Access this article online
Quick Response Code:
Website:
www.ajts.org
DOI:
10.4103/ajts.ajts_29_21

Impact of COVID-19 pandemic on the pattern of blood donation and blood safety: Experience from a hospital-based blood center in North India

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Abstract:

INTRODUCTION: Although coronavirus disease-2019 (COVID-19) pandemic does not result in increased blood needs, blood supply can be considerably compromised due to the unavailability of blood donors. The objective was to share our experience about blood donation patterns and concerns on blood safety during COVID-19 pandemic in India.

METHODS: This was a retrospective study of approximately 4.5 months of data including both lockdown period (LD) and LD phases. LD phase was further subdivided into four phases of varying durations. Data of blood collected and various reasons for deferral of prospective donors were analyzed. The effectiveness of mitigation strategies adopted to maintain adequate blood inventory was also assessed. Events in transfusion services during the LD were compared with the pre-LD (P-LD) phase.

RESULTS: The mean collection per day for WB and SDP was reduced by 70% and 50%, respectively, compared to pre-LD. Approximately 23% of WB and 27% of SDPs were collected on an appointment basis during LD. The proportion of indoor voluntary blood donation was increased by 7–8 times during LD compared to P-LD. Approximately 2% of total prospective donors screened were deferred after thermal scanning and due to risk of being infected with COVID-19. Donor deferrals due to high-risk behavior increased significantly in the LD phase compared to P-LD period.

CONCLUSION: COVID-19 pandemic has a significant impact on the pattern of blood donation and blood safety. Transfusion services must develop appropriate plans to respond efficiently to various challenges posed by such pandemics.

Keywords:

Blood donor deferral, blood donor management, blood safety, blood supply, coronavirus disease-2019

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Submitted: 08-03-2021
Revised:31-03-2021
Accepted: 04-04-2021
Published: 01-11-2021

Introduction

Novel coronavirus disease-2019 (COVID-19) is caused by the most recently discovered coronavirus named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).[1] A causative agent (SARS-CoV-2) is primarily a respiratory virus that spreads more efficiently through respiratory droplets.[2] Although transmission through blood transfusion is not yet proved, it has the potential to affect blood supply and compromise the blood safety.[3,4] Incubation period for COVID-19 ranges from 1 to 14 days. The first case of COVID-19 in India was reported on 30 January 2020 from a student who had

How to cite this article: Bharat S, Rahul K, Indraneel D, Anubha S, Atul P, Preeti E, *et al*. Impact of COVID-19 pandemic on the pattern of blood donation and blood safety: Experience from a hospital-based blood center in North India. Asian J Transfus Sci 2021;15:119-24.

returned home for a vacation from Wuhan University in China.[5] Seven weeks later, the Indian Government declared nationwide lockdown (LD) from March 25 as a preventive measure against the COVID-19 pandemic. Even after complete LD, the number of confirmed positive cases increased rather rapidly and changed many routine practices at transfusion centers. The respiratory virus outbreak might have a negative impact on the transfusion services.[6,7] Blood transfusion services faced many challenges during LD including the risk of transmission through transfusion, imbalance between blood supply and demand, and deteriorating donor quality on the front of blood safety. In response to these challenges, various interventions were implemented to neutralize the possible negative impact on blood services. Through this study, we want to share our experience as a hospital-based blood center about the impact of COVID-19 pandemic on the pattern of blood donation and blood safety along with mitigation strategies. Lessons learned from the study may be helpful in managing transfusion services, both for now and future.

Methods

Our center is a 1300-bedded super specialty government hospital in northern India with a hospital based blood center. Annual whole blood (WB) and single donor platelet (SDP) collections are approximately 27,000 and 800, respectively. The blood requests decreased during this period; however, red cell units were still required for patients of thalassemia, cancers, and obstetrics. In view of COVID-19 outbreak, a policy document, suitable to local needs, was also formulated and adopted in accordance with national guidelines. This policy document was aimed at preventing transmission at blood collection site, theoretical risk of transmission through transfusion, and shortages of blood supply.

General measures

- Staggered duties of the staff
- Use of appropriate personal protective equipment (PPE) in all areas
- Regular equipment/floor/working bench cleaning using 1% sodium hypochlorite or other equivalent recommended disinfectants
- Disinfection of waste generated during working of blood transfusion center using 1% sodium hypochlorite.

Safety measures adopted in blood donation area

- Primary screening area including a history of exposure was introduced at the hospital main gate in all prospective donors coming for donation
- Strict donor-only policy was implemented to reduce the crowding inside the blood donor area
- Donors were checked for body temperature by a handheld infrared thermal scanner before entering into the blood donor area
- Reorganization of waiting area and donor couches to maintain social distancing protocol
- Use of physical barriers in the form of transparent plastic sheets between the staff and donor
- Implementation of COVID-related questionnaire for donors as per the guidelines issued by the National Blood Transfusion Council[8]
- Each donor was given hand rub sanitizer and a face mask, if not wearing
- The staff was instructed to use PPE (gloves, face mask, and disposable gown).

Recruitment of blood donors

- Blood donor movement passes were issued (e-pass/WhatsApp) mentioning the date of donation to allow them to travel to the blood transfusion center for donation (donation by appointment)
- Intensification of personal communication with individual voluntary blood donors and camp organizers to motivate them for donation
- Intensification of IEC activities on various platforms of mass media (print/electronic media including social media)
- Transport facility was provided to a small group of voluntary donors, who were not able to organize the camp.

The study was divided into two phases namely:

- LD Phase – From March 25, 2020, to May 31, 2020 (totally 67 days, divided into four phases)
- Pre-LD Phase (P-LD) – From 18th January to 24th March 2020 (67 days).

Various activities which were restricted in different phases of LD including public or private transport, hospitality services, and general public movement are given in Table 1. Along with these restrictions, places of large gatherings such as colleges, religious places, and offices were closed completely where outdoor VBD camps used to be organized.

Our main hospital housing blood transfusion center was declared a non-COVID hospital which adopted a policy of only admitting tested COVID-19-negative patients accompanied by COVID-19-negative attendants or relatives. A separate building away from the main hospital was designated as COVID-19 hospital.

This was a retrospective descriptive study of approximately 4.5 months of data, including an equal time period (67 days) of both P-LD and LD phases. Details of WB and SDP collected, prospective blood donors deferred, and packed red blood cell (PRBC) usage were retrieved from a computerized hospital information system. On the basis of this information, change in patterns of blood donation and prospective donors' deferral and PRBC usage during the LD phase was evaluated compared to P-LD phase. The effect of LD on blood inventory was investigated using issuable stock index (ISI) and wastage against percentage of issue (WAPI) as per Bedi *et al*.[9] Results of implementing some mitigation strategies (to keep stock at adequate levels and ensure blood safety) were also assessed.

The data were analyzed using SPSS software (SPSS Inc. Released 2009. PASW Statistics for Windows, Version 18.0. Chicago, USA: SPSS Inc.). Chi-square test was applied to test the difference between percentages.

Results

Table 2 describes WB and SDP collection data including type of donor details. The mean collection per day for WB and SDP was reduced by 70% and 50%, respectively. No outdoor VBD camp was organized during the LD period, while in-house voluntary blood donation activity increased significantly (7–8 times, $P < 0.001$) for both WB and SDP. Donation by appointment was introduced in LD-1. Approximately 23% of WB and 27% of SDP were collected on an appointment basis during LD, and it was significantly higher ($P < 0.001$) compared to P-LD phase. During November–December 2020, we were collecting approximately 65% of WB as of P-LD phase, while SDP collection was almost similar to P-LD phase.

Table 3 shows the deferral pattern of prospective blood donors during the P-LD and LD periods. Prospective donor deferral increased significantly during LD when compared to the P-LD phase for both WB and SDP donations. Thermal scanning was introduced at the beginning of LD, and approximately 2% of the total prospective donors were deferred by thermal scanning. Deferral of prospective WB donors due to high-risk behavior (HRB) or suspicious behavior was significantly higher in the LD phase compared to the P-LD period, while for SDP donors, statistical significance could not be determined due to less frequency. A total of 1.6% and 3% of prospective WB and SDP donors, respectively, were deferred due to risk of being infected with COVID-19

Table 1: Activities allowed/restricted in different phases of lockdown

Phases of lockdown	Activities allowed	Activities restricted
LD-1 (21 days)	Strictly essential services only	All types of public transport (taxi, auto, cab, buses, train)
LD-2 (19 days)	Some other services were allowed in addition to essential services	Almost similar to LD-1
LD-3 (14 days)	Intradistrict movement of cab, taxi, private vehicle and buses with cap on number of passengers allowed	Air, rail, metro, and interstate road movement Educational institutes, hospitality services, and offices
LD-4 (14 days)	Both inter- and intradistrict movement by auto, taxi, personal vehicle, or bus with a limited number of passengers Domestic flights with safety measures Public movement between 7 am and 7 pm only	International air travel Movement by rail/metro Interstate road movement Coming out between 7 pm and 7 am

LD=Lockdown

Table 2: Whole blood and single donor platelet collection data

Parameter	Pre-LD (67 days)	LD (67 days)	Net impact/remark	Present (November-December, 20)
Mean collection/day				
WB	87 (29-156)	26.1 (7-58)	Deceased by 70%-50% for WB and SDP, respectively	56.7 (35-117)
SDP	3.7 (0-7)	1.9 (0-4)		3.5 (1-11)
Voluntary donation, *n* (%) of total donation				
Outdoor				
WB	235 (5.1)	0	No VBD camps were organized during the LD due to logistical challenges	201 (5.8)
SDP	NA	NA		NA
Indoor				
WB	61 (1.3)	177 (10.1)	In LD, WB and SDP collection by I-VBD was increased by 7-8 times	118 (3.4)
SDP	4 (2.3)	22 (17)	$P<0.0001$ (for both WB and SDP)	8 (3.8)
Donation by appointment, *n* (%) of total donation				
WB	134 (2.3)	411 (23)	In LD, WB and SDP collection by appointment were increased by 10 and 8 times, respectively	111 (3.2)
SDP	8 (3.2)	35 (27)	$P<0.0001$ (for both WB and SDP)	13 (6.1)

VBD=Voluntary blood donation, I-VBD=Indoor VBD, WB=Whole blood, SDP=Single donor platelet, LD=Lockdown, NA=Not applicable

Table 3: Prospective blood donors deferral data

Parameter	Pre-LD (67 days)	LD (67 days)	Net impact/remark	Present (November-December, 20)
Prospective WB donors deferred, *n* (%) of total screened	640 (9.9)	380 (17.9)	Donor deferral increased by 90% approximately for both WB and SDP *P*<0.0001 (for both WB and SDP)	442 (11.3)
Prospective SDP donors deferred, *n* (%) of total screened	35 (12.3)	37 (22.4)		40 (15.8)
Prospective donors deferred by thermal scanning, *n* (%) of total screened				
WB	NA	38 (1.8)	Started with LD-1. About 2% of all screened donors were deferred	47 (1.2)
SDP	NA	4 (2.4)		3 (1.18)
Prospective donors deferred due to HRB* or suspicious behaviour†, *n* (%) of total screened				
WB	49 (0.75)	68 (3.2)	Donor deferral increased by four times *P*<0.0001	35 (0.9)
SDP	3 (1.05)	5 (3.0)	Donor deferral increased by three times	2 (0.79)
Prospective donors differed due to suspicion of COVID-19‡, *n* (%) of total screened				
WB	NA	34 (1.6)	Started with LD-1. About 1.5%-3% of all screened donors were deferred	26 (0.66)
SDP	NA	5 (3.0)		04 (1.6)

*HRB: Behaviors and practices that put prospective blood donors at high risk for TTI, †Suspicious behavior: Prospective donors providing unreliable or contradictory information about their health, ‡Donors with contact/travel history and those coming from containment zone. WB=Whole blood, SDP=Single donor platelet, LD=Lockdown, COVID-19=Corona virus disease-2019, TTI=Transfusion transmitted infections, HRB=High-risk behavior

based on the history of contact and travel to an endemic zone. During November–December 2020, donor deferral rates declined and were only slightly higher compared to P-LD phase.

Mean collection and mean issue of PRBC followed a similar trend (decreased) through different phases of LD. Both mean collection and issue were dropped sharply with the implementation of LD and remained low in all phases of LD. ISI followed an increasing trend through LD-1 to LD-2 compared to P-LD, while the reverse happened in LD-3 and 4. Wastage of PRBC (represented as WAPI) was increased by 4–5 times in LD-1 and 2 compared to P-LD, but it came down again in LD-3 and 4. In the last few months (November–December 2020), ISI and WAPI were close to P-LD level [Figure 1].

As explained earlier, various measures were taken to ensure staff safety. From April to December of 2020, only 40%–50% of the total staff members were called for duty. The staffers with any comorbid illness were all on leave at the same time. It was made mandatory to carry a COVID-19-negative report for all prospective plateletpheresis donors. During the given period, only one staff member was found to be positive for COVID infection.

Discussion

COVID-19 pandemic has led to many concerns and doubts about its impact on transfusion services and especially how to ensure a stable blood supply amid coronavirus concerns. The Government has taken different measures to control the spread of this infection such as complete LD of all activities except essential

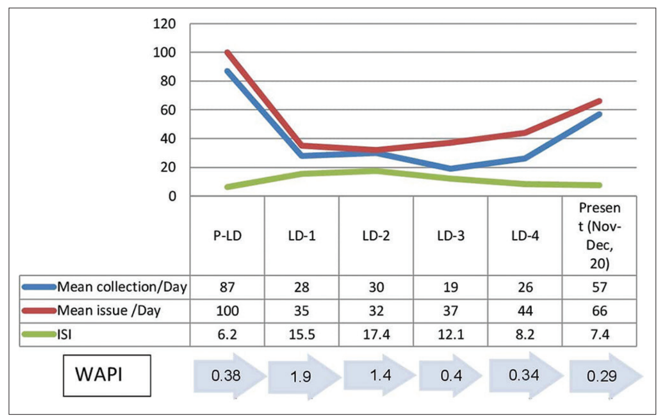

Figure 1: Red Cell Units: Collection, issue, issuable stock index, and wastage against percentage of issue

services [Table 1]. LD had a negative impact on various blood transfusion center activities including decreased footfall of blood donors leading to blood shortages. Hence, we reviewed blood collection, issue, and adequacy of bloodstock through different phases of LD.

We have analyzed data from the LD phase compared to P-LD phase. Immediately after the implementation of LD, the mean collection of WB and SDP fell drastically. The decrease was primarily caused by the unavailability of blood donors as a result of restriction on public movement, avoidance of public places to maintain social distancing, and the closing of places for voluntary blood donation camps such as educational institutes, offices, and religious places. This was also compounded by a decrease in the number of indoor patients due to cancellation of most of the elective and nonurgent clinical interventions, resulting in decreased demand for blood and components. Being a hospital-based blood center which is primarily dependant on replacement/family donors (80%–90%), blood supply decreased considerably. It was observed during the SARS epidemic 2002 that the most significant effect on the blood supply during a pandemic is likely to be an acute shortage of blood donors.[10]

Although there was no advisory released by the Government of India to put a hold on the conduct of the voluntary blood donation camps, it was not possible to organize outdoor camps due to various logistical challenges posed by complete LD. To support long-term transfusion-dependent patients such as thalassemics and emergency cases during LD, we started focusing on strategies to promote in-house VBD. It included issuance of movement pass to donors, increased personal communications with individual voluntary donors and camp organizers, and transport facility. Our efforts resulted in a significant increase in I-VBD for both WB and SDP by 7–8 times compared to the P-LD period [Table 2].

Donation by appointment was introduced in LD to avoid crowding inside the donor area and to facilitate unimpeded donor movement. A total of 23% and 27% of WB and SDP, respectively, were collected on an appointment basis during LD, thus helped in improving daily collection [Table 2]. Booked appointments corresponded to 42.2% of all donations made in the LD period as reported in a recent study from Brazil.[11] Another study from India reported appointment-based donation as a useful donor recruitment strategy during the crisis period.[12]

We observed an increase in the donor deferral during LD [Table 3] for both WB and SDP. This increase could be explained by the introduction of certain preventive measures such as thermal scanning and COVID-specific questionnaire to detect at-risk population. Moreover, this increased deferral may partly be ascribed to more vigilant donor screening.

During the LD period, we noticed an increase in prospective donors who were willing to donate voluntarily. Although these donors had altruistic motives, they were ill informed about the importance of disclosing health-related information before donation. Therefore, they sometimes even hid or provided unreliable or contradictory information about their health. We categorized these donors as donors with suspicious behavior. Through our vigilant donor screening, we were able to identify and defer them. As a result, prospective WB donors' deferral due to HRB or suspicious behavior increased during the LD compared to the P-LD period [Table 3]. This observation suggests that donor safety profile might change significantly during LD-like situations, so transfusion services should be more vigilant to screen out these donors. Even after our best attempts to prevent them from donating blood, the possibility of few donors with HRB/suspicious behavior escaped predonation screening cannot be denied. Influx of first-time donors with a high rate of transfusion-transmitted infections (TTI) was reported in the USA after 9/11 attack. Donations confirmed positive for TTI nearly tripled after the 9/11 attack, largely explained by the increase in first-time donors.[13]

Mean red blood cells' collection and issue per day were comparable through different phases of LD resulting in the overall balance between collection and issue [Figure 1]. ISI in P-LD phase was 6.2. Considering the mean issue of 100 red cells per day during P-LD, we had an inventory of approximately 600 units just before the beginning of LD-1. Due to an acute fall in red cell demand and inflated holding inventory, ISI jumped considerably. Due to increased ISI, time expiry of blood was also increased despite strict vigilance and adherence to the first-in, first-out policy. On realization that demands are less and wastage increasing (represented as WAPI), we stopped insisting on replacement donation. At the same time due to relaxation in LD rules and hospital started admitting patients again after COVID testing, demand also gets increased. As a result, issue per day was more than units collected per day during LD 3 and 4. By doing this, we balanced our demand and supply. This balance was reflected in decreased wastage in LD 3 and 4. By this trend of collection, issue, and ISI, we learned that there is no need to panic in view of possible blood shortages in LD like situation as, demand of blood also fell in equal proportion with decreasing collection. In our case, we had sufficient inventory in every phase of LD. Hence, efficient bloodstock management with effective stock rotation can optimize utilization and minimize the discard rate during an extraordinary situation. Similar findings have been reported by other authors showing maintenance of overall balance between supply and demand during this COVID pandemic.[12] In a study from South Korea, it was recommended that to keep blood wastage at a lower rate, inventory should be in proportion to the demand.[14]

The lower rate of staff COVID-19 positivity (only one staffer tested positive from April to December of 2020) reflects the effectiveness of the preventive measures taken. To alleviate apprehension among staff members, they should be reassured about their safety from COVID-19 if they are following preventive measures properly.

Conclusion

The impact of emerging viruses can have multifaceted and unpredicted consequences on blood supplies and blood safety. Our experience highlights the importance of disaster management planning at the blood center to ensure adequate and safe blood supply during pandemics. To maintain adequate blood inventory, better coordination with all stakeholders including individual voluntary donors, blood donor organizations, government agencies and clinical colleagues seems crucial. This study also points up that blood supplies might face additional risk in the front of blood safety, and so transfusion services should be extra watchful to keep blood supplies safe from both pandemic-related pathogen and other TTI. Our observations in this study may be useful to other hospital-based blood centers in responding to such situations.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

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