31(15.5%) followed by other causes.

CONCLUSION:

From this study we can conclude that,

- The highest requirement of blood component was observed within the 19-40 years age group. The number of blood components used in male and female are almost same.
- DIC is always secondary to an underlying condition such as severe infections, trauma, malignancies and obstetric calamities. Septicaemia is the most common cause for DIC followed by obstetric complications.
- Majority of patients received FFP as compared to other blood products. Fresh Frozen plasma plays an important role in therapeutic management of DIC when overt bleeding is present or anticipated.
- Female showed significantly low Hb as compared to males with obstetrical complications.
- From the study it is concluded that, 1793 blood components were transfused in 200 DIC patients, thus therapeutic transfusion of component is one of the most important parts of DIC management.
- In DIC ongoing consumption of platelets and coagulation factors, resulting in thrombocytopenia and low concentration of clotting factors which may cause profuse haemorrhagic complications in such conditions. Transfusion of various blood components plays very important role.

Abbreviations

AHF : Anti haemophilic factor
APTT : Activated partial thromboplastin time
CRYPPT : Cryoprecipitate
DIC : Disseminated intravascular coagulation
FDP : fibrin degradation products
FFP : Fresh frozen plasma
HELLP : Hemolysis, elevated liver enzyme, low platelet count
MODS : Multiorgan dysfunction syndrome
PRC : Platelet rich concentrate
PT : Prothrombin time
RCC : Red cell concentrate
TAFI : Thrombin-activatable fibrinolysis inhibitor
TF : Tissue factor
tPA : Tissue plasminogen activator
TT : Thrombin time
vWf : Von Willebrand factor
PPH : Postpartum haemorrhage

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