

## Usage of Blood and Blood Components in COVID-19 Patients in A Tertiary Health Care Centre: A Retrospective Study

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### Abstract

**Introduction:** The novel coronavirus disease 2019 (COVID-19) pandemic caused the severe acute respiratory syndrome (SARS-COV-2). COVID-19 is a contagious disease which disturbed all aspects of the human life worldwide. Old age, immuno-compromised patients and patients with co morbidity were severely affected by the COVID-19 infections.

Healthcare systems were affected significantly all over the world. Outbreak of COVID-19 had a severe impact on the blood donation, supply as well as on blood safety.

Transfusion was needed in few critically ill COVID-19 patients. Blood components transfused to COVID-19 patients were packed red cells predominantly, followed by fresh frozen plasma (FFP) and platelets. Blood centers had to maintain the blood inventory based on the demand of blood.

**Aims and Objectives:** To find the usage of blood and its components in COVID-19 patients. To find the indications of blood transfusion in COVID-19 patients.

**Material and Methods:** This retrospective observational study was carried out from May 2020 to May 2021 in Dr Vasanttrao Pawar Medical College, Hospital & RC, Adgaon, Nashik. Study was done to know usage of blood and blood components transfused to COVID-19 cases who were admitted in our hospital.

**Keywords:** COVID-19, Blood Components, Pandemic, Blood Transfusion, Donor, Inventory.

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### Introduction

An outbreak of pneumonia of unknown etiology was identified in city of Wuhan on 31 Dec 2019 [1,2]. On 11 March 2020, the outbreak of COVID-19 was declared as pandemic by World health organization (WHO) [3,4]. COVID-19 patients

presented with wide ranges of symptoms such as fever, dry cough, shortness of breath, muscle ache, fatigue, aguesia and anosmia [5]. 30,369,778 confirmed cases of COVID-19 were reported to WHO till September 19, 2020 [6]. Health care system

all over the world was drastically affected by the COVID-19 pandemic. Human life was disturbed as lockdown was imposed in many countries. Anxiety and fear developed in people about their health and life. Nationwide shutdown was announced on 25 March 2020 [3]. Academic institutions like school, colleges and universities were shut. Sports events, religious gatherings and cultural events were postponed and later cancelled<sup>3</sup>. No outdoor blood donation camps could be organized due to closure of IT sectors, educational institutes and industries which are mainstay involved in organizing these camps. As people were affected with COVID-19 and their contacts got quarantined, the blood donor pool was decreased [3]. These factors resulted in increase in replacement donation. Blood transfusion medicine faced challenges regarding the shortage as well as safety of blood products [4]. Due to cancellation of elective surgeries and non-urgent procedures, low non COVID admissions, overall demand of blood was less<sup>7</sup>. However blood requirement was needed for patients with hemoglobinopathies and hematological malignancies [8]. Even few critically ill COVID-19 patients admitted in ICU needed blood component though demand was less [9,10,11]. Effect of COVID-19 pandemic on blood donation and transfusion requirements in patients was a matter of concern [11]. Transmission through blood products is theoretical as SARS-CO2- transmission through blood is not reported [12,13,14].

As COVID- 19 patients also required blood transfusion therapy, blood inventory supply must be maintained by blood transfusion services [15].

COVID- 19 patients with bad outcome were associated with coagulation disturbances commonly presenting with thrombotic episodes. Bleeding, anemia and hemolysis was rare in these patients [16]. Laboratory investigations revealed normal or mildly decreased hemoglobin and

platelet values in COVID-19 patients. COVID-19 patients also had increased D-DIMER, fibrinogen. In contrast to disseminated intravascular coagulation (DIC), decreased platelet count is unusual [1,16]. The main blood component transfused was packed red cell, followed by FFP and platelets [1,10]. COVID-19 showed regional variation. A genome wide study on severe COVID-19 with respiratory failure detected cross replicating associations with rs11385942 at locus 3p21.31 with rs657152 at locus 9q34.2. The association signal at locus 9q34.2 coincided with the ABO blood group locus. They found a higher risk in individuals with blood group A than in those with other blood groups [6,17]. Other viruses i.e HBV, SARS -COV, MERS -COV are susceptible to ABO blood groups. The mechanisms underlying the association of blood groups are not understood properly. Histi- blood group antigens are expressed on endothelial cells and platelets [6, 18].

### Method

This retrospective observational study was carried out from May 2020 to May 2021 in Dr. Vasantrao Pawar Medical College, Hospital and Research Centre, Nashik. Study was done to know usage of blood and blood components transfused to COVID-19 patients who were admitted in our hospital. Out of 4857 COVID-19 hospitalized patients, 142 transfused patients were included in the study. Details of patients included clinical findings, laboratory investigations and blood transfusion details which were obtained from hospital, laboratory and blood centre records.

Blood centre is an integral part of hospital with facilities available to provide blood and/or blood components to needy patients. After screening, healthy donors were selected for blood donation. Whole blood collected from healthy volunteer donors was separated into blood components i.e. packed red cells (PRC), fresh frozen plasma(FFP) and random donor platelets (RDP). Blood units were screened for

transfusion transmitted diseases. For all patients requiring blood and/or blood components transfusion, complete blood requisition forms with appropriate blood samples for pre-transfusion testing were received in the blood centre. After mandatory cross matching, compatible blood component units were issued to patients for transfusion. Testing and blood issue was done according to national guidelines.

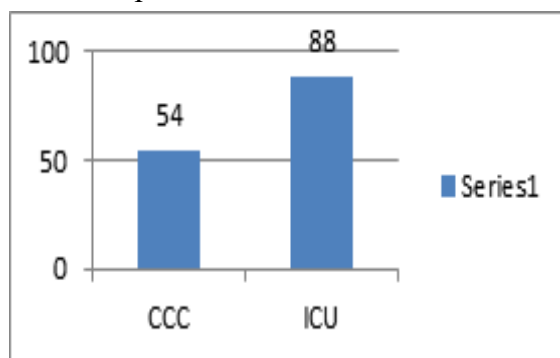
For identifying the studies reporting data on blood utilized in COVID-19 patients,

references were searched in Medline, Scopus and web of science. Analysis was performed, with calculation of mean values and outputs of searches were reviewed.

**Results:**

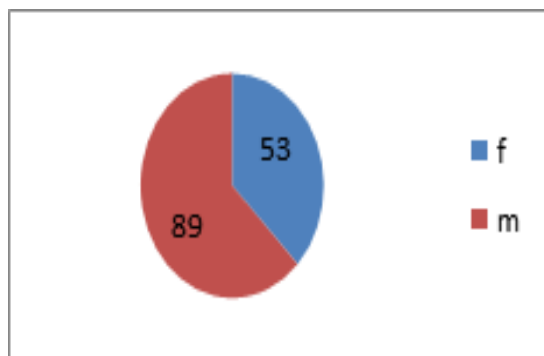
In our hospital total 4857 patients were admitted with COVID-19 infection.

During the study period, 142 out of 4857 patients (2.92%) required blood and blood component transfusion.



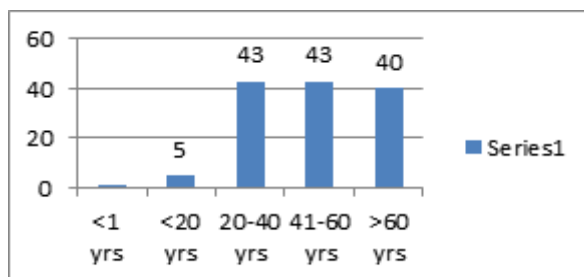
**Figure 1 Ward wise distribution of patients**

Out of 142 patients who required blood and blood component, 88(61.97%) patients were admitted in ICU and 54 (38.02%) in non ICU COVID-19 wards (CCC i. e Corona Care Centre)(Fig 1).



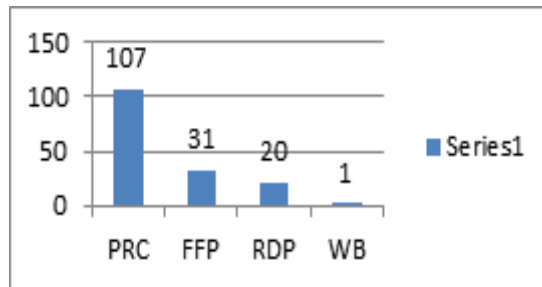
**Figure 2: Gender wise distribution of patients**

Out of 142 patients 89 (62.67%) were male patients and 53 (37.32%) were female patients with a male predominance (M:F=1.7:1).



**Figure 3: Age wise distribution of patients**

Age of the patients ranged from 1 yr to 80 yrs. Most patients requiring blood and blood components were in the age group of 20 yrs to 60 yrs (86 out of 142 patients =60.56 % ). 6 patients were less than 20 yrs age, out of which one patient was 6 months old.



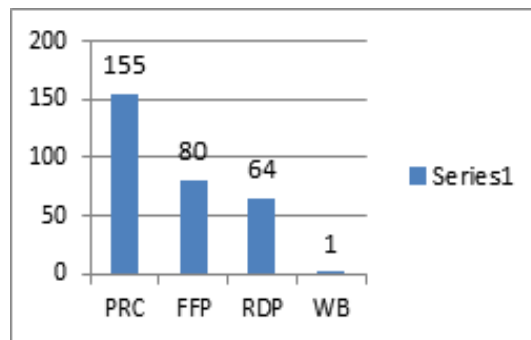
**Figure 4: Number of patients requiring blood and blood components**

Mean hematological values such as hemoglobin (Hb), white blood cells and platelets were 6.6 g/dl, 8.22 X10<sup>3</sup>μL and 2.39 X10<sup>3</sup>μL respectively.

73 patients had Hb <7g/dl, 67 patients had Hb between 7 -10 g/dl, one patient had Hb between 10 -14 g/dl and one patient had Hb value >14 g/dl.

Mean ESR, PT INR and IL-6 observed were 91.547 mm/hr, 21.2 sec and 332pg/ml

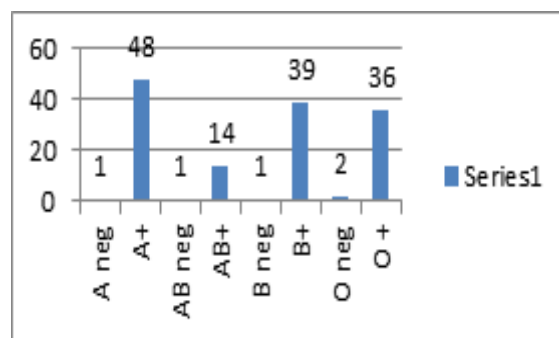
respectively. Mean LDH was 512.72 IU/ml and ferritin 103.6μ/L. In the present study, the most common blood component transfused was packed red cells followed by fresh frozen plasma and random donor platelets. Number of patients who required packed red cells, fresh frozen plasma, random donor platelets and whole blood were 107 (75%), 31(21.83%), 20 (14.08%) and 1(0.70%) respectively.



**Figure 5: Number of components transfused**

Some patients required multiple transfusions.

Total transfusion includes 155 packed red cells (107 patients), 80 fresh frozen plasma (31 patients) and 64 random donor platelets (20 patients ) and one whole blood .



**Figure 6: Requirement of blood components according to blood group**

We observed that maximum patients i.e 137(96.47%) as Rh positive and 5 (3.52%) as Rh negative. “A” positive was the predominant blood group in our study (48, 33.8%), followed by “B” positive (39, 27.46%), “O positive” (36, 25.35%) and “AB” positive (14, 9.85%).

**Table 1: Ward wise distribution of patients of different blood groups**

Bl Gr	ICU	CCC
A+	29 (80.56%)	7 (19.45%)
B+	31 (75.60%)	10 (24.40%)
O+	35 (72.91 %)	13 (27.08%)
AB+	7(58.34%)	7(58.34%)

Out of 48, “O” positive patients, 35 (72.91 %) were admitted in ICU and 13 (27.08%) were in COVID general ward . Of the 41 “B” positive patients, 31 (75.60%) were in ICU and 10 ( 24.40 %) in COVID general ward. Of the 36 “A” positive patients 29 (80.56%) were admitted in ICU and 7 (19.45%) in COVID general ward. Out of 12 “AB” positive patients, 7(58.34%) were in ICU and 5 (41.67%) in COVID general ward. We observed that maximum number of patients admitted in ICU had “A” positive blood group.

However the ABO and /or Rh blood group may not be responsible for this association, as these may indicate an unexplored underlying factor like comorbidity. Therefore, larger, multicentre and prospective studies are needed to ascertain the relationship between blood group and SARS-COV-2<sup>5</sup>.

### Discussion

In our study, we observed that less blood was utilized in hospital admitted COVID-19 patients. In our hospital total 4857 patients of COVID- 19 were admitted, out of which only 142 patients required blood or blood component transfusion (2.92%). Study done by AL Mahmasani and De Simone RA et al also observed that only 0.63% and 3.3% of hospitalized COVID-19 patients were transfused with blood and/or blood components respectively [4,10].

Similar observations were seen in study by Stanworth SJ et al, Barriteau et al. and DAS

SS et al, Kracklik I et al, and FAN BE et al [1,2,11,19,20].

Out of the 142 patients who required blood and blood component, 88 (61.97%) patients were admitted in ICU, and 54 (38.02%) in non ICU COVID ward. This shows that blood component transfusion rate was more in COVID-19 ICU wards as compared to non-ICU COVID-19 wards. Our observations are comparable with study done by Das SS et al (88.2% of ICU admission)<sup>1</sup>. However, study done by FAN BE et al reported 36.8% and Barriteau CM et al reported 13.4% ICU admission [20,11]

We observed male predominance in our study i.e. M:F=1.7:1. Out of 142 transfused patients male patients were 89 (62. 67%) and female patients were 53 ( 37. 32%) . DAS SS et al and Soumya Hadimani et al had similar observations [1,21].

Mean age of patients in our study was 41 yrs. Maximum number of transfused patients were in the age group of 20 to 60 yrs (86 out of 142 patients i.e. 60.56% ). Median age observed was 58 years in study by Das SS et al [1], however it was 80 years by Fan et al [20].

Laboratory investigations were related to demand for transfusion. Mean hematological values such as hemoglobin (Hb), was 6.9 g/dl. Similarly, DeSimone RA et al also observed lower hemoglobin as 6.6 g/dl<sup>10</sup> and Das SS et al observed mean HB value as 8.9 gm/dl in COVID- 19 patients [1] .

Mean value of white blood cells was  $8.22 \times 10^3/\mu\text{L}$  with neutrophilic leukocytosis observed in 29 patients. Leukocytosis, specifically neutrophilia was seen in moderate to critically ill patients (20.4%). Similar findings were seen by Das SS et al and Huang et al [1,22]. Study by Huang et al showed that patients with severe symptoms with ICU requirement and bad prognosis was related to lower lymphocyte count<sup>22</sup>. Study by Bajaj PB et al also observed increased neutrophils to lymphocyte ratio (NLR) in COVID-19 patients [23].

Mean platelet value in our study was  $2.39 \times 10^3/\mu\text{L}$ . DeSimone RA also observed mean platelets value as  $1.11 \times 10^3$ . Out of 142 patients, 20 (14.08%) were transfused random donor platelets (14.08%) had platelet value  $< 60 \times 10^3/\mu\text{L}$  ( $60000/\text{mm}^3$ ). Lippi et al observed that severe thrombocytopenia was observed in patients with severe symptoms [24]. Moderate thrombocytopenia was seen in COVID-19 patients in study done by Kander et al [25].

FFP and platelets are mainly requested for patients having COVID-19 patients associated coagulopathy and thrombocytopenia which was mostly seen in critically ill patients [7].

Patients who succumbed, had raised D-dimer, longer PT, APTT, IL6 and fibrinogen. Few studies i.e Kander et al, Chenn et al, Wu j et al observed that coagulation abnormality was related to mortality in COVID-19 infection [25,26,27]. Study done by Soumya Hadimani et al reported that mildly increased PT seen in 31% patients (i.e 15-30sec) and that of moderately increase in 5% patients ( $>30\text{sec}$ ) were observed<sup>21</sup>. As per study done by Kander et al, significantly raised levels of D dimer in COVID 19 patients [25]. Study done by FAN BE et al observed increased D-dimer in COVID-19 patients but the author also stated that D- dimer is non specific and is commonly increased in hospital admitted patients having inflammation and liver

disease [20]. According to DeSimone RA also reported that levels of fibrinogen were not related to demand for transfusion [10].

In our hospital patients, mean IL-6 in transfusion required patients was  $332\text{pg/ml}$ . This is similar to study by Das SS who observed mean IL-6 as  $120.8\text{pg/ml}$ <sup>1</sup>.

In the present study, the most common blood component transfused was packed red cells followed by fresh frozen plasma and random donor platelets. Total 155 PRC units were transfused to 107 patients, 80 units of FFP were transfused to 31 patients having significant leukopenia and raised PT INR. 64 RDP units were transfused to 20 patients who had thrombocytopenia. More number of PRC transfusion was required in ICU patients compared to non ICU COVID 19 patients in analysis done by FAN BE et al, Doyle AJ et al and DeSimone RA et al [10,20,28].

According to a study done by Sanz C et al use of anticoagulants as a treatment protocol in COVID- 19 patients, results in bleeding episodes thus increasing the demands of packed red cell transfusion [29]

We observed maximum transfusion of blood components i.e  $137(96.47\%)$  in Rh positive patients and 5 (3.52%) as Rh negative patients. A +ve was the predominant blood gr in our study (48, 33.8%), followed by B+ (39, 27.46%), O+(36, 25.35%) and AB+ (14, 9.85%). These findings were similar to study by Rana R et al., Cai X et al. and Mahmud R et al and Latz C who stated that blood group A persons are most commonly affected by COVID-19 infection while persons with blood group O are less vulnerable to this infection [5,6,30,31].

### Conclusion:

Worldwide health care system and resources felt serious challenges during COVID- 19 pandemic.

There was no significant increased demand for blood and its components.

Mostly elderly patients, critically ill patients, patients with co morbidities needed blood components therapy for anemia, thrombocytopenia and coagulopathy

Decreased Hb level was the most common indication for transfusion. Leukopenia and thrombocytopenia was the indication for Fresh frozen plasma and platelets respectively.

Packed red cells was the most common blood component transfused to COVID- 19 patients followed by platelets and fresh frozen plasma.

It is difficult to assess the trend of usage of blood components in COVID- 19 patients as patients may need multiple transfusion with different blood components depending on the indication and severity of disease.

Though blood requirement for COVID -19 patient was minimal, still few patients needed blood component transfusion. Blood centers must maintain the blood inventory as per the demands.

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