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Original Article

Transfusion Medicine Section

Trends of Blood Transfusion Services before and during COVID-19 Pandemic- A Retrospective Study from Maharashtra, India

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ABSTRACT

Introduction: Coronavirus Disease 2019 (COVID-19) affected the usual number of blood donations as well as the component utilisation in routine use severely. Directions by government to maintain social distancing and avoidance of social gatherings resulted in lesser number of voluntary blood donation camps. This resulted in blood scarcity.

Aim: To assess the impact on pattern of usage of blood components previously and during COVID-19 pandemic.

Materials and Methods: This was a retrospective study, conducted in Department of Immunohaematology and Transfusion Medicine (Blood Centre) of a tertiary care hospital, Navi Mumbai, Maharashtra, India. The study was carried out for a period of two years i.e., from April 2019 to March 2021. The study was divided into two phases. Phase I- April 2019 to March 2020, Phase II- April 2020 to March 2021. Data was collected retrospectively from the donor registers and camp reports. Blood components utilisation data was collected from issue registers. Microsoft Excel and Microsoft Word were used to compile the data. Basic descriptive statistics and graphs were prepared using Statistical Package for the Social Sciences (SPSS). Independent t-test was applied to assess the difference in mean and Standard Deviation (SD) between two phases. The p-value $p<0.05$ was considered as significant.

Results: A total of 6,060 units were collected during the phase I whereas 3,433 units were collected during the phase II. Mean number of units received during phase I were significantly higher (505±127.2) as compared to phase II (286.1±73.9) ($p<0.05$). Overall, utilisation of Packed Red Blood Cell (PRBC), Random Donor Platelet/Single Donor Platelet (RDP/SDP) and Fresh Frozen Plasma (FFP) was significantly higher in phase I as compared to phase II ($p<0.05$).

Conclusion: Every day, our understanding of the COVID-19 epidemic grows. An effective communication strategy with voluntary blood donors to urge them to donate, as well as networking with neighbouring blood centres, will go a long way towards managing the blood supply during the epidemic.

Keywords: Blood products, Convalescent plasma, Utilisation, Voluntary blood donor

INTRODUCTION

The Severe Acute Respiratory Syndrome Corona Virus 2 (SARS-CoV-2) caused severe acute respiratory illness. It was first noticed in December 2019 at Wuhan, China. Since then, it has spread to several regions all over the world [1]. As on 20th July, 2021 there were a total of 3,11,44,229 cases reported in India [2]. During these extraordinary occurrences, essential quality health services were given to the whole population. For individual and community health security, the COVID-19 pandemic reaffirmed the importance of a robust and inclusive healthcare system [3]. Declaration of public lockdown by Government of India and Janta Curfew in order to limit the spread of infection has affected blood centre services remarkably. Directions by government to maintain social distancing and avoidance of social gatherings resulted in lesser number of voluntary blood donation camps. This resulted in blood scarcity. In these trying times, the blood community must strike a balance between acquisition and distribution of blood in a proactive manner. There was a significant reduction in donations of blood by 40% to 67% during COVID-19 outbreak, especially in countries where movement restriction was implemented [4].

So far, efforts in finding the best treatment for COVID-19 is still ongoing. Convalescent Plasma (CP) and hyperimmune immunoglobulin has been used as a potential therapy for COVID-19 patients who do not react well to other therapies. It involves transfer of antibodies collected from a patient recovered from COVID-19 illness. Treatment with CP which provide neutralising antibodies and other proteins which may improve the severe inflammatory response by immunomodulation [5]. Medical colleges' Blood Transfusion Services (BTS) are reliant on hospital blood banks, which are in charge of blood supply and testing. Direct donation (mostly from patients' family), volunteer non remunerated donors, and mobile blood drives are the main sources of given blood [6]. While the scenario prior to COVID-19 was far from ideal, the pandemic was sure to make things worse for transfusion dependent thalassaemia patients. Despite the fact, that evidence from past epidemics revealed comparable effects on blood transfusions, the necessity for a backup buffer stock was overlooked [7]. The pandemic's overall impact cannot be assessed on BTSs since, it hasn't yet subsided [8]. Blood transfusions may save lives in many situations, thus keeping a steady supply of blood is critical. The 2003 SARS-CoV outbreak adversely affected blood donation and the blood supply [6].

In the present study, comparison of the BTSs provided before COVID-19 pandemic and during the pandemic was done to assess the effect of COVID-19 pandemic with reference to collection of blood, organisation of voluntary blood donation camps and usage of blood components. The present study was carried out to determine the influence of COVID-19 pandemic on services of blood centre. The objective of the study was to develop strategies to overcome the situations like pandemic in future with the available resources.

MATERIALS AND METHODS

The present study was a retrospective study, conducted in Department of Immunohaematology and Transfusion Medicine (Blood Centre) of a tertiary care hospital, Navi Mumbai, Maharashtra, India, for a period of two years i.e., from April 2019 to March 2021. From April 2021 to July 2021, the data that was collected, analysed and interpreted. Making it a total of two years and four months. Institutional Ethical Committee approval was obtained (Approval Number N- EC/2021/07/42).

The study duration was categorised into two stages namely:

Phase-I: Pre COVID-19 pandemic phase in India (April 2019 to March 2020).

Phase-II: The post lockdown (during COVID-19 pandemic) phase in India (April 2020 to March 2021).

Details of the blood units collected both in house as well as in the Blood Donation Camps along with number of blood donation camps held were retrieved from the donor registers and camp reports. Blood components utilisation data was collected from issue registers for Packed Red Cells (PRC), RDP/SDP, FFP, cryoprecipitate (Cryo). COVID Convalescent Plasma (CCP) details were taken from CCP preparation register and issue register. Discard data was taken from discard register and data was confirmed from the master register.

Inclusion criteria: All the donated blood units, voluntary and replacement, collected in house and in camps during the study period of two years from April 2019 to March 2021 at Department of transfusion medicine were included in the study. All the blood components- PRC, RDP/SDP, FFP, cryoprecipitate and CP utilised during the study period were included in the study.

Exclusion criteria: Therapeutic phlebotomy donations were excluded from the study.

STATISTICAL ANALYSIS

Microsoft excel and Microsoft word were used to compile the data. Basic descriptive statistics and graphs were prepared using SPSS-20.0. Independent t-test was carried out to evaluate the difference in mean and SD between two phases. The p-value $p<0.05$ was considered as significant.

RESULTS

A total of 6,060 units were collected during the phase I whereas 3,433 units were collected during the phase II. Mean number of units received during phase I were significantly higher (505±127.2) as compared to phase II (286.1±73.9) ($p<0.05$). Number of camps were significantly reduced during second phase and thus mean number of blood units collected from camps were significantly higher in phase I (432.2±146.7) as compared to phase II (209.6±68.6); ($p<0.05$). However, in house collection as well as discard rate were statistically not significant during both the phases ($p>0.05$) [Table/Fig-1].

Overall, utilisation of PRBC, RDP/SDP and FFP was significantly higher in phase I as compared to phase II ($p<0.05$). No such difference in utilisation of cryoprecipitate was noted between two phases ($p>0.05$) [Table/Fig-2].

Month	No. of units		No. of camps		Camp collection		In house collection		Discard	
	Phase I	Phase II	Phase I	Phase II	Phase I	Phase II	Phase I	Phase II	Phase I	Phase II
April	373	242	6	1	324	167	49	75	55	165
May	381	254	3	7	214	227	167	27	62	40
June	384	238	7	5	310	237	74	1	37	10
July	492	156	6	4	428	132	64	24	80	56
August	529	263	7	6	457	205	72	58	41	39
September	590	207	8	3	377	134	213	73	41	39
October	787	371	9	5	750	213	37	158	76	19
November	366	288	10	5	351	101	15	187	200	27
December	557	378	8	8	495	275	62	103	49	56
January	623	394	9	7	604	339	19	55	79	57
February	547	337	10	4	532	275	15	62	98	24
March	431	305	4	4	344	210	87	95	97	57
Total	6060	3433	87	59	5186	2515	874	918	915	589
Mean±SD	505±127.2	286.1±73.9	7.3±2.2	4.9±1.9	432.2±146.7	209.6±68.6	72.8±60.6	76.5±53.7	76.3±44.4	49.1±39.9
p-value	0.001		0.02		0.001		0.89		0.17	

[Table/Fig-1]: Total blood units collection, camps and discard during phase I (April 20 19-March 2020) and phase II (April 2020-March 2021).
Independent t-test for comparing phase I and phase II. The p-value $p<0.05$ was considered as significant

Month	PRBC		RDP/SDP		FFP		CRYO		Total	
	Phase I	Phase II	Phase I	Phase II	Phase I	Phase II	Phase I	Phase II	Phase I	Phase II
April	420	175	90	22	196	60	0	0	706	257
May	416	294	116	46	188	206	12	13	732	559
June	404	269	96	60	182	232	0	5	682	566
July	441	239	145	44	196	160	4	0	786	443
August	499	170	379	56	291	121	1	0	1170	347
September	517	295	387	74	371	151	0	0	1275	520
October	597	333	259	133	265	174	32	11	1153	651
November	534	214	222	98	263	112	7	2	1026	426
December	480	433	163	68	216	195	11	32	870	728
January	495	359	97	52	299	152	26	8	917	571
February	489	271	115	84	221	136	0	13	825	504
March	397	412	46	42	169	247	21	15	633	716
Total	5689	3464	2115	779	2857	1946	114	99	10775	6288
Mean±SD	474.1±60.4	288.7±84.6	176.3±112.9	64.9±29.6	238.1±60.5	162.2±52.9	9.5±11.2	8.3±9.6	897.9±212.7	524±40.7
p-value	0.001		0.003		0.02		0.71		0.001	

[Table/Fig-2]: Total utilisation of blood components during phase I and II.
Packed red blood cell (PRBC), Random donor platelet/Single donor platelet (RDP/SDP) Fresh frozen plasma (FFP), Cryoprecipitate (CRYO); independent t-test; p-value <0.05 considered significant

In our departments, first CCP collection procedure was done in July 2020. After that, a total 59 CCP were collected and all were utilised. Maximum harvesting of CCP and its utilisation was noted in the month of August and September 2020 [Table/Fig-3].

Month	No. of CCP collection	No. of CCP utilisation
July 2020	2	2
August 2020	28	21
September 2020	19	22
October 2020	8	11
November 2020	2	2
December 2020	-	0
January 2021	-	1
Total	59	59

[Table/Fig-3]: Total number of COVID-19 Convalescent Plasma (CCP) collection and utilisation in year 2020-2021.
COVID Convalescent Plasma (CCP)

DISCUSSION

The COVID-19 and emergency patients were given priority by the Indian government, which halted all elective transfusions. Patients who require frequent Blood Transfusions Treatment (BTT), such as those with myelodysplasia, nutritional anaemia, or thalassaemia, have inevitably suffered because of these developments [7]. The SARS-CoV-2 epidemic has hampered blood storage management at a large, decentralised blood centres, and several scenarios have been proposed to maintain an adequate blood supply to meet transfusion demands [9].

Multiple studies were reviewed during the study period and their findings were compared with the present study as is tabulated in [Table/Fig-4] [10-18].

On 22nd April, 2020 ICMR began an examination for the utilisation of improving plasma in patients with moderate COVID-19 contamination. It was a stage II, open mark, randomised clinical preliminary trial with the essential goal to survey the security and adequacy of the treatment of moderate illness with CP transfusion [11]. The blood centre got the approval to collect plasma by Apheresis on 23rd May, 2020. A total of 59 units of CP were collected from recovered patients and they all were used. The ICMR Trial concluded that Convalescent Plasma Treatment (CPT) did not affect the progression of mild-moderate disease to serious Coronavirus or all-cause mortality in the patients who got CPT in comparison with the group of patients that didn't get CPT [19]. After this treatment with CP was stopped.

This study can help in finding resourceful ways of handling blood stock and demands during similar public health crisis in the future. The blood stock can be distributed based on priority being given to Intensive Care Units (ICUs), surgery patients as well as chronically ailing patients like thalassaemia, Chronic Kidney Disease (CKD) patients etc. Nearby blood centres can be periodically informed of the excess and low unit blood groups. So, the stocks of all centres can be managed efficiently. They may also help in forming nationwide or worldwide guidelines for the same.

Blood Service Departments ought to keep up with opportunity and precise correspondence with administrative and public health establishments, embrace adaptable strategies, get ready for ideal crisis plans, guarantee that blood supply addresses clinical issues, guard staff and blood givers, and breaking point infection transmission through blood transfusion. Perceiving dire areas, proactive masterminding, formed frameworks and their optimal consequences is essential for holding organisations to hold over the current COVID-19 pandemic.

S. No.	Author	Place	Year	Blood collection	Utilisation
1.	Gupta AM and Ojha S [10]	Navi Mumbai, India	2020	Number of blood donations decreased in the lockdown. Difference was not significant (238.5 vs. 197.8, p=0.391).	Decrease in PRC utilisation (722.5 vs. 329.0, p=0.001).
2.	García-Erce, JA, et al., [11]	Spain	2021	Decline in blood donations as compared with the 2018-2019 period: average decrease 20.1%.	Significant reduction; consumption of packed Red Blood Cells (RBCs) (24.5%), plasma (45.3%), and platelets (25.3%) in March–May.
3.	Noor NHM, et al., [12]	Malaysia	2021	Mobile drive whole blood units were predominantly affected with the number of blood donors in bloodmobiles decreased by 80.7% during Movement Control Order. 25 mobile drives were cancelled.	Blood usage came down to 840 during the CO, which was due to no elective operations, admissions, or procedures done during the MCO.
4.	Bouhou S and Benajiba M [13]	Morocco	2020	In March, the number of donations made nationally -27,812, in April-22,415 donations and in May-17,147 donations.	-
5.	Sharma S et al., [14]	Jaipur, India	2021	Total blood collection was 51317 units in the year 2019 and 34151 units in 2020 from voluntary and replacement blood donors.	Total 89948 blood components were supplied in the year 2019 and 55152 in the year 2020.
6.	Kasanga M et al., [15]	Zambia, Africa	2020	Collection decreased First- quarter of 2020 (mean=2172) compared to the 2019 (mean=3446), even though this decrease was not statistically significant (p=0.50).	-
7.	Ogar CO et al., [16]	Nigeria	2021	A total of 1638 donors were recorded within the study period. Concomitant decrease of 26.1% was observed	Concomitant decrease of 18.9% were recorded in request.
8.	Wang Y et al., [17]	China	2020	Whole blood donors dropped by 67%, the weekly amount of issued RBC units (10171.5u) was six times higher than the collected units (1347.5 u).	RBCs supply dropped by 65%. About 4% of RBCs and 2-8% of frozen plasma was used in COVID-19 patients.
9.	Politis C et al., [18]	Greece	2020	Total blood collection declined by 36% during the study, especially (65%) on the premises of the blood services.	FFP and whole blood derived platelets fell continuously throughout the study period, the former by 43% overall and the latter by 44%. Red Blood Cells (RBCs) issued also fell, by 17%, from over 400 units per day in February to an average of 344 in the lockdown period.
10.	Present study	India	2021	Total blood collection dropped by 43.35% and camp collection reduced by 51.50%.	There was a significant reduction (41.64%) in utilisation of blood components PRBC, FFP, RDP/ SDP except Cryoprecipitate

[Table/Fig-4]: Shows studies depicting their experiences of blood collection and utilisation during the COVID-19 pandemic [10-18].

Limitation(s)

As it was not a multicentric study, it was difficult to comment upon the conclusive picture of the result of the pandemic all over the nation. The varying donor deferral strategy during the pandemic and the vaccination status of the donors were a few important factors contributing to the decreased number of donors, but they weren't assessed separately in present study. Extensive research can be done on the probable causes of donor deferral during the pandemic and the outcome vaccination and CPT on regular donors in the future.

CONCLUSION(S)

The overall collection of the blood units during the pandemic came down to almost half of what it was when compared with the normal period. This was mainly due to the reduction in the number of camps. The same trend was seen with the utilisation of blood components. A successful correspondence system with regular donors to encourage them to donate and an open communication channel with adjoining blood centres, will go far towards dealing with the blood supply during this pandemic. Limited portability because of the lockdown and the fear of contracting the infection from COVID-19 dedicated hospitals brought a fall in the number of voluntary blood donors. To guarantee that there is no shortage of blood, a plan of action should be ready to be carried out in such emergencies. Such plans can be implemented at the beginning phases of similar emergencies which will ensure voluntary blood collection in support from the local areas before the infection spreads. With an organised exertion from specialists, the blood centre administrations ought to have a more grounded vital arrangement set up to adjust to troubles presented by a pandemic, zeroing in on blood deficiencies, squander, broad communications assume a significant part in making it doable.

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