

Efficiency of Transfusion Service Utilization in Hospitalized Patients during COVID -19: Experience of a Newly Operational Blood Centre.

Archana Shetty¹, Nagendra Prasad², Nirupama Murali¹, Rajagopalan Satyamoorthy³

ABSTRACT

Background: COVID-19 has affected blood demand supply chain leaving tight spots in functioning. Manoeuvring unpredictable scenarios lies in judicious utilization and of blood stock. Analysis of transfusion indicators can aid better inventory management. **Aims:** To study patterns of components utilized during phases of COVID 19 as per our regional timelines and estimate Cross Match to Transfusion Ratio (C: T Ratio), Transfusion probability (T%) and Transfusion index (TI). **Methods:** Study was conducted over a period of 18 months. Data was collected from patient transfusion requisition forms, crossmatch and issue records. Timelines: PHASE I First wave of Covid 19 (May -Nov 2021) PHASE II Waning of first wave (Dec 2020 - March 2021) PHASE III Second wave (April to June 2021) PHASE IV Waning of second wave. (July to November 2021). **Results:** Whole blood collections were 797 units. Phase I, II, III and IV contributed to 17.7%, 11.0%, 23.8 % and 46.9% of total collections. Of the 1003 units issued, 135 (13%), 171 (17.1 %), 263 (23.7 %) and 464 (46.3 %) were issued over Phase I, Phase II, III and IV. Covid cases accounted for 4.2% of issues. Overall, we had a CT Ratio of (1.57), Transfusion probability (79.0%) and Transfusion index (1.18). **Conclusion:** Waning phases (Phase II and Phase IV) had higher utilization compared to collections. Transfusion indicators were optimal due to assessment and reassessment of areas for improvement by stringent monitoring of our blood ordering and utilization practices in spite of being a newly operational blood centre.

Keywords: Blood donation, COVID-19, Transfusion

¹Dept of Pathology, ²Department of OBG, ³Dept of General Surgery, Dr. Chandramma Dayananda Sagar Institute of Medical education & Research

Corresponding Author: Dr. Archana Shetty, Professor, Department of Pathology, Dr. Chandramma Dayananda Sagar Institute of Medical education & Research, Medical Education & Research, Dayananda Sagar University, Devarakagalahalli Vikkage, Kanakapura, Ramanagara District, Karnataka - 562112, India
Email: archanashetty2924@gmail.com

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Introduction

The unforeseen outbreak of COVID-19 has affected healthcare systems globally, including transfusion services. High infectivity, apprehension among donors, denial from regulatory authorities to conduct camps left blood centres with tight spots in functioning [1]. The World Health Organization at the global level and National Blood Transfusion Council (NBTC) in our country has been revising their policy on donor recruitment, selection and inventory management with evolution of the pandemic. In India, Ministry of Health and Family Welfare (MoHFW), had directed uninterrupted care of patients with cancer and those needing recurrent blood products like nutritional anaemias, thalassemia, haemophilia and sickle cell disease. To add on to this blood centres also were committed to cater to non - Covid emergencies [2].

Possibility of manoeuvring unpredictable scenarios lies in judicious utilization and management of blood. Quality indicators are designed to monitor one or more processes during a defined time, for

evaluating service demands and adequacy of personnel inventory. AABB (American Association of Blood Banking) defines quality indicators as the specific performance measurements designed to monitor one or more processes during a defined time, which are also useful for evaluating service demands and adequacy of personnel inventory [3]. Analysis of transfusion indicators can aid better inventory management. Ours being a blood centre which started operating during the pandemic, optimization of blood ordering and utilization was all the more necessary.

Materials & Methods

This retrospective, descriptive cross-sectional study was conducted from June 2020 to December 2021 in the Blood Centre attached to a teaching medical hospital in a rural area of South India. Objectives of the study were to study patterns of blood utilization and estimate Cross Match to Transfusion Ratio (C: T Ratio), Transfusion probability (T%) and Transfusion index (TI) during phases of COVID 19 as per regional timelines. C:T ratio above 1.2 Transfusion

Probability of >50% and Transfusion Index of more than 1 were considered as indicators of efficient blood transfusion.

Inclusion Criteria

All units of blood ordered for and requested for hospitalized patients in our institute. Exclusion criteria: Blood issued or procured for utilization from outside. The duration of study was divided into 4 Phases.

- PHASE I:** First wave of Covid 19 (May to Nov 2021)
PHASE II: Waning of first wave (Dec 2020 to March 2021)
PHASE III: Second wave (April 2021 – June 2021)
PHASE IV: Waning of second wave (July 2021 to November 2021).

Clearance was obtained from the institutional ethical committee. Ref number : CDSIMER/MR/0023/IEC/2021 dated 15.11.2021. Data was analysed using SPSS version 26.0 (IBM SPSS Statistics for Windows, IBM Corp., Armonk, NY, USA).

Results

Total whole blood collections were 797 units, with Phase I, II, III and IV contributing to 17.7%, 11.0%, 23.8 % and 46.9% of total collections. Of the total 1003 units issued, 135 (13%), 171 (17.1 %), 263 (23.7 %) and 464 (46.3 %) units were issued over Phase I, Phase II, III and IV respectively. Majority of units issued were utilized by females and patients below 45 years of age. Blood units issued for COVID Positive patients accounted for only 4.2% (43) of units.

The indices - CT Ratio, TP and TI were within acceptable limits during all the phases. Transfusion Probability during phase II was the lowest (**Table 1**). Overall, we had a CT Ratio of (1.57), Transfusion probability (79.0%) and Transfusion index (1.18). The demand supply chain was maintained at optimum as reflected by our transfusion utilization indicators.

Discussion

The global healthcare system witnessed unpreparedness in many aspects of patient care with sudden occurrence of COVID-19, including transfusion services. Optimizing the supply demand chain was a challenge for blood centres, more so as ours was a newly operational blood centre. [4] Stringent regulations by governing authorities directed blood centres to stop running donation drives and camps [5]. As mass lockdown and quarantine had restricted movement of blood donors we relied on in-house and repeat donor's registry.

Blood units collected during initial phase of the pandemic saw a

sudden dip during the second phase, as strict lockdown was imposed. However, demand did not proportionately lower as there was constant need of blood for non-covid indications in our hospitalized patients like nutritional anaemias, obstetric emergencies, road traffic accidents and patients on chemotherapy. As this hospital was the only tertiary care centre in the district Non Covid cases got directed to us many of which needed blood transfusions.

Role of convalescent plasma in Covid-19 though initially recommended, remains controversial with usage in these patients [6]. Bleeding complications that could increase transfusion requirements have not been frequently reported in patients with COVID-19. In our study hospitalized Covid patients who received transfusion were either anaemic or had superadded Dengue and snake bites.

After observing unpredictable utilization patterns during the various phases of Covid, we realized the need for continuous monitoring and auditing of our blood component utilization and transfusion practices to identify areas of concern. Quality indicators in transfusion medicine have been identified by WHO and AABB like Cross match: Transfusion or C/T ratio, Transfusion probability (TP %) and Transfusion Index (TI) to keep a check on over-ordering and piling of blood. C:T ratio is used as a measure of effectiveness of blood ordering practice [7]. A C:T ratio of >2.0 means that less than 50% of the cross matched units are being transfused [8]. As a result of each unnecessary request, the blood component cross-matched loses a certain time from its shelf life in storage. The same unit if not reserved can be transfused to some other patient in need. Globally C:T ratio of 3.9 (Egypt) (5.0) Malaysia, and 2.96 (Saudi) have been reported, which may be the result of their transfusion policies [9]. One of the major factors that determines a C:T ratio is ordering practices. A good C: T ratio in our study was a combined result of our timely interactions with clinicians on blood ordering protocols by frequent interactions. Strict monitoring was also done by our hospital transfusion committee which had started functioning simultaneously.

Transfusion probability (TP) signifies appropriateness of number of units cross-matched and transfusion index measures appropriateness of number of units transfused. A Transfusion Probability of $\geq 30\%$ and TI of more than 0.5 is considered indicative of efficient blood utilization. [1,3] Our TP was consistently more than 50% and TI more than expected optimal indicating efficient utilization of blood. Transfusion probability as low as 4.9 % to 8.8% and 11.15% to 47% have been reported [10].

As the COVID 19 scare is still evolving stringent blood collection and utilization must be adhered to a few of which are mentioned below from our experience. (**Table 2**)

Table 1: Calculation of Transfusion Indices Phase wise:
Cross match to transfusion ratio (CT Ratio), Transfusion Probability (TP%) and Transfusion Index (TI)

Timelines	No. of units cross matched	No. of units transfused	No. of patients transfused	No. of patients cross matched	Cross match transfusion Ratio (CT Ratio)*	Transfusion Probability TP %**	Transfusion Index – TI***
Phase I	158	101	61	75	1.56	81.33	1.65
Phase II	351	250	101	177	1.4	57.06	1.98
Phase III	162	101	48	70	1.6	68.57	2.1
Phase IV	490	384	199	282	1.27	70.56	1.92

*Crossmatch to Transfusion ratio (C: T): No. of crossmatched red blood cell (RBC) units/No. of transfused RBC units.

**Transfusion Index (TI): No. of transfused RBC units/No. of crossmatched RBC units.

***Transfusion probability (%T): No. of patients transfused/ No. of patients crossmatched $\times 100$.

Table 2: Key points for optimal functioning of blood centres during unpredictable scenarios

CHALLENGES FACED	PROBABLE STRATEGY
Unpredictable Demand Supply Pattern	<ul style="list-style-type: none"> • In house /local voluntary donor base registry. • Formulate an inter-regional blood transfer/receiving policy. • Adopt type and reserve strategy than type and cross match.
Non - Optimal Transfusion Indicator Values Over Time	<ul style="list-style-type: none"> • Frequent blood ordering audits by the hospital blood transfusion committee. • Transfusion triggers to be decided in consensus with clinicians by balancing risk benefit ratio. • Devising a Maximum Blood Ordering Schedule for surgical departments.
Inventory Management	<ul style="list-style-type: none"> • Avoid over hoarding of blood. • Plan collections depending on utility patterns • Outreach excess units after audit during fixed intervals.

Limitations

The present study followed the regional timeline of the pandemic and is representative of this geographical area only. Also, transfusion practices were not standardized during the COVID -19 as the protocols and patient management systems were still evolving.

Future prospects: Large scale studies at blood centres with a higher workload can help derive meaningful insights into the blood utilization and ordering practices, if similar studies are done when facing unpredictable situations like Covid-19.

Conclusion

Demand and supply patterns of blood components varied with different phases of the pandemic, with waning phases having higher utilisation compared to collections. As COVID -19 has not yet remitted, we cannot conclude on its overall effect on transfusion services. Our transfusion indicators were optimal due to assessment and reassessment of areas for improvement by stringent monitoring of blood ordering and utilization practices in spite of being a newly operational blood centre.

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