

Dangerous shortage of blood banks as an indirect effect of SARS-CoV-2: An obstetrics perspective

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Abstract

Objective: To describe the impact of the SARS-CoV-2 pandemic on the frequency of blood donation (BD) in a Latin American hospital and how the social isolation policy implemented during the pandemic jeopardizes the quality of postpartum hemorrhage (PPH) care due to shortages at blood banks (BB).

Methods: A retrospective, descriptive study was conducted, lasting for 31 months, including the start of the pandemic. Frequency of BD and the use of obstetric emergency services was observed.

Results: A direct relationship was observed between the pandemic and a decrease in BD. Although emergency obstetric visits decreased, the frequency of deliveries and cases of PPH remained unchanged. After applying strategies to promote voluntary BD, a very slight increase was observed in the frequency of BD, with a negative indicator persisting between donation and blood demand.

Conclusion: The SARS-CoV-2 pandemic has led to shortages at BBs. In this context, typical measures to encourage an altruistic attitude toward BD have not had a significant impact. As causes of PPH continue, quality of care may be affected by the current situation at BBs. Governments and institutions must implement new strategies to motivate BD.

KEYWORDS

Blood donation; COVID-19; Postpartum hemorrhage; SARS-CoV-2

1 | INTRODUCTION

The SARS-CoV-2 pandemic has generated a global crisis of a magnitude as yet undetermined. The economic and health impacts are difficult to estimate because there are several unmeasured and often overlooked effects in other pathologies.¹ In the field of maternal mortality, a reduction in health coverage from 18.5% to 9.8% has been estimated, which will result in a total of 12 200 additional maternal deaths over a 6-month period.²

Postpartum hemorrhage (PPH) is the leading cause of maternal mortality. However, 95% of these deaths are preventable. The availability of an adequate blood bank infrastructure is paramount for increasing the chance of survival after PPH.³ Although it is essential to ensure the adequate provision of blood products that are obtained from voluntary blood donors, social isolation policy and stay-at-home orders could affect the frequency of donations and therefore the availability of blood products.

The aim of the present study was to describe the impact of the pandemic and stay-at-home orders on the frequency of blood donation in

a Latin American hospital and how this situation jeopardizes the quality of care of severe obstetric hemorrhage.

2 | METHODS

A retrospective review was performed of the blood bank information management system at Fundación Valle del Lili (FVL), University Hospital in Cali, Colombia, between January 2018 and July 2020. The information on blood donations was collected directly from Hexabank (Tharsis-it®) and included the frequency and type of blood product donated and transfused.

The FVL blood bank routinely collects blood products either directly at the blood bank facility (BBF) or using a mobile blood donation unit (MBDU). During the pandemic, the MBDU visited blood donors at their place of residency to maintain social isolation and avoid contact by blood donors with people outside their household in a hospital setting.

The frequency of blood donations was estimated on a monthly basis for the study period. In addition, the frequency of transfusions was estimated, with a special interest in those in the obstetric service and operating rooms.

In late March 2020, a marked decrease in blood donors was observed in FVL in relation to the SARS-CoV-2 pandemic; therefore, the following strategies were implemented to ensure the response to institutional demands for blood products⁴:

1. The modification of the physical spaces in the MBDU and BBF by increasing the distance between patients.
2. The publication and dissemination of biosafety protocols to the general public in donation areas.
3. An advertising campaign on blood donation within the FVL aimed at employees of the institution.
4. An advertising campaign on blood donation via social networks and regional media aimed at the general population.
5. Changes in the collection dynamics of the two FVL MBDUs, which before the pandemic had moved to locations where a large number of donors were expected (universities, schools, and companies among others) so that they could be mobilized to any location in which an individual expressed an interest in donating (door-to-door collection).
6. The launch of the emergency program ("S.O.S.") by the blood bank.
7. Draws among blood donors to promote voluntary and altruistic donation and to commemorate World Blood Donor Day on June 14.
8. Supply of red blood cell units (RBCU) from other institutions.

To evaluate the demand for transfusions in the obstetric population served in FVL during the SARS-CoV-2 pandemic, the frequency of the use of obstetric services was also evaluated, specifically the number of emergency obstetric consultations, births, and cases of PPH and placenta accreta spectrum (PAS). For this purpose, the discharge records of the obstetric unit of FVL were reviewed.

2.1 | Statistical analysis

A descriptive statistical analysis was performed. Categorical variables were expressed as percentages. All data were analyzed using the statistical package Stata version 14.0 (StataCorp., College Station, TX, USA). The present study was approved by the FVL Institutional Review Board.

3 | RESULTS

Figure 1 illustrates the number of blood donations received at the FVL BBF and MBDU. In 2018 and 2019, the number of packed RBCUs donated in the FVL BBF was in the range of 200–400 per month, while the donations obtained in the MBDU approached 600 units, for a total range of 800–1000 RBCUs between the two collection sites (BBF plus MBDU). In addition, in April and October, mass donation days were held in university institutions, obtaining a higher number of donations in the MBDU.

Considering all donations collected each year, in 2018 and 2019, 71.3% and 73.3% of donations were obtained in the MBDU, respectively.

On March 25, 2020, a mandatory nationwide "stay-at-home" preventive isolation order was established in Colombia.⁵ Because of this, irregular behavior regarding blood donation in 2020 was observed, with the months from January to March seeing a donation frequency almost identical to those of the same months of the previous 2 years.

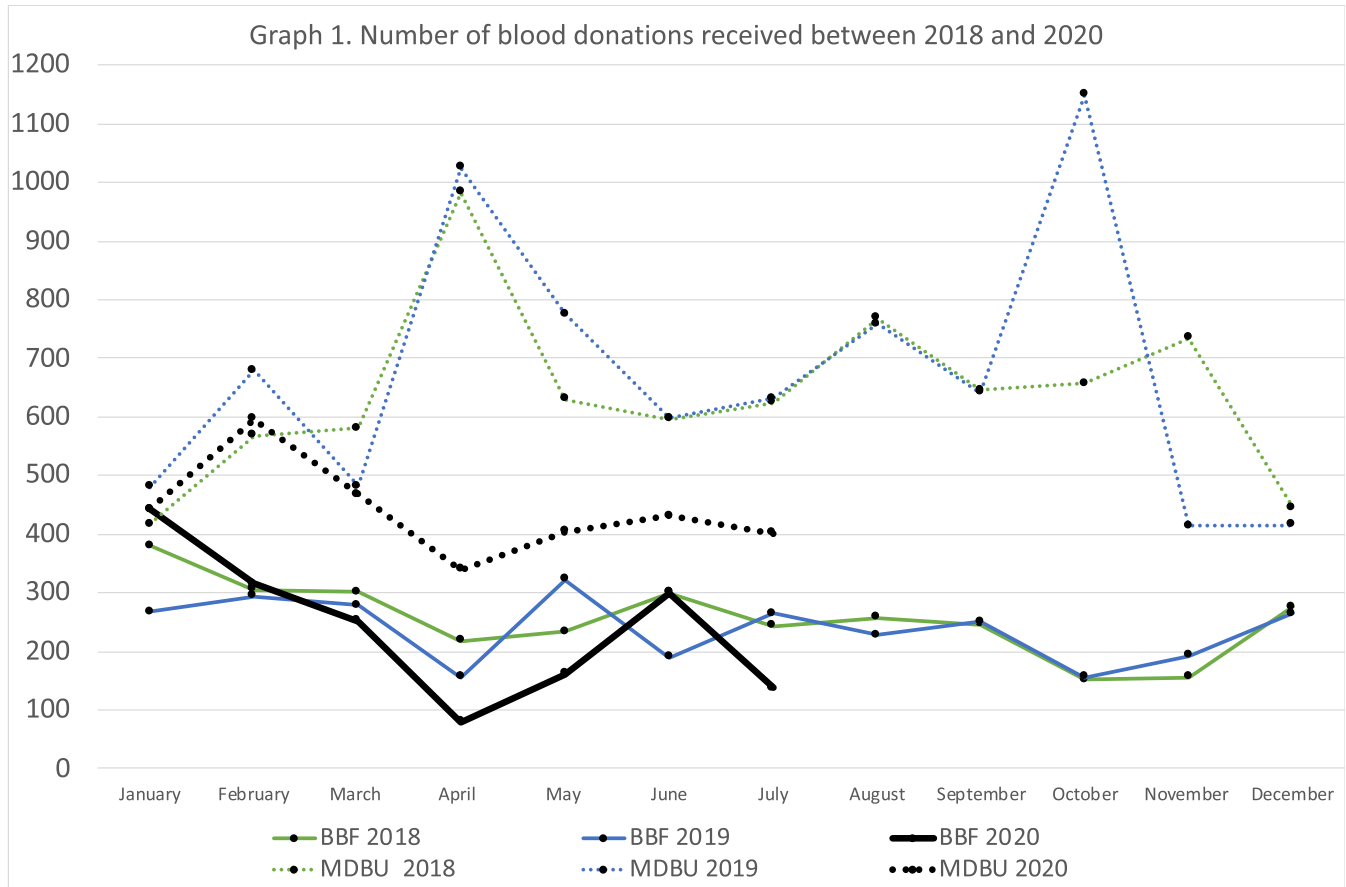
In April 2020, a sudden drop in the frequency of donations was seen, with 79 RBCUs collected in the BBF and 340 RBCUs in the MBDU (for a total of 419 RBCUs). This was the lowest collection rate in the 31 months evaluated, representing a decrease of 65.1% and 64.1% compared to the 1201 RBCUs obtained in April 2018 and the 1182 RBCUs obtained in the same month of 2019, respectively.

May 2020 saw a slight increase in the frequency of blood donations, reaching a total of 565 RBCUs (an increase of 34.8% compared to April 2020). In June, a marked increase in donations was observed, reaching numbers similar to those of March 2020 (731 RBCUs). In July 2020, a severe drop in donations recurred.

Figure 2 illustrates the RBCU transfusions performed in FVL during the study period. In 2018 and 2019, approximately 1000 RBCUs per month were transfused. Between January 2020 and March 2020, that number fell to a median of 884 RBCUs, whereas it dropped sharply to 612 RBCUs in April and increased to an average of 841 RBCUs between May and July.

The bottom of Figure 2 describes the number of RBCU transfusions in the FVL obstetric unit and operating rooms, which was similar to that of the entire institution. The number of transfusions was markedly reduced in April and recovered to values similar to those of the first months of the year in the operating rooms while remaining at low levels in obstetrics services.

The relationship between blood donations and RBCU transfusions has been negative since March (−69 RBCUs), with increasingly alarming results in May (−333 RBCUs) and July (−296 RBCUs).



Blood donations 2020 (RBCU)	January	February	March	April	May	June	July
BBF 2020	443	315	252	79	161	300	137
MBDU 2020	442	596	468	340	404	431	402
Total donations	885	911	720	419	565	731	539
Supply from other blood banks	43	54	48	241	280	151	198

FIGURE 1 Number of blood donations received between 2019 and 2020. Donations at the BBF and those received at the MDBU are distinguished. The grid shows detailed for the months of January to July 2020, as well as the number of RBCUs acquired from other blood banks. Abbreviations: BBF, blood bank facility; MDBU, mobile blood donation unit; RBCU, red blood cell units.

Thus, the accumulated potential deficit of RBCUs grew gradually from March (−69 RBCUs) to July (−951 RBCUs). Due to the supply of RBCUs from other blood banks (54, 48, 241, 280, 151, and 198 RBCU in the months of February, March, April, May, June, and July, respectively), the actual inventory of RBCUs in the FVL's blood bank was higher than 100 available units for the rest of 2020, with 101 RBCUs available in July 2020 (Fig. 2, bottom).

Figure 3 shows the frequency of the use of FVL obstetric services. There were 535, 416, and 436 urgent obstetric consultations in January, February, and March, respectively.

The consultations drop to 337 and 373 in April and May, with a return to frequencies similar to those observed before the pandemic in June and July (426 and 477, respectively). The number of births and cases of PPH did not show significant variation in the first 7 months of 2020 (Fig. 3). During the study period, eight patients with PAS

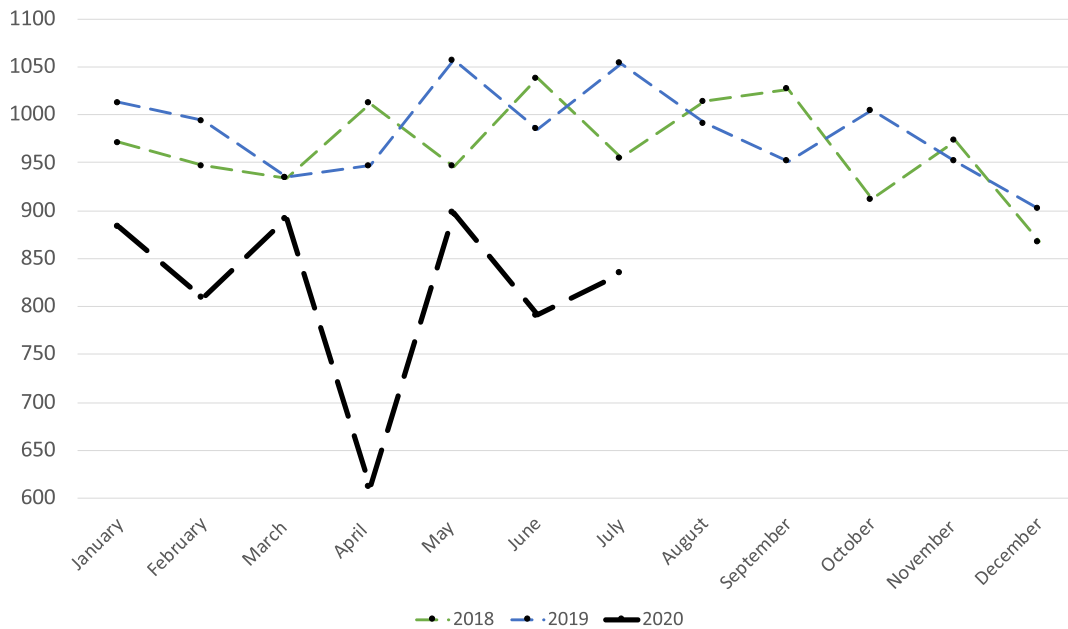
were treated: three in February, three in March, and one each in June and July.

4 | DISCUSSION

A decrease was observed in the frequency of blood donation during the SARS-CoV-2 pandemic, which, in April 2020, showed the lowest level of the 31 months evaluated (45.88% of that collected in the same month in 2019).

After applying strategies to promote voluntary blood donation among FVL workers and the general community in April and May, a very slight increase was observed in the frequency of blood donation (34.8% increase in May compared to April), with a negative indicator persisting between blood donation and demand (−595 RBCUs).

Graph 2. Red Blood Cell unit transfused between 2018 and 2020



Transfusions 2020 (RBCU)	January	February	March	April	May	June	July
Total FVL transfusions	884	809	892	612	898	791	835
Obstetric department transfusions	33	46	24	19	15	15	18
Operating room transfusions	174	124	173	83	159	143	111
Donations - transfusions monthly Indicator	1	102	-172	-193	-333	-60	-296
Possible RBCU accumulated deficit	+1	+103	-69	-262	-595	-655	-951
Actual RBCU monthly inventory	188	258	173	205	172	244	101

FIGURE 2 RBCUs transfused between 2018 and 2020. The grid details the transfusions in the months of January to July 2020. The total transfusions in the FVL and transfusions in operating rooms and the obstetric department are detailed. The relationship between donations and transfusions are described month by month (donations - transfusions monthly indicator), as well as the possible RBCU accumulated deficit (the result of subtracting transfusions from donations each month). The last row describes the actual monthly inventory of RBCU. Abbreviations: FVL, Fundación Valle del Lili University Hospital; RBCU, red blood cell unit.

The highest increase in donations among FVL workers (in the BBF) was observed during the commemorative activities of World Donor Day in June. However, they had a transitory effect, and in July, there was again a large decrease in the frequency of donations.

In April, 612 RBCUs were transfused; at the same time, 419 RBCUs were collected (79 RBCUs in the BBF and 340 RBCUs in the MBDU), which justified the increase in the supply of RBCUs from external blood banks by 5- to 6-fold (48 units obtained in March, 241 units obtained in April, and 280 units obtained in May) as the only strategy to meet the needs of the institution.

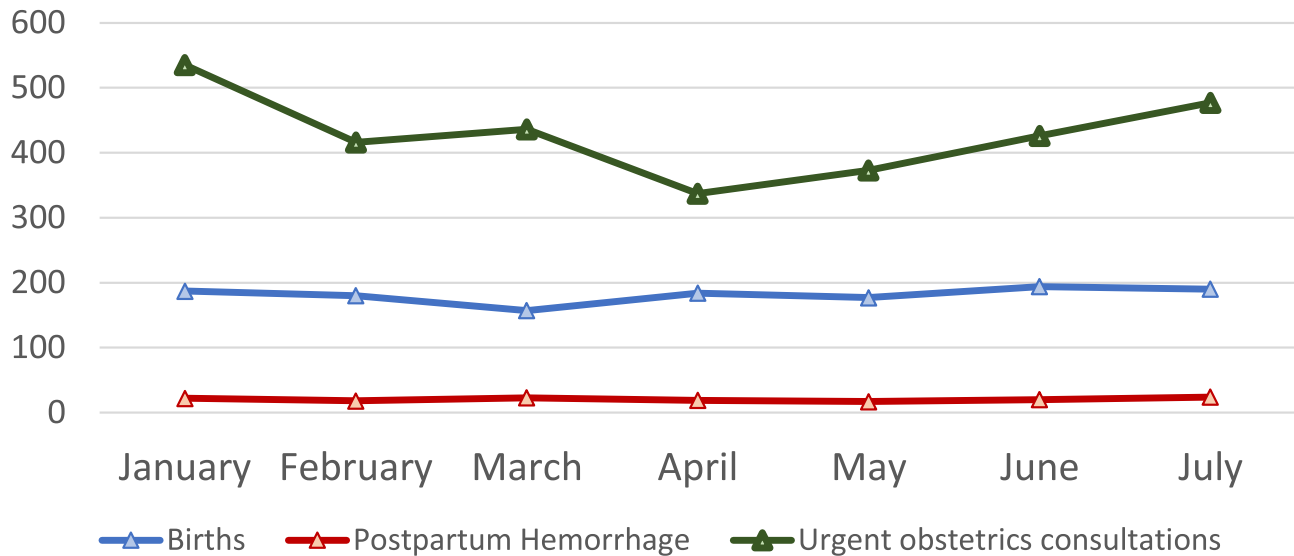
The current "blood bank crisis" has been reported on almost all continents^{4,6-8} and has prompted the proposal of extraordinary measures, such as facilitating the mobility of blood donors during mandatory confinement,⁹ performing triage in cases requiring massive transfusion,¹⁰ making calls from scientific associations at the regional level,¹¹ and even considering the obligatory nature of blood donation amid the health crisis.¹² This complex issue and the difficult decisions necessary to overcome it have led to a debate about

necessary public healthcare from economic, sociological, and even legal points of view.⁹

A factor that has mitigated the blood bank crisis is the decrease in the frequency of transfusions by 30.7% in April 2020 compared to that in previous months. This decrease was probably due to the cancellation of elective surgical procedures and the reduced occurrence of trauma-emergent consultations due to mandatory confinement. Regarding obstetric activities at the study institution, a 22.7% decrease was observed in urgent consultations in obstetric services in April (with a progressive increase in the number of consultations between May and July), but the volume of births and number of cases of PPH remained unchanged during the pandemic (Fig. 3). The above aspects make it clear that although urgent visits decreased temporarily, severe obstetric pathologies that result in PPH with high requirements for transfusion remained unchanged, and if blood donation decreases, the problem of scarce blood supplies will be increased.

Fortunately, the obstetric pathology most related to transfusions did not appear to be high in the months with the least number of blood

Graph 3. Frequency of use obstetric services during 2020



Frequency of use of obstetric services during 2020	January	February	March	April	May	June	July
Births	187	180	157	184	177	194	190
Postpartum hemorrhage	22	18	23	19	17	20	24
Urgent obstetrics consultations	535	416	436	337	373	426	477
PAS	0	3	3	0	0	1	1

FIGURE 3 Frequency of use of obstetric services during 2020. Abbreviation: PAS, placenta accreta spectrum.

donations, and only eight cases of PAS were identified in 2020 (only two of them after April 2020).

The blood donation and RBCU transfusion balance must be monitored daily by the blood bank. The average number of available RBCUs considered as a critical threshold in the study institution is 100 RBCUs. Although other institutions accept a different number, the requirements for the care of a single patient with PPH due to PAS can deplete blood reserves rapidly since as many as 40% of cases require massive transfusions, with patients demanding up to 46 units of RBCU.¹³ Similarly, the prevalence of 7.5% of irregular antibodies in patients with PAS requires the availability of a large number of RBCUs to maintain safety during a transfusion.¹⁴

Although the exclusion of donors as a precaution and the national mandatory confinement partly explain the reduction in the blood bank

inventory,⁹ the most frequently mentioned reason for not donating blood is the fear of acquiring SARS-CoV-2 during the donation.¹⁵

The cancellation of extramural campaigns using the MBDU was the most striking factor in the low frequency of donations. Under normal conditions, 80% of blood donations are collected by the MBDU, whose operation is subject to cancellation or reduced operation if the interest or support of the general population decreases.¹⁶ The American Red Cross estimated that 4600 appointments for donations were canceled immediately upon ordering mandatory confinement in the United States, with an estimated loss of 143 600 RBCUs.¹⁷ Similarly, in 2018 and 2019 in the study institution, 71.3% and 73.3% of donations, respectively, were obtained by the MBDU, whose maximum productivity occurred in 2 months each year (April and October), when massive donation days were scheduled at universities with

strategic alliances. The cancellation of collections via the MBDU for the month of April 2020 at two allied universities resulted in 686 fewer UGRE cases than in the same month of 2019.

Unlike cardiovascular surgery and transplants of solid organs, obstetric pathologies requiring transfusion cannot be deferred, which is demonstrated by the unaltered frequency of PPH during the evaluated months of 2020 (18–24 episodes per month). Although the saving of blood components by canceling elective procedures has somewhat alleviated the pressure on some blood banks,¹⁸ the frequent intraoperative PAS finding related to the failure of prenatal diagnosis failure,¹⁹ the unpredictability of uterine atony, and the frequent insufficiency of transfusion services during PPH care in pre-pandemic situations²⁰ comprise a worrying combination when thinking about the situation for patients with PPH today during the SARS-CoV-2 pandemic.

This concern becomes greater when thinking about lifting mandatory confinement orders and restarting elective surgical procedures,¹⁷ which has been done gradually in Colombia since May 2020. This has been related to an increase in the demand for transfusions but not with a greater frequency of blood donations, reaching the largest imbalance between transfusions and donations in July 2020 (–296 RBCUs).

Most maternal deaths from hemorrhage can be prevented with low-complexity interventions.²¹ The PAS is a clear example of a fatal pathology in which the availability of large amounts of blood components plays an important role. The situation in low- and middle-income countries is especially worrisome because in addition to expecting more serious consequences of the pandemic,²² the current situation of blood banks is unknown. For example, in the study environment, only 32.3% of the hospitals that care for patients with PAS report the availability of their own blood banks,²³ which may hinder intentions to apply policies reported as useful in countries with different economic situations.^{24,25}

Although some countries have made public calls for donations to prevent or resolve critically low blood inventories in blood banks,^{26,27} the response to these calls is unknown and the relevant information in regions such as Latin America is scarce.

Among the extraordinary strategies described are the active mobilization of the donor base, considering non-altruistic donation strategies, large-scale public health campaigns promoting donation as a symbol of national solidarity,^{11,28,29} or even the modification of some established criteria for the acceptance of blood donors.^{30–32} The disclosure of the positive psychological effects of donation may also be helpful in the context of the negative effects of the stay-at-home policy.^{33,34}

The truth is that blood banks must find their “new normal,” and the health of the population that requires transfusions depends on the joint efforts of society as a whole.³⁵

Maternal health, especially the care of patients with PPH and PAS, is at risk due to the side effects of SARS-CoV-2. In addition to the speed of the virus, the ability of blood banks to respond to the usual requests of hospitals depends on the attitudes that society and everyone in it have toward blood donation.

The present study has some limitations. The experience of only one hospital was represented, which implies that the present observations and recommendations have some barriers related to external validity. Multicenter studies are required for further reproducible affirmations.

5 | CONCLUSIONS

The SARS-CoV-2 pandemic has led to a shortage of blood banks, and the typical measures used to encourage an altruistic attitude toward donation have not had a significant impact. Thus, it is necessary for governments and institutions to implement effective strategies to motivate blood donation. The obstetric pathologies that cause PPH continue to occur, and the quality of their care may be affected by the current blood bank situation.

AUTHOR CONTRIBUTIONS

All authors contributed to the design, planning, data analysis, and writing of the manuscript.

ACKNOWLEDGMENTS

The authors extend special appreciation to the Clinical Research Center team of Fundación Valle del Lili (FVL), Cali, Colombia, for their support during the development of the article and Ramiro Manzano-Nunez, Harold Londoño, Andres Mauricio Castro, and the blood bank staff responsible for the enrollment of blood donors.

CONFLICTS OF INTEREST

The authors have no conflicts of interest.

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