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COVID-19 related callback in blood donors; Outcomes in blood donors and patients

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ABSTRACT

Call back as a procedure to report post donation symptoms or illness by donors has been established since 2009 in Iranian Blood Transfusion Organization (IBTO). **D**uring the first phase of COVID-19 outbreak, all blood donors were requested to report any respiratory infection symptoms after donation. The study investigated the callback data of COVID-19 in Tehran Blood Center during the first 3 months of the outbreak in Iran. The purpose of this study was to estimate the frequency of post donation COVID-19 related call back reports and determine its implications for blood donors and patients.

A telephone interview was conducted with donors who had reported COVID-19 symptoms. Some questions were asked to evaluate donor's health at the time of blood donation. The donors categorized into three groups: laboratory-confirmed, suspected, and COVID-19 irrelevant based on their answers. In cases that the blood component obtained from a laboratory-confirmed donor had been released, the hospital was notified and asked to follow up the recipient for COVID-19.

The results showed 30 donors (0.08 %) had callback related to COVID-19 and 76.63 % of the obtained component was disposed. The results also showed that only one donor had a laboratory-confirmed result with the RBC unit processed from her whole blood released for transfusion. The RBC unit recipient did not show any signs or symptoms of infection during a 46-day follow-up.

Concluded that callback system was effective to remove most of the components obtained from the donors who reported to be COVID-19 suspected or confirmed. Moreover, the result did not support virus transmission through blood transfusion.

1. Introduction

COVID-19 caused by the SARS-CoV2 virus started to spread in December 2019 from Wuhan, Hubei, China. This disease has seriously endangered personal and community health and limited social activities around the world. Evidence shows that the virus is specific to bat species and is not infectious to human cells due to its protective spike structure [2,6]. However, the mutated virus is now pathogenic to humans and has become a pandemic disease due to its high rate of transmission. To date, there is no evidence for transmission of any respiratory virus, including SARS-CoV and MERS-CoV, through blood components. While theoretically there is a possibility of virus transmission from patients infected with SARS-CoV and MERS, none of these studies have been able to prove this claim clinically [3,4].

The World Health Organization does not recommend inactivating the SARS-CoV2 virus in blood products as well as performing laboratory tests for virus detection. However, to mitigate the risk of infectious transmission, donor screening is crucial when an outbreak of such diseases occurs [1,5–7]. In this regard, deferrals associated with COVID-19 symptoms including fever or respiratory symptoms, close contact with infected patients including household members, travel to endemic regions at the beginning of this outbreak before pandemic announcement were added to the donor health questionnaire (DHQ) by WHO. So IBTO implemented mandatory changes in donor selection criteria in all blood centers [9]. Moreover, during the first phase of COVID-19 outbreak all blood donors were requested to report any respiratory infection symptoms after donation. Blood donor physicians have been required to explain the importance of post donation reporting of COVID-19 related

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symptoms to blood donors. Call back as a procedure to increase the safety of blood components has been established systemically and made available to all blood centers in IBTO since December 10, 2009.

The study investigated the COVID-19 related callback data in Tehran Blood Center during the first 3 months of the outbreak in Iran. The purpose of this study was to estimate the frequency of post donation COVID-19 related call back reports and determine its implications for blood donors and patients. So the follow-up of the patient who had received the blood component obtained from the COVID-19 confirmed blood donor was done.

2. Method

2.1. Data collection

This study investigated the available callback data during the outbreak of COVID 19 in Tehran Blood Center. Data pertained to January 21st 2020 through April 9th 2020, and were obtained from the IBTO software. Collected data included (1) donor demographic data, (2) donation status as first-time donor (a donor who succeeds in donating blood for the first time), repeated donor (a donor who has donated blood in the past but not in the preceding 12 months), regular donor (a donor who has donated twice or more within a period of 12 months), (3) callback reason, (4) the interval between the donation and the callback date, (5) processed blood components, and (6) blood component status as released or disposed.

2.2. Telephone interview with blood donors

A phone contact was made with all donors who had reported symptoms related to COVID-19 including fever, cold, influenza, and/or taking antibiotics due to respiratory infection during this period of time. Telephone interview was conducted according to a written standard protocol by a trained physician. At first, the physician made sure about the donor identification; then, they explained to the donor about the purpose of the research study. If the donor accepted to participate in the research, the physician would ask some medical questions and complete the checklists. The interview focused on COVID-19 related symptoms like fever, cough, sore throat, headache, and so on. The donor was also asked about COVID-19 related risk factors including close contact with a confirmed case, attendance at medical centers where COVID-19 patients are managed or other high risk areas during the two weeks before the blood donation. Finally, the donors were asked if they were visited by a doctor. If the donor had been visited by a doctor, the diagnosis of the doctor as well as the result of paraclinical tests would have been asked. Eventually based on the information obtained, donors were categorized into three groups: laboratory-confirmed, suspected, and irrelevant. Laboratory-confirmed cases are those who have documentation of a positive nasopharynx PCR tests. Suspected cases are donors who have had clinical symptoms related to COVID-19 but have not undergone laboratory tests or have had negative test results. Irrelevant cases are donors whose clinical symptoms were due to other causes.

2.3. Patient follow-up

If the blood component collected from laboratory-confirmed donors was released, the receiving hospital would be notified and asked to recall the component recipient. In case the blood component has been administered to the patient, the clinical physician would be informed and asked to review the patient's medical documents for any symptoms associated with COVID-19 at the time of blood transfusion or hospitalization. Then the physician notifies the blood recipient on the component recall. Consequently, the clinical history of the blood recipient is evaluated and they undergo physical exam and if consented, a laboratory test for antibodies or a PCR is performed in terms of time lapse.

2.4. Ethical consideration

The project was approved by the Ethics Committee of the High Institute for Research and Education in Transfusion Medicine. (IR.TMI.REC.1399.001)

2.5. Statistical analysis

Statistical analyses were carried out with SPSS software [SPSS 22, SPSS Inc, Chicago, IL]. The frequencies and percentages of demographic data were described. Data with normal distribution analyzed by parametric test and data with abnormal distribution were analyzed by nonparametric test. A p value of less than 0.05 indicates that a difference is significant.

3. Results

The results of this study demonstrate that 62,026 blood donors were registered from January 21 st 2020 through April 9th 2020 in Tehran Blood Center. These data showed that 52 blood donors (0.08 %) had callbacks with 30 (0.046 %) of whom reporting the possibly of becoming COVID-19 infected. While the data for the similar period in the preceding year during 21 January 2019 to 20 April 2019 showed 78,326 blood donations with 56 cases (0.07 %) of callbacks 21 (0.026 %) of whom reporting respiratory infection symptoms. (Table 1)

Table 2 shows that there is no significant difference in COVID-19 callback frequency rates as compared to different age groups, gender, and donation status. The results showed that the most reported reason for callback among donors was suspected symptoms of the common cold ($P = 0.039$). (Table3) The time interval from blood donation to callback ranges from less than 2 days in 18 blood donors (60 %), from 2−7 days in 8 (26.7 %), and more than 7 days in 4 (13.4 %) ($P = 0.03$) (Table3).

A total of 17 Platelet Concentrate (PC) components, 26 plasma components, and 26 RBC components were processed from whole blood of 30 donors with COVID-19-related callback reports and 4 whole blood were disposed before processing.

Since most donors (83.13 %) had a callback of less than 7 days, a high rate of blood components (76.63 %) were disposed; out of the remaining components (23.33 %) ($P = 0.015$), 5 units of PC and two units of RBC were released (Table3).

The telephone interview was made with all 30 blood donors with COVID-19 related callback status. One (3.33 %) donor did not respond to the phone call. Based on their answers one (3.33 %) was assigned to the laboratory-confirmed group, 19 blood donors (63.33 %) were classified as the suspected group, and 9 donors (30 %) were classified as the irrelevant group (Fig. 1). The details about the history of donor with COVID-19 related callback report is shown in Table 4.

The history obtained from the laboratory-confirmed donor showed that she was a 37 year-old repeated donor. She worked in hospital as a nurse and has dealt with the infected person in the family since a few days before blood donation. She donated blood in 8 April 2020. In a telephone interview, she stated that she had lost her sense of taste since

Table 1
Frequencies of Blood Donation and Callbacks related to Respiratory Symptoms.

Time period	Donation Number	Callback Number (%)	Respiratory Infection Related Callback (%)	P value *
2019 January 21–2019 April 20	78,326	56(0.07)%	21(0.026 %)	0.1
2020 January 21–2020 April 9	62,026	52(0.08 %)	30(0.046 %)	

* Comparison between respiratory infections related callbacks in two time periods.

Table 2
Frequency of total and COVID-19 related callbacks by sex, donor status, and age group.

Variables		Blood Donations **N**	Call back **N** (%)	COVID-19 Related **N** (%)	P value *
Gender	Male	58,936	49(0.083 %)	27(0.045 %)	0.31
	Female	3090	3(0.097 %)	3(0.097 %)	
	total	62,026	52	30	
Donor status	First time	12,497	12(0.096 %)	6(0.048 %)	0.36
	Repeat	21,137	18(0.085 %)	10(0.047 %)	
	Regular	28,392	22(0.057 %)	14(0.036 %)	
	Total	62,026	52	30	
Age groups (years)	<24	4310	6(0.13 %)	4(0.092 %)	0.41
	25–34	15,768	18(0.11 %)	13(0.082 %)	
	35–44	21,157	18(0.085 %)	9(0.042 %)	
	45–54	15,406	8(0.051 %)	4(0.025 %)	
	55–64	5368	2(0.037 %)	0	
	>65	17	0	0	
	total	62,026	52	30	

* Compare the percentage of callbacks related to COVID-19.

23 March 2020 but no further investigation had been performed. She was screened at her workplace in hospital accidentally and the PCR test result was positive despite the absence of respiratory symptoms. Since she had done the callback 24 days after donation, her RBC unit was released to a hospital on 2020 April 15.

Further investigation showed that the patient receiving the product was a two-day-old male newborn with congenital heart disease (pulmonary stenosis) having undergone preoperative echocardiography and angiography at the time of admission. Four days later, at the age of six days old, one unit of RBC was administered to him during surgery. The hemoglobin range varied between 13.9–15.1 gr/dl and CRP: 6–9 mg/dl WBC: 9300–11300/μl, neutrophil percentage 35.6-75 %, lymphocyte percentage 19.8–45.8 %, and monocyte 4.8–18.1 %. The patient after receiving RBC unit did not show any signs or symptoms related to COVID-19 and the hematological parameters did not change significantly. He was referred to the clinic in a good general condition in the follow up 46 days after being administered the RBC and never had symptoms related to COVID-19. No symptoms related to the COVID-19 were observed in any of his family members either. However, the patient did not consent to the confirmatory laboratory tests.

4. Discussion

This study reveals 52 donors had a callback from January 21st 2020 through April 9th 2020. The results demonstrate that there is no significant difference between the frequencies rates of total callbacks registered compared to the same time in the preceding year (0.08 % vs. 0.07 % respectively). However, callback frequency rates related to respiratory infection showed a 19 % increase in the current year (38 % vs 58 %).

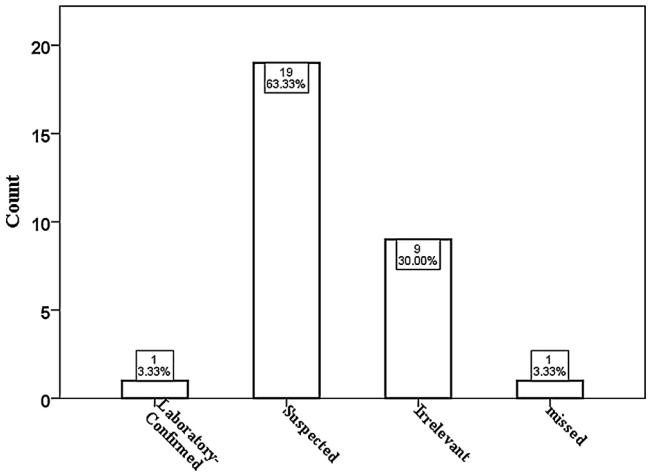

Fig. 1. Frequency and percentage of donors with COVID-19 related callback status.

Table 3
Comparison of donors with the callback related to respiratory symptoms within different study variables.

		Laboratory Confirmed	Suspected	Irrelevant	Total	P value*
Gender	Male	0 (0%)	17 (62.9 %)	9(33.33 %)	27 (100 %)	0.043
	Female	1 (33.33 %)	2 (66.66 %)	0 (0%)	3(100 %)	
	Total	1(9%)	19 (63.2 %)	9 (30 %)	30(100 %)	
Call back reason	Antibiotic	0 (0%)	0(0%)	5(100 %)	5(100 %)	0.039
	Common Cold	1(4%)	19 (76 %)	4 (16 %)	25(100 %)	
	Total	1(9%)	19 (63.2 %)	9 (30 %)	30(100 %)	
Donation Status	First time	0 (0%)	5(83.3 %)	0 (0%)	6(100 %)	P> 0.05
	Repeated	1(9%)	6(54.5 %)	4 (36.5 %)	11(100 %)	
	Regular	0 (0%)	8 (61.5 %)	4 (30.7 %)	13(100 %)	
	Total	1(9%)	19 (63.2 %)	8 (26.67 %)	30(100 %)	
Donation- Callback Interval (Day)	<2	0 (0%)	9 (50 %)	8 (44.44 %)	18(100 %)	0.03 (1 vs 3)
	2–7	0 (0%)	7(87.5 %)	0 (0%)	8 (100 %)	
	>7	1(25 %)	3(75 %)	0 (0%)	4 (100 %)	
	Total	1(3.3 %)	19 (63.2 %)	8 (26.67 %)	30(100 %)	
Component Status	Disposed	0 (0%)	13(56.5 %)	9 (39 %)	23 (100 %)	0.015
	Released	1(14.2 %)	6(85.7 %)	0 (0%)	7(100 %)	
	Total	1(3.3 %)	19(63.2 %)	9 (30 %)	30 (100 %)	
Age groups	<24	0 (0%)	1(50 %)	1(50 %)	2(100 %)	P > 0.05
	25–34	0 (0%)	9(64 %)	5(35.7 %))	14(100 %)	
	35–44	1(10 %)	6(60 %)	2 (20 %)	10(100 %)	
	45–54	0 (0%)	3(75 %)	1(25 %)	4 (100 %)	
	55–64	0 (0%)	0 (0%)	0 (0%)	0 (0%)	
	64<	0 (0%)	0 (0%)	0 (0%)	0 (0%)	

* Comparison of the sum of confirmed and suspected positive percentages according to different variables of sex, cause of callback, donation status, time interval from donation to callback, product status and age.

Table 4
Demographic characteristics, Donation Product, and Outcome of Donor Interview with Callback Probably Related to COVID-19.

Case	Gender	Age	Callback Reason	Donation Status	Donation -Callback Interval* (Day)	Produced Blood Components	Product Status	Result of interview
1	Male	34	Antibiotic	Regular	0	Plasma/RBC/PC	PC / RBC / Plasma Disposed	Irrelevant (urinary tract infection)
2	Male	40	Common Cold	Regular	0	Plasma/RBC/PC	PC / RBC / Plasma Disposed	Not response
3	Female	24	Common Cold	First Time	0	Plasma/RBC/PC	PC / RBC / Plasma Disposed	Suspected
4	Male	37	Common Cold	Repeat	0	Plasma/RBC/PC	PC / RBC / Plasma Disposed	Suspected
5	Male	30	Common Cold	Repeat	1	Plasma/RBC	PC / RBC / Plasma Disposed	Irrelevant
6	Male	32	Common Cold	Regular	2	Plasma/RBC/PC	PC Released/ RBC / Plasma Disposed	Suspected
7	Male	28	Common Cold	First Time	1	Plasma/RBC/PC	PC / RBC / Plasma Disposed	Suspected
8	Male	46	Antibiotic	Regular	1	None	Whole Blood Disposed	Irrelevant (Acne)
9	Male	35	Antibiotic	Regular	0	Plasma/RBC/PC	PC / RBC / Plasma Disposed	Irrelevant (Acne)
10	Male	34	Common Cold	Regular	1	None	Whole Blood Disposed	Suspected
11	Male	43	Common Cold	Repeat	2	Plasma/RBC/PC	PC / RBC / Plasma Disposed	Suspected
12	Male	31	Common Cold	Regular	1	Plasma/RBC	PC / RBC / Plasma Disposed	Suspected
13	Male	38	Antibiotic	Repeat	0	None	Whole Blood Disposed	Irrelevant (intestinal- H. PYlori)
14	Male	41	Common Cold	Regular	6	Plasma/RBC/PC	PC Released RBC / Plasma Disposed	Suspected
15	Male	28	Common Cold	Regular	1	Plasma/RBC/PC	PC Released/ RBC / Plasma Disposed	Suspected
16	Male	34	Common Cold	Regular	3	Plasma/RBC	PC / RBC / Plasma Disposed	Suspected
17	Male	21	Common Cold	First Time	0	None	Whole Blood Disposed	Irrelevant
18	Male	25	Common Cold	Regular	0	Plasma/RBC/PC	PC / PRBC / Plasma Disposed	Irrelevant
19	Male	26	Common Cold	Regular	2	Plasma/RBC/PC	PC / RBC / Plasma Disposed	Suspected
20	Male	25	Common Cold	First Time	1	Plasma/RBC/PC	PC / RBC / Plasma Disposed	Suspected
21	Male	27	Common Cold	Repeat	2	Plasma/RBC/PC	PC / RBC / Plasma Disposed	Irrelevant
22	Male	50	Common Cold	First Time	1	Plasma/RBC/PC	PC / RBC / Plasma Disposed	Suspected
23	Female	54	Common Cold	Repeat	0	Plasma/RBC/PC	RBC / PC Released	Suspected
24	Male	28	Antibiotic	Repeat	1	Plasma/RBC	PC / RBC / Plasma Disposed	Irrelevant (intestinal- H. Pylori)
25	Male	40	Common Cold	Repeat	5	Plasma/RBC/PC	PC Released RBC / Plasma Disposed	Suspected
26	Female	37	Common Cold	Repeat	24	Plasma/RBC	RBC Released / Plasma Disposed	Laboratory-confirmed
27	Male	38	Common Cold	First Time	24	Plasma/RBC	RBC Released/ Plasma Disposed	Suspected
28	Male	30	Common Cold	Repeat	9	Plasma/RBC	PC /RBC /Plasma Disposed	Suspected
29	Male	49	Common Cold	Repeat	9	Plasma/RBC	PC /RBC /Plasma Disposed	Suspected
30	Male	39	Common Col d	Regular	2	Plasma/RBC	PC /RBC /Plasma Disposed	Suspected

* The time interval between blood donation and callback made by the donor.

The results also revealed that there are no significant differences in the COVID-19 related callback in different genders, age groups, and donor status but a slight increase of the callback rate was seen in the female and younger blood donors. Considering that the COVID-19 rate in Iran is higher in men than women [8], this may pertain to the more care exerted by female blood donors in reporting information related to COVID-19 due to the sensitivity of the issue.

Further investigation showed that (83.13 %) of the blood donors had reported symptoms in less than 7 days after blood donation and this has caused most of the blood components (76.63 %) to be disposed. Among the seven released blood components (23.33 %), 5 (16.6 %) components were platelets, which were released quickly due to short half-life. Also, 2 units of RBC one of which collected from a confirmed COVID-19 donor was released due to a 24-day delay in the callback.

Evidence from this study showed that the COVID-19 confirmed blood donor was affected without showing any respiratory symptoms and was diagnosed during random screening. A noteworthy point about her is the loss of sense of taste 20 days before blood donation. It seems that these symptoms were ignored probably because of not being included in donor history questionnaire. It seems asking questions about more symptoms associated with COVID-19 such as loss of smell and taste could be effective because it may be the only trace of the disease in some donors.

The result of this study showed that a patient who received blood component collected from confirmed cases of COVID-19 never had a fever or respiratory symptoms during the hospital admission and the pursuing 46 days. In this regard, a similar study was conducted by Kwon SY, which identified seven confirmed COVID-19 donors after blood donation. This study showed that one patient died of non−COVID-19-related diseases and the other eight recipients did not show any symptoms of COVID-19 for 29 days after receiving blood components [2]. In this regard, many studies have been conducted to discover the transmission of coronaviruses such as SARS and MERS through blood components. These studies have shown that in the absence of clinical symptoms, it is not possible for the virus to be transmitted through blood components [3,4].

The most important strengths of this study were its ability to evaluate the callback system of blood transfusion. However, this study had some limitations the most important of which being the impossibility of following up on suspicious cases due to the possibility of causing concern in patients. Furthermore, the results were limited because of its being conducted just in one province of the country.

In summary, the blood transfusion callback system was shown to be effective in highly disposing of the blood components prepared from blood donors with COVID-19 related callback reports. Finally, patient follow-up did not raise the possibility of transmission of the virus through blood components.

CRediT authorship contribution statement

Sahar Balagholi: Formal analysis, Methodology, Writing - original

draft, Data curation, Investigation. **Mahtab Maghsudlu:** Conceptualization, Methodology, Investigation, Writing - review & editing. **Sedigheh Amini-Kafiabad:** Validation, Methodology, Writing - review & editing. **Amir Masoud Nazemi:** Data curation, Investigation, Writing - review & editing. **Maryam Sotoudeh Anvari:** Investigation, Validation.

Declaration of Competing Interest

The authors declare no conflict of interest.

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