Transfusion and Apheresis Science xxx (xxxx) xxx

Contents lists available at ScienceDirect

Transfusion and Apheresis Science

journal homepage: www.elsevier.com/locate/transci

Exploring the unseen effect of COVID 19 pandemic on blood transfusion services in a tertiary care centre

Paramjit Kaur *, Ravneet Kaur Bedi, Kshitija Mittal, Tanvi Sood

Department of Transfusion Medicine, Government Medical College and Hospital, Chandigarh, India

ARTICLE INFO

Keywords:
COVID-19
Blood transfusion
Voluntary donors
Replacement donors
Transfusion transmitted infections

ABSTRACT

Background: The coronavirus pandemic confronted blood transfusion services with major challenges. The present study was conducted to explore the effect of the COVID-19 pandemic on blood transfusion services including seroprevalence of transfusion-transmitted infections.

Material and Methods: A retrospective cross-sectional study was conducted and data on blood donation, utilization, camps, plateletpheresis and seroprevalence of transfusion-transmitted infections (TTI) was retrieved from software from March to September 2020 and 2021 and compared with corresponding time periods of three preceding non-pandemic years.

Results: There was a decline of 53.79% and 34.4% in blood donations in 2020 and 2021 respectively with a significant reduction in voluntary donations from 91.8% in the pre-pandemic period to 72.2% in 2020 and 77.7% in 2021. Replacement donors increased by 60.81% and 72.89% in 2020 and 2021 respectively. There was a decline of 48.4% in the number of plateletpheresis procedures in 2020 which increased in 2021 during the dengue outbreak. The decline in total blood donations and issue of packed red blood cells was statistically significant but supply and demand were balanced with no deficit. TTI seroprevalence increased from 1.01% to 1.49%($p<0.001$) and 1.51%($p<0.001$) in 2020 and 2021 respectively. Replacement donors showed a significantly higher TTI prevalence as compared to voluntary donors($p<0.001$). A significant increase in prevalence was observed for Syphilis (0.4%) in 2020 and HBsAg (0.54%), HCV(0.63%) and syphilis (0.25%) in 2021.

Conclusion: The potential consequences of the COVID-19 pandemic on blood safety cannot be undermined. Developing a strong database of regular voluntary donors can be instrumental in dealing with future waves and surges in infections.

1. Introduction

The coronavirus pandemic had major implications on healthcare services and blood transfusion services were also not spared. With evidence that severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is transmissible by asymptomatic individuals and the majority of the individuals being asymptomatic, a threat to blood supply was looming large. While elective procedures were put on hold to deal with the unprecedented crisis in hospitals, shortages of blood for emergencies and multi-transfused patients were reported from major healthcare centres across many countries [1].

Blood transfusion services faced unique challenges owing to the strict lockdown and curfews imposed to prevent the spread of SARS-CoV-2 infection ever since the first case was reported in early 2020 in India. Apart from inventory shortages, blood centres witnessed huge challenges in recruitment of blood donors, conducting outdoor blood collection drives, blood utilization, management of chronically transfused patients, staff, and supplies [2–8]. Cancellation of mobile blood connection drives as a measure to avoid gatherings and prevent the spread of infection added to the woes of blood centres [2].

Blood and its components have a limited shelf life and continuous replenishment of inventory is necessary. Studies and media reports have highlighted major perceived shortages of blood components since the pandemic started, either due to fear of contracting infection among the donor pool or hardship faced by blood donors in reaching blood centres due to government-imposed restrictions. Although a decline in blood donation between 26% and 40% was reported by various authors, a corresponding decline in requisitions between 18% and 21% following the postponement of routine surgeries was also seen [9,10]. Some authors also reported wastage of blood with higher discards due to a

* Correspondence to: Department of Transfusion Medicine, Government Medical College, Sector 32, Pin 160030, Chandigarh, India.
E-mail addresses: paramjit.gp71@yahoo.com (P. Kaur), rkbedi15@yahoo.com (R.K. Bedi), drkmittal@gmail.com (K. Mittal), drtanvisood@yahoo.in (T. Sood).

https://doi.org/10.1016/j.transci.2022.103569
Received 13 July 2022; Received in revised form 21 August 2022; Accepted 2 September 2022
Available online 6 September 2022

sudden decrease in demand amid adequate or even surplus stocks in the initial phase of the pandemic [2,11].

It is crucial to maintain a balance between the supply and demand of blood components for uninterrupted transfusion services [12]. In such a situation, when voluntary donations are less, blood centres have to turn to other sources such as family donors and replacement donors [9]. Replacement donors have shown a higher prevalence of transfusion-transmitted infections as reported in various studies [13–16]. Although many blood centres have a system in place to motivate doctors and staff during emergent demands, these too are limited given the scale of the pandemic. Some centres had to turn to neighboring blood centres to meet the emergent demand for blood for emergency patients [17].

The healthcare workers were at maximum risk due to the uncertain nature of the illness and stressful work atmosphere. Besides, many of them got infected and had to be quarantined which further contributed to the disrupted functioning of emergency departments[18]. Blood centre staff were hesitant to go for outdoor blood donation drives amid fear of contracting infection and risk to family members, particularly elderly members in the household.

The current study was conducted to assess the impact of the COVID 19 pandemic on the entire blood transfusion chain in a tertiary care hospital along with the prevalence of transfusion-transmitted infections (TTI) in corresponding time periods of three preceding pre-pandemic years with two consecutive pandemic years.

2. Material and Methods

The present study was a descriptive retrospective cross-sectional study conducted in a tertiary care institute in northern India. The study was approved by the institutional research and ethics committee. Due to the retrospective collection of records, the institutional ethics committee waived the informed consent requirement. Data collection was done from the Blood Bank module of Health management information system (HMIS) software developed by the National Informatics Centre India. The data was collected for seven months period from 1st March to 30th September 2020 and 2021 of the pandemic periods and compared with the corresponding pre-pandemic time period of 2017, 2018 and 2019. Data retrieval was done month-wise for the time period from March to September for five years. Similar time periods were chosen for comparison of the pre-pandemic years coinciding with the first and second waves of the pandemic in India. Data collection was done pertaining to all major activities.

1. Blood donations - voluntary and replacement
2. Voluntary blood donation camps
3. Number of apheresis procedures
4. Number of requisitions
5. Issue of blood components - Packed red blood cells (PRBC), Fresh frozen plasma (FFP), Platelet concentrates (PC)
6. Seroprevalence of transfusion-transmitted infections HIV, HCV, HBsAg, Malaria and syphilis in voluntary donors (VD) and replacement donors (RD)

The data extraction was done from computerized records of blood centre software by the principal investigator and cross-checked independently by two co-investigators and relevant details were retrieved and analyzed. No names of patients or donors were used at any stage.

2.1. Statistical analysis

Data was entered using a Microsoft Excel spreadsheet and analyzed. Continuous data were checked for normality and further analyzed by descriptive statistics such as mean and standard deviation or median and interquartile range as appropriate. All categorical variables were expressed as frequency and percentages. Student t-test and Pearson's chi-square test were used as appropriate to compare the differences between the time periods studied. A p-value < 0.05 was considered statistically significant.

3. Results

There was a decline of 53.79% and 34.4% in total whole blood donations from 13,652 in 2019 to 6308 donors in 2020 and 8478 donors in 2021 respectively during the study period of March to September. The decline in the number of female donors was more as compared to male blood donors. The gender distribution and details of voluntary and replacement donors during the study period are shown in Table 1. A comparison of the mean of pre-pandemic years (2017, 2018 and 2019) with the pandemic periods of 2020 and 2021 is shown in Table 2. On comparing the mean annual blood collection of the preceding non-pandemic years during the same time period, the decline was 52.75% and 36.49% respectively in 2020 and 2021. In the pre-pandemic period, 91.8% of annual blood collection was from voluntary blood donors which decreased to 72.2% in 2020 and 77.7% in 2021. Although there was a decline in voluntary donors, the number of replacement donors increased by 60.81% and 72.89% in 2020 and 2021 respectively. The in-house blood collection from both voluntary and replacement donors was 38.4% in 2020 and 26.1% in 2021. Voluntary blood donation camps showed a decrease of 60.6% in 2020 and 39.1% in 2021.

There was a decline of 48.4% in the number of plateletpheresis procedures in 2020($n = 162$) but the numbers increased in 2021($n = 269$) due to the dengue outbreak, particularly in the month of September. A comparison of month-wise plateletpheresis procedures showed a similar trend for all the years with a greater number of procedures during the month of September in 2017 and 2021 (Fig. 1). The mean number of requisitions received per day showed a decline of 54% and 35% in 2020 and 2021 respectively when compared to the mean of the pre-pandemic period in a similar pattern to monthly blood donations. The mean monthly requisitions received for various blood components were 4473.52 ± 389.95 in the pre-pandemic period which declined to 2043.42 ± 521.68 and 2905.28 ± 804.94 in 2020 and 2021 respectively. We also studied issue statistics for PRBC, FFP and PC prepared from whole blood and the issue trends are depicted in Fig. 2. The issue of blood components showed a decreasing trend and the decline ranged between 48% and 62% for various components in 2020 and 29–35% in 2021 (Table 2). Thus we observed that issue of blood components and donations gradually increased in 2021.

The mean monthly blood collection was compared between pre-pandemic and pandemic periods. Using an unpaired t-test the mean monthly blood donations in the preceding non-pandemic years were 1907 ± 234.26 which declined to 901 ± 221.97 in 2020 (95% Confidence Interval (CI) 798.33–1213.66, $p<0.0001$). In 2021 during the same time period, the mean monthly donations were 1211 ± 304 (95% CI 469.86–922.13, $p<0.0001$). We also compared the mean monthly PRBC issued which was 1880 ± 121 in the pre-pandemic study period which declined to 965 ± 178 in 2020(95%CI 792.74–1037.26, $p<0.0001$) and 1273 ± 196 in 2021 (95%CI 479–734.27, $p<0.0001$). It was observed that supply and demand were balanced with no deficit of blood during the pandemic period although the decline in total blood donations and issue of PRBC in both the pandemic years of 2020 and 2021 was statistically significant.

The seroprevalence of transfusion-transmitted infections in blood donors showed an increasing trend for HIV, HCV, HBsAg and Syphilis reactivity as shown in Fig. 3. It was compared between pre-pandemic and pandemic periods using the chi-square test which showed an increasing trend for all infections and the difference was statistically highly significant for Syphilis ($p<0.0001$) in 2020 and for HBsAg ($p<0.05$), HCV ($p<0.05$), and Syphilis ($p<0.01$) in 2021. There was no statistically significant difference between the TTI prevalence in 2020 and 2021. However, on comparing between 2017, 2018 and 2019, the prevalence of syphilis increased significantly from 2017 to 2018

Table 1
Details of types of blood donors.

Year (Mar-Sep)	Total donors	Male donors n (%)	Female donors n (%)	Voluntary donors n (%)	Voluntary donors (VD)		Replacement donors (RD) n (%)	Total In-house (VD+RD) n (%)
					Camps n (%)	In-house n (%)		
2017	12979	12357 (95.2%)	622 (4.8%)	12188 (93.9%)	11527 (88.8%)	661 (5.1%)	791 (6.1%)	1452 (11.2%)
2018	13416	12901 (96.2%)	515 (3.8%)	12356 (92.1%)	11531 (85.9%)	825 (6.2%)	1060 (7.9%)	1885 (14.1%)
2019	13652	13225 (96.8%)	427 (3.2%)	12227 (89.6%)	11065 (81.1%)	1162 (8.5%)	1425 (10.4%)	2587 (18.9%)
2020	6308	6184 (98%)	124 (2%)	4552 (72.2%)	3886 (61.6%)	666 (10.6%)	1756 (27.8%)	2422 (38.4%)
2021	8478	8303 (97.9%)	175 (2.1%)	6590 (77.7%)	6258 (73.8%)	332 (3.9%)	1888 (22.3%)	2220 (26.1%)

Table 2
Comparison of blood donation and issue of blood components between pre-pandemic and pandemic period.

Parameter	Pre-pandemic 2017,2018,2019 Mean $\bar{X}$	2020 N (%change from pre-pandemic)	2021 N (%change from pre-pandemic)
Blood Donors	13349	6308 (↓52.75%)	8478 (↓36.49%)
Male donors	12828	6184(↓51.79%)	8303(↓35.27%)
Female donors	521	124(↓76.19%)	175(↓66.41%)
Voluntary donors (Camps and in-house)	12257	4552(↓62.86%)	6590(↓46.23%)
Voluntary donors (Camps)	11374	3886(↓65.83%)	6258(↓44.98%)
Replacement donors	1092	1756(↑60.81%)	1888 (↑72.89%)
Voluntary blood donation camps	145	57(↓60.69%)	88(↓39.31%)
Plateletpheresis	314	162(↓48.4%)	269(↓14.3%)
Mean patient requistions/day	168.35	76.9(↓54.32%)	109.33 (↓35.06%)
PRBC Issued	13161	6758(↓48.65%)	8913(↓32.27%)
FFP Issued	8935	3962(↓55.65%)	5753(↓35.61%)
Platelet concentrate issued	2958	1122(↓62.06%)	2079 (↓29.71%)

↑Increase from pre pandemic mean
↓Decrease from pre pandemic mean

($p<0.01$) and 2018–2019 ($p<0.05$) while no significant trend was observed for other TTI.

Further, we also observed the overall TTI reactivity and compared between voluntary and replacement donors as shown in Table 3. The overall TTI reactivity showed an increasing trend from 2018. The difference in TTI reactivity between voluntary and replacement donors was also statistically significant in 2020 and 2021($p<0.001$). The combined TTI reactivity showed a statistically significant increase from 1.01% in the pre-pandemic period to 1.49%($p<0.001$) and 1.51%($p<0.001$) in 2020 and 2021 respectively. In addition, the difference in combined TTI reactivity was statistically significant from 0.92% in 2018 to 1.17% in

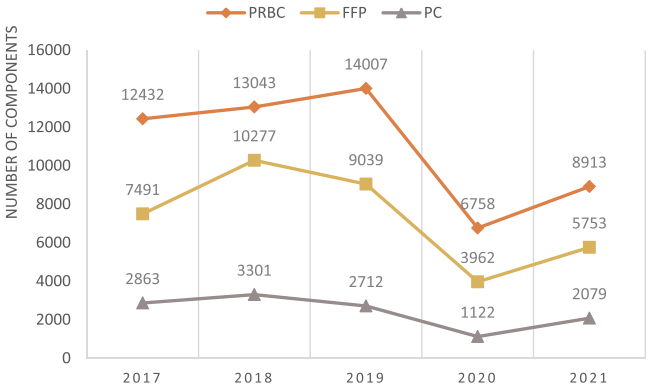

Fig. 2. Trends of issue of blood components year wise.

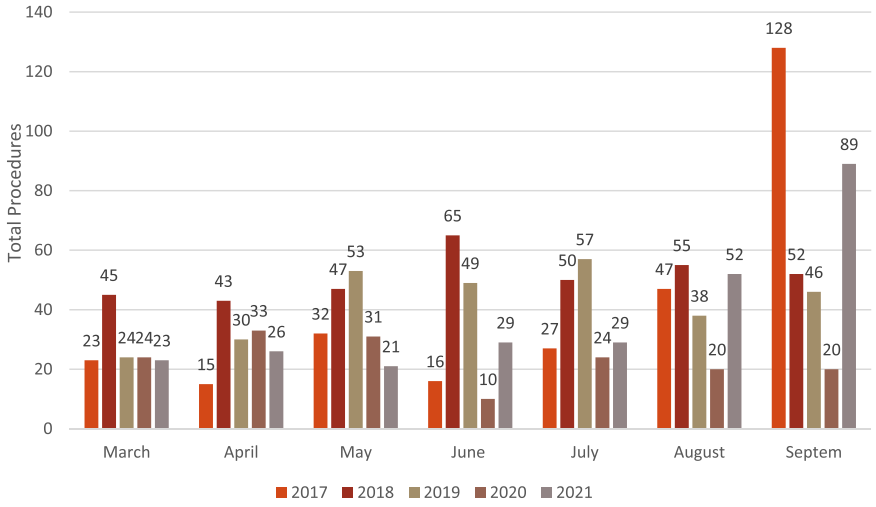

Fig. 1. Monthwise plateletpheresis procedures over five years.

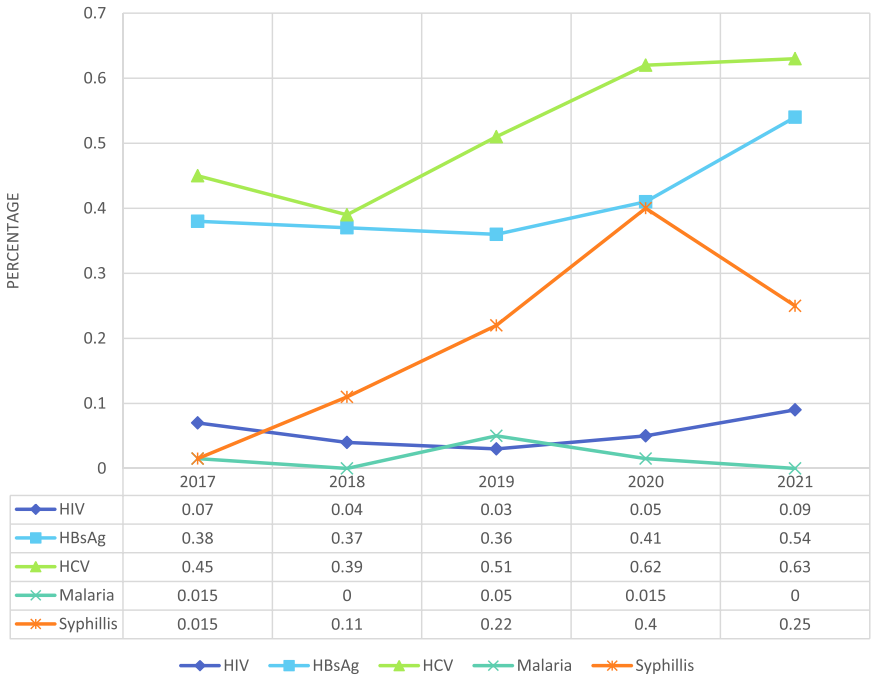

Fig. 3. Trends of seroprevalence of transfusion-transmitted infections.

Table 3
Year-wise overall TTI reactivity in voluntary and replacement donors.

Year (Mar-Sep)	Overall (%)	VD (%)	RD (%)	p value
2017	0.93	0.94	0.76	0.604
2018	0.92	0.93	0.75	0.554
2019	1.17	1.11	1.68	0.058
2020	1.49	1.14	2.39	<0.001[a]
2021	1.51	1.24	2.44	<0.001[a]

[a] p is significant at a value <0.05.

2019 ($p<0.05$). The TTI reactivity rate calculated for pre-pandemic and pandemic periods together was 1.04% in voluntary donors and 1.82% in replacement donors($p<0.001$). The overall TTI reactivity increased in replacement donors from an average of 1.16% in the pre-pandemic period to 2.39%($p<0.001$) in 2020 and 2.44%($p<0.001$)in 2021 and was statistically significant whereas the change in prevalence in voluntary donors was not statistically significant.

4. Discussion

The brunt of the COVID-19 pandemic was widespread over the globe. Blood donations in our centre declined to 53.79% in 2020 in comparison to 2019 during the study period from March to September which coincided with the lockdown and peak of the first wave. The second wave started in March 2021, however, the decline in donations in the corresponding time period of 2021 was 34.4%. A similar decline was seen when data from the pandemic period was compared with the mean of the preceding non-pandemic period. Although the second wave was severe with the emergence of new variants B.1.617.1 and B.1.617.2 of SARS-CoV-2, the improvement in donor attendance could be attributed to better awareness among the general public and a feeling of security due to the availability of vaccines. In addition, lockdowns and night curfews were imposed on weekends during the second wave which too varied from state to state based on caseload while a complete national lockdown was in place in 2020 during the early first wave with gradually unlock phases. Moreover, donor organizations had now adapted to the new normal for conducting outdoor blood donation camps with social distancing, use of masks and sanitizers, and entry of blood donors in a staggered manner. Studies have shown a similar trend of decreased whole blood donations during the pandemic ranging from 21% to 67% [9,10,19]. In a study from the Southern part of India, the authors reported a negative impact of COVID 19 on total blood donations, a number of voluntary blood donation camps, blood inventory and the issue of blood components. Although the elective demand was reduced, there was an increase in emergency demand which caused a shortage of blood inventory. They suggested flexible regulatory policies in such situations to meet demand and supply balance and maintain adequate blood inventory [17].

One major impact of the COVID-19 pandemic observed in our study was a significant decline in blood collection from voluntary blood donors. Voluntary blood donation drives decreased by 60.6% in 2020 but improved in 2021 during the second wave. Voluntary blood donations are considered the backbone of a safe blood supply. A decrease in outdoor blood donation camps prompted voluntary blood donors from the faculty, resident doctors, nursing, paramedical staff and security personnel of our hospital to come forward in large numbers in response to our appeals. Donor recruitment during the covid pandemic was done using repeated appeals through telephonic calls, WhatsApp messages, e-mails and electronic and print media. Organisations that used to conduct regular blood donation camps before the Covid pandemic set in were not getting permission to conduct blood donation drives from the authorities during the first major lockdown in March 2020. The hospital administration and local and district authorities were approached and curfew passes were issued to blood donors to visit the blood centres for donation. Regular blood donors associated with non-governmental organisations(NGOs) were requested to donate at blood centres and pick and drop transport using blood centre mobile van was arranged. The vehicle route was mapped daily based on the list of addresses provided by the NGOs and the availability of blood donors. In order to allay the anxiety of blood donors, a doctor accompanied the donors and thermal screening, strict hand hygiene, social distancing, face masks and sanitization measures were employed. Staff was provided with personal protective equipment and each donor couch was sanitized thoroughly before and after donation. Refreshment packets were provided to the donors maintaining utmost hygiene. In order to meet the demand for thalassemic children, emergency and obstetric and neonatal patients, the hospital faculty, residents, nursing officers, paramedical, security

and other staff were roped in on days when fewer donors could be mobilized. The college authorities sent individual personal thanks mails and letters to faculty and all other staff members. Duties of departmental staff were adjusted with staggered entry and exit during shift change and alternate day shifts. The first successful outdoor blood donation camp after March was held in May 2020 following strict Covid protocols.

In a study, the authors observed that voluntary donors who had registered for a call during an emergency could not reach centres even after being given appointments as the government had restricted the movement of the general public without curfew passes [12]. In a study from the tertiary care centre of North India on fears deterring people from blood donation, it was seen that donors lacked confidence in safety measures employed at hospitals to prevent the spread of infection and fear was statistically significant across eligible age groups for blood donation [20]. Authors have suggested that this issue can be addressed through social media and awareness campaigns [17,20]. A study from Nigeria reported the benefit of harnessing family donors as replacement donors during the COVID-19 pandemic in order to meet the demand for blood. They stressed on directed altruism of such donors to help family members [9].

In the current study, an increase in replacement donations was observed in the pandemic periods of 2020 and 2021 to meet the demand for blood components. Our blood centre collected more than 90% of blood from voluntary donors before the pandemic struck. The overwhelming response from healthcare workers, and regular blood donors along with the support of donor organisations and local authorities enabled us to collect 72.2% and 77.7% of blood from voluntary donors in 2020 and 2021 respectively during the study period. Despite this, replacement donors had to be recruited to meet the blood demand for thalassemia, cancer patients on chemotherapy, obstetric and emergency cases. The relatives and friends of patients were educated by our staff in order to address their apprehensions about the donation process and the risk of contracting SARS-CoV-2 infection. There was an initial hindrance to our policy of striving towards 100% voluntary donation through blood donation camps due to initial fear among the general public. The National blood transfusion council released the first and second interim guidance on 25th March 2020 and 25th June 2020 respectively for blood transfusion services in India highlighting preventive measures to be taken and strategies to maintain adequate stocks of blood from voluntary donors to meet the requirements [21,22]. With widespread awareness through print and electronic media, gradual improvement in the voluntary donation camps was seen in 2021.

Plateletpheresis procedures on the other hand showed a different trend with a decrease in demand in 2020, but in 2021, the demand was almost similar to the pre-pandemic study period. In 2021, India witnessed a surge in dengue fever cases beginning from August 2021 and the demand for plateletpheresis rose significantly during the subsequent months and was even higher than in 2018 and 2019 during August and September coinciding with the dengue outbreak. The double whammy of routine demands for blood components along with soaring demand for plateletpheresis and random donor platelets further increased the burden on blood centres in India. Another challenge was posed as some resident doctors and staff who were posted for additional duties in COVID wards had tested positive for SARS-CoV-2 leading to staff shortage and a limited overburdened workforce. Besides, the increased pace of vaccination due to repeated waves of COVID-19 lead to further shrinkage of donor inventory for plateletpheresis due to the mandatory deferral of 14 days post-vaccination [23].

In a similar trend to blood collection, the overall issue of blood components including PRBC, FFP and random donor platelets also declined in 2020 mainly due to a hold on elective surgeries and decreased hospitalizations for non-covid ailments but improved in 2021. The initial restrictions on non-covid related walk-in OPDs and elective procedures were gradually lifted by the hospital administration with the introduction of limited online appointments, telemedicine services and regular testing of patients for SARS-CoV-2 infection enabling the gradual resumption of elective surgeries and indoor admissions. Despite a statistically significant decline in the mean monthly blood collection between pre-pandemic and pandemic periods, a matching significant decline in the requirement of PRBC was observed in 2020 and 2021 and there was no perceived shortage of blood components. Most of the requirement of blood and components was met by strategic planning of outdoor blood donation camps, on-campus collection, close coordination with the clinical residents by Transfusion medicine residents and judicious use of blood components. Although many centres reported more outdating of red cells due to the initial lockdown in 2020 with a sudden decrease in demand [2,11] we did not observe such issues as surplus packed red cells were transferred to other blood centres for utilization as per the national regulatory guidelines allowing bulk transfer of surplus stock with other licensed blood centres [24].

We also analyzed the seroprevalence of transfusion-transmitted infections among blood donors. which showed a significant increase in HIV, HBsAg, HCV and syphilis seroprevalence during the pandemic. A significant increase in prevalence was observed for Syphilis (0.4%) in 2020 and HBsAg (0.54%), HCV (0.63%) and syphilis (0.25%) in 2021 when compared with the combined prevalence of these infections in the pre-pandemic period. The prevalence was significantly higher among replacement donors as compared to voluntary donors. We attribute this to the increase in replacement donations to meet the demand for various blood components as there was no change in the testing methodology used for syphilis screening in blood donors. Replacement donors have been shown to have a higher prevalence of transfusion-transmitted infections [13–16]. A recent study reported a reactive rate of 0.8% for all infections among voluntary donors and 1.95% in replacement donors ($p< 0.001$) in their analysis of trends of seroprevalence over 10 years [25]. In our study, TTI reactivity rate was 1.04% in voluntary donors and 1.82% in replacement donors ($p<0.001$). It was also seen that the overall reactivity of TTI was less among replacement donors as compared to voluntary donors in 2017 and 2018 while the pattern was reversed from 2019 onwards. The overall percentage of replacement donors in 2017 and 2018 was less and hence the findings may not be generalizable. Besides this, the increasing trend of overall TTI seroprevalence cannot be overlooked and the risk behaviour pattern of blood donors needs to be explored. The UNODC's 2021 World Drug Report states an increase in drug abuse due to the socio-economic impact of the COVID-19 pandemic and associated stress and anxiety [26]. Authors from other studies have also cautioned about an increase in deviant behaviour due to the psychological impact of coronavirus on life and livelihood [27,28]. Further research is warranted to look into behavioural patterns of voluntary and replacement blood donors and correlate them with the prevalence of transfusion-transmitted infections. A recent meta-analysis could not find any statistically significant changes in TTI rates of HBV, HCV, HIV-1/2, HTLV-I/II and syphilis in blood donors who donated in response to a disaster. However, the authors cautioned about the uncertainty of these observations due to limited evidence on blood safety after a disaster [29].

Our study has certain limitations being retrospective in nature and from a single centre. However, the major strength of our study is that we compared data of the first and second waves of the COVID-19 pandemic with the corresponding months of three preceding non-pandemic years to evaluate the effect of the pandemic separately from temporal trends. Our analysis of transfusion-transmitted infections was unique as a similar comparison has not been reported in other studies that have focused on the impact of COVID-19 on the collection, demand and utilization of blood and components. Our study highlights the need to formulate strategies for the management of future waves of infection and better preparedness for such pandemics. We also succeeded in overcoming the challenge of blood shortage in the early phase of the pandemic by recruiting regular donors during the lockdown using route mapping and to and fro transport based on daily demand in coordination with camp organisers. We feel that there is a need to develop robust voluntary donor databases in all centres with an emphasis on the

enrollment of regular repeat donors using stringent screening measures to meet the demand for blood and blood components while ensuring patient safety.

5. Conclusion

In conclusion, the COVID-19 pandemic not only posed a challenge to blood donation, supply and utilization but also had an impact on the seroprevalence of transfusion-transmitted infections which needs further evaluation. Blood safety is of prime importance and there is a necessity to develop a strong donor database of regular blood donors to tackle and tide over such future unparalleled crises as witnessed during the pandemic.

Funding statement

The study did not receive funding from any agency.

CRediT authorship contribution statement

Paramjit Kaur: Concept and design of the study, acquisition of data, analysis and interpretation of data, literature review, and writing the manuscript. **Ravneet Kaur Bedi**: Design of the study, data collection, critical review of intellectual content, and editing of the manuscript. **Kshitija Mittal**: data collection and manuscript review. **Tanvi Sood**: Manuscript Review.

Ethical approval statement

The study was approved by the institutional ethics committee and informed consent waiver was obtained as it is a retrospective analysis.

Conflict of interest disclosure

The authors have no conflicts of interest to declare.

Data Availability

The data pertaining to the study is available with the first author.

References

[1] Chiem C, Alghamdi K, Nguyen T, Han JH, Huo H, Jackson D. The impact of COVID-19 on blood transfusion services: a systematic review and meta-analysis. Transfus Med Hemother 2021;30:1–12.
[2] Pagano MB, Hess JR, Tsang HC, Staley E, Gernsheimer T, Sen N, et al. Prepare to adapt: blood supply and transfusion support during the first 2 weeks of the 2019 novel coronavirus (COVID-19) pandemic affecting Washington State. Transfusion 2020;60:908–11.
[3] Kracalik I, Mowla S, Katz L, Cumming M, Sapiano MRP, Basavaraju SV. Impact of the early COVID-19 pandemic on blood utilization in the United States: a time-series analysis of data reported to the National Healthcare Safety Network Hemovigilance Module. Transfusion 2021;61(Suppl 2):S36–43. https://doi.org/10.1111/trf.16451.
[4] Stanworth SJ, New HV, Apelseth TO, Brunskill S, Cardigan R, Doree C, et al. Effects of the COVID-19 pandemic on supply and use of blood for transfusion. Lancet Haematol 2020;7:e756–64. https://doi.org/10.1016/S2352-3026(20)30186-1.
[5] Kasanga M, Mudenda S, Gondwe T, Chileshe M, Solochi B, Wu J. Impact of COVID-19 on blood donation and transfusion services at Lusaka provincial blood transfusion centre, Zambia. Pan Afr Med J 2020;35(Suppl 2):74. https://doi.org/10.11604/pamj.supp.2020.35.2.23975.
[6] Al-Riyami AZ, Abdella YE, Badawi MA, Panchatcharam SM, Ghaleb Y, Maghsudlu M, et al. The impact of COVID-19 pandemic on blood supplies and transfusion services in Eastern Mediterranean Region. Transfus Clin Biol 2021;28:16–24.
[7] Ngo A, Masel D, Cahill C, Blumberg N, Refaai MA. Blood banking and transfusion medicine challenges during the COVID-19 pandemic. Clin Lab Med 2020;40:587–601.
[8] Kiely P, Hoad VC, Seed CR, Gosbell IB. Severe acute respiratory syndrome coronavirus-2: implications for blood safety and sufficiency. Vox Sang 2021;116:155–66.
[9] Ogar CO, Okoroiwu HU, Obeagu EI, Etura JE, Abunimye DA. Assessment of blood supply and usage pre- and during COVID-19 pandemic: a lesson from non-voluntary donation. Transfus Clin Biol 2021;28:68–72.
[10] Yahia AIO. Management of blood supply and demand during the COVID-19 pandemic in King Abdullah Hospital, Bisha, Saudi Arabia. Transfus Apher Sci 2020;59:102836. https://doi.org/10.1016/j.transci.2020.102836.
[11] Gupta AM, Ojha S, Nagaraju P, Poojary M, Sh S, Sathyan V, Ansari A. Impact of the novel coronavirus disease and lockdown on the packed red blood cells inventory management: an experience from a tertiary care oncology center in Western India. Hematol Transfus Cell Ther 2021;43:126–32.
[12] Rajendran V, Pinki S. Impact of COVID-19 outbreak in blood transfusion services in India: experience from tertiary care blood centres in Kerala: a short review. Glob J Transfus Med 2020;5:215–7.
[13] Mremi A, Yahaya JJ, Nyindo M, Mollel E. Transfusion-transmitted infections and associated risk factors at the Northern Zone Blood Transfusion Center in Tanzania: a study of blood donors between 2017 and 2019. PLoS One 2021;16:e0249061. https://doi.org/10.1371/journal.pone.0249061.
[14] Fernandes H, D'souza PF, D'souza PM. Prevalence of transfusion transmitted infections in voluntary and replacement donors. Indian J Hematol Blood Transfus 2010;26:89–91.
[15] Pallavi P, Ganesh CK, Jayashree K, Manjunath GV. Seroprevalence and trends in transfusion transmitted infections among blood donors in a university hospital blood bank: a 5-year study. Indian J Hematol Blood Transfus 2011;27:1–6.
[16] Saba N, Nasir JA, Waheed U, Aslam S, Mohammad I, Wazeer A, et al. Seroprevalence of transfusion-transmitted infections among voluntary and replacement blood donors at the Peshawar Regional Blood Centre, Khyber Pakhtunkhwa, Pakistan. J Lab Physicians 2021;13:162–8.
[17] Divya NS, Vanishree HR, Jaikar SKB. Impact of COVID 19 pandemic on blood transfusion services at a rural based district Hospital Blood-Bank, India. Indian J Pathol Oncol 2021;8:50–4.
[18] Arcot PJ, Kumar K, Mukhopadhyay T, Subramanian A. Potential challenges faced by blood bank services during COVID-19 pandemic and their mitigative measures: the Indian scenario. Transfus Apher Sci 2020;59:102877. https://doi.org/10.1016/j.transci.2020.102877.
[19] Wang Y, Han W, Pan L, Wang C, Liu Y, Hu W, et al. Impact of COVID-19 on blood centres in Zhejiang province China. Vox Sang 2020;115:502–6. https://doi.org/10.1111/vox.12931.
[20] Sachdev S, Kishore K, Singh L, Lamba DS, Hans R, Dhawan HK, et al. Exploration of COVID-19 related fears deterring from blood donation in India. ISBT Sci Ser 2021;16:147–57.
[21] National Aids Control Organisation. Policies and Guidelines. National Blood Transfusion Council (NBTC) Interim guidance for blood transfusion services in view of COVID-19. Available from: ⟨http://naco.gov.in/nbtc-interim-guidance-blood-transfusion-services-view-covid-19⟩ (Accessed on 8-07-2022).
[22] Second Interim National Guidance to Blood Transfusion Services in India in light of COVID-19 Pandemic. Available from ⟨https://covid19.india.gov.in/document/2nd-interim-national-guidance-to-blood-transfusion-services-in-india-in-light-of-covid-19-pandemic/⟩ (Accessed on 8-07-2022).
[23] Bhasker B. Covid 19 vaccination: latest guidelines on blood donor deferral in India. Transfus Clin Biol 2021;28:299. https://doi.org/10.1016/j.tracli.2021.05.005.
[24] 24. GOI. The Gazette of India, Notification G.S.R. 328(E) New Delhi: Central Drugs Standard Control Organization, Ministry of Health and Family Welfare, Government of India; 2017. Apr 3. Available from ⟨https://cdsco.gov.in/opencms/opencms/system/modules/CDSCO.WEB/elements/download_file_division.jsp?num_id=OTc5⟩ (Accessed on 8-07-2022).
[25] Pokhrel A, Chaudhary J, Sachdeva P, Das AK, Gupta A, Kirtania T, et al. Trends of infectious disease markers among healthy blood donors in northern India: A ten year study. Transfus Apher Sci 2022 4;4:103442. https://doi.org/10.1016/j.transci.2022.103442.
[26] World Drug report 2021 available from ⟨https://www.unodc.org⟩ (Last accessed on 8-07-2022).
[27] Zaami S, Marinelli E, Varì MR. New trends of substance abuse during COVID-19 pandemic: an international perspective. Front Psychiatry 2020;11:700. 10.3389/fpsyt.2020.00700.
[28] Dodge KA, Skinner AT, Godwin J, Bai Y, Lansford JE, Copeland WE, et al. Impact of the COVID-19 pandemic on substance use among adults without children, parents, and adolescents. Addict Behav Rep 2021;14:100388. https://doi.org/10.1016/j.abrep.2021.100388.
[29] Laermans J, Van den Bosch OD, De Buck E, Compernolle E, Shinar V, Vandekerckhove P E. Impact of disasters on blood donation rates and blood safety: a systematic review and meta-analysis. Vox Sang 2022;117:769–79.