

## Blood Supply Management During COVID-19 Pandemic and Ramadhan Fasting at a Tertiary Hospital

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### ABSTRACT

The worldwide pandemic of Coronavirus Disease 2019 (COVID-19) has a major implication for blood donation. The beginning of the pandemic occurred at the same time as Ramadhan fasting. This study aimed to evaluate blood donation, blood use trends, and several factors associated with the need for transfusion during the COVID-19 pandemic and Ramadhan fasting in Dr. Sardjito General Hospital (SGH). Information on blood donation and the use of blood components in the SGH-Blood Centre (SGH-BC) from 1 February to 30 September 2019 and 2020 were collected and analyzed. The average number of blood donations from February to September 2020 declined by 11.22% compared to the previous year. The average use of blood components from February to May 2020 also declined compared to the previous year. The decline found in this study was Packed Red Cells (PRC) by 15.43%; Thrombocyte Concentrate (TC) by 23.03%; Whole Blood (WB) by 73.64%; Fresh Frozen Plasma (FFP) by 10.56%; and Thrombocyte Apheresis (TA) by 32.87%. Two characteristics of donors remain unchanged between 2019 and 2020. Most of them were males and age younger than 25 years old. However, there was a shifting characteristic of donors in blood group, weight, and hemoglobin level. Declined number of blood donations might be caused by the pandemic situation and Ramadhan fasting. Blood usage also decreased in the early of this pandemic. The SGH-BC had modified some strategies to increase blood donation and decrease blood component use in this situation.

**Keywords:** COVID-19, fasting, blood supply, blood management, transfusion

### INTRODUCTION

In December 2019 an unknown pneumonia was discovered in Wuhan, China.<sup>1</sup> Later in late December, the pathogen causing this pneumonia was identified as a new strain of Coronavirus.<sup>2</sup> International Committee on Taxonomy of Viruses (ICTV) named this virus as 'Severe Acute Respiratory Syndrome Coronavirus 2' or (SARS-CoV-2). This virus was named by the World Health Organization (WHO) as 'Coronavirus Disease 2019' (COVID-19). On 31 January 2020, WHO declared COVID-19 a public health emergency of international concern because it has become a pandemic.<sup>3,4</sup>

The first patient confirmed with COVID-19 was reported in Indonesia on 2 March 2020 in Depok, the satellite city of the capital Jakarta. It was approximately three months after the first outbreak in Wuhan.<sup>5</sup> On 15 March 2020 or two weeks after Indonesia's first confirmed case, the first patient confirmed with COVID-19 was reported in Yogyakarta. The number of cases had been

increasing in the country since then. On the last day of May, a total of 26,473 cases were confirmed. In this period, Yogyakarta, which is located approximately five hundred km from Jakarta, had 238 confirmed cases.<sup>6</sup>

To limit the spread of the disease, many countries including Indonesia had enforced partial 'lockdown' and social distancing. Since the last day of March, local governments closed many public places except those considered essential. This included social, educational, and entertainment venues. The Indonesian government also enforced a travel ban until 7 June due Eid holiday tradition (a religious holiday celebrated by Muslims after Ramadhan fasting).<sup>7</sup> Currently the lockdown policies have been relaxed, exempting international travel, some entertainment venues, and large gatherings. Our hospital was one of the government healthcare providers. Dr. Sardjito General Hospital (SGH) was a tertiary and the biggest hospital located in Yogyakarta that has its blood center (SGH-BC).

The COVID-19 pandemic affected blood

collection in many countries including Indonesia. The unprecedented pattern of this pandemic has caused concern in blood centers.<sup>8,9-11</sup> Most of their concern was not only blood supplies during this pandemic, but also the blood transfusion system itself.<sup>12-15</sup> It was important to share experiences based on blood transfusion services during this pandemic. Transfusion professionals need to understand the nature of the emergency and its effect on transfusion services.<sup>8</sup> this study aimed to evaluate blood donation and blood use trends during the COVID-19 pandemic and Ramadhan fasting in SGH, and identifies factors associated with the need for transfusion.

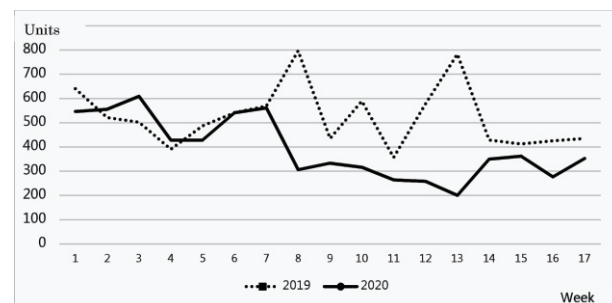
## METHODS

Blood donation numbers in SGH-BC from 1 February to 30 September 2020 and the same time in the year 2019 were collected. The number of blood uses from 1 February to 30 May in each time was also collected. All the procedures were reviewed and approved by the Medical and Health Study Ethics Committee, Faculty of Medicine Public Health and Nursing, Universitas Gadjah Mada/Dr. Sardjito General Hospital with ethics committee approval number KE/FK/1228/EC/2020. All of the data were provided by the SGH-BC through the blood donation and supply system. Blood use data were obtained by query search of electronic medical records and laboratory information systems. These data were tabulated and analyzed in spreadsheet (Excel, Microsoft, Redmond, WA) software. Descriptive analysis was used to characterize the data. All the procedures were reviewed and approved by the local ethics committee.

## RESULTS AND DISCUSSIONS

In SGH-BC the average number of blood donations from February to September was 503 units a week in 2019 and 422 units in 2020. This number indicated that blood donation in 2020 declined by 11.22%. In the first and second weeks after the first COVID-19 outbreak in Indonesia (week five) the number of blood donations remained increased, similar to that of between week two and week six. The average number of blood donations increased by 9.13% in these five weeks. In week seven the number of blood donations in SGH-BC was starting to decline. The most dramatic decline was found in week thirteen, in which only about one-four from the same period of 2019. The number of donors dropped from 783 blood donations in 2019 to 200

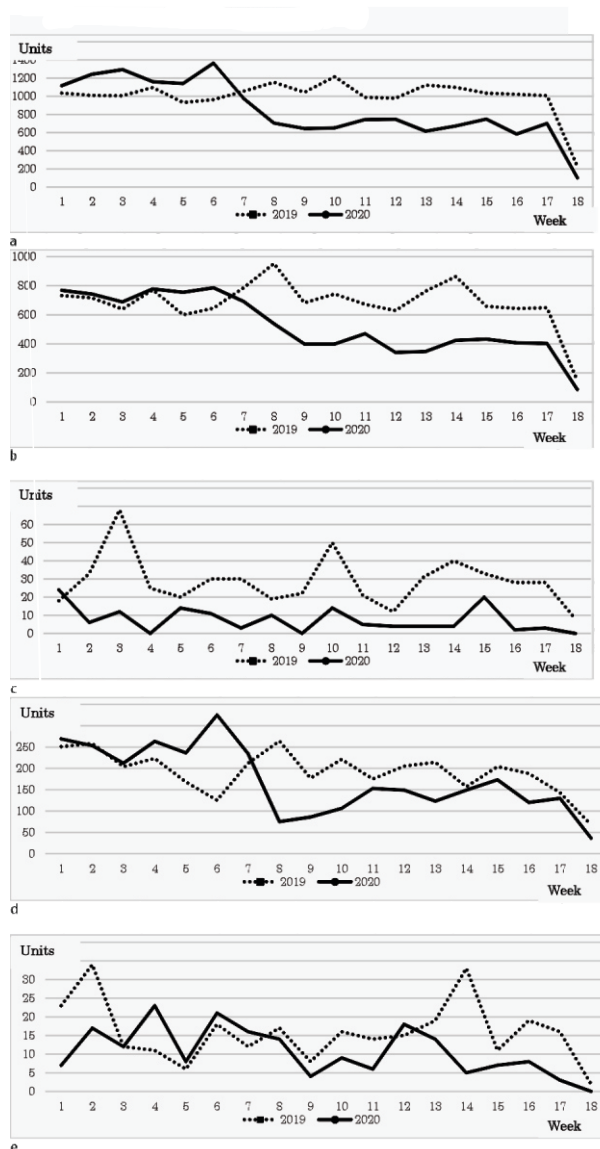
blood donations in 2020. In 2019 Ramadhan fasting began from 5 May to 4 June (week fourteen until eighteen) and from 23 April to 23 May 2020 (week eight until twelve). Of note during the weeks eighteen and nineteen of 2019 included in this study, there was a prolonged Islamic holiday (Eid Al-Fitr). In this period blood donations usually decrease. This decrease caused blood donation trends in 2020 to increase dramatically by 58.64%. From week twenty-one until twenty-eight, the number of donors in SGH-BC was just starting to increase again, with an average of 5.33%. From week twenty-nine until thirty-four, the number of donors in SGH-BC decreased again, with an average of 24.95% (Figure 1).



**Figure 1.** The gap between donors by week from 1 February to 30 September 2019 vs. 2020 (2019: dotted line, 2020: straight line)

This study found a decrease in the average use of blood components. This decrease included Packed Red Cell (PRC), Thrombocyte Concentrate (TC), Whole Blood (WB), Fresh Frozen Plasma (FFP), and Thrombocyte Apheresis (TA) from March to May 2020 vs 2019 (Figure 2). Total blood components used for PRC in 2020 and 2019 were 192 and 286, for TC were 9.457 and 12.286, for FFP 3.092 and 3.457, for WB 36 and 516, for TA 15.204 and 17.978. This number in 2020 decreased by 15.43% for PRC, 23.03% for TC; 73.64% for WB; 10.56% for FFP; and 32.87% for TA compared to 2019. Except for WB, the decreased use of all blood components started at week seven of this study (Figure 2).

The COVID-19 pandemic gave a big impact on the blood supply. Maintaining an adequate blood supply was the most important strategy.<sup>12,16</sup> Other challenges in this pandemic were staff shortage; public, staff, and donors safety, logistics, and mobilities.<sup>15,17</sup> Thankfully, SGH-BC did not encounter any logistics and mobility problems during this pandemic. To maintain enough blood supply during this pandemic, there were some factors to consider.



**Figure 2.** Blood use in SGH each week from February to May 2019 vs. 2020 a. PRC, b. TC, c. WB, d. FFP, and e. TA. (2019: dotted line, 2020: straight line)

Transfusion Professionals need to pay attention to donor recruitment, donors eligibility, blood donation planning, logistics management, staff availability, and product safety.<sup>8</sup>

Although in weeks five and six the number of blood donations remained increased, some Indonesian still had less concern about COVID-19, assuming that it was a common pandemic just like tuberculosis. In week seven the number of blood donations in SGH-BC was starting to decline. It might probably be due to the first confirmed COVID-19 case in Yogyakarta in week seven. In this period not only the central government, focused on the prevention of COVID-19 but also local government

and private sector agencies. The decrease in blood donations was primarily caused by the unavailability of donors because of the avoidance of public places (including hospitals). Some donors assumed that the hospital was a dangerous place in which COVID-19 could spread easily. This might also be caused by the closing of workplaces and universities as the common sites for blood drives during the normal situation. Some potential donors also feared that giving blood might weaken their immune systems, making them more susceptible to COVID-19 infection. The government messages urging people to stay at home and implement social distancing are also confused. The potential donor seemed to doubt whether blood donation was safe. Furthermore, this dramatic impact is worsened by the first week of Ramadhan fasting (an annual Islamic tradition). Donors needed to adopt fasting conditions in the first Ramadhan week, resulting in a tendency not to donate blood. The month of Ramadhan was determined by the Hijri calendar, so the period will not be the same every year (Gregorian calendar). During Ramadhan month, people fast from 4 am to 6 pm, making them slightly impossible to donate blood at that hour. In this period donors did not have enough time for donating their blood. At the end of Ramadhan fasting, there was an Eid Al-Fitr holiday. This long holiday only occurs once a year, causing a tendency to decline in donor numbers. This happened because most Indonesian were too busy with homecoming. There was no Eid Al-Fitr holiday in 2020 due to the COVID-19 pandemic. The government not only tightened social distancing measurement but also implemented a partial lockdown. Almost all intercity public transport was stopped in this period.

From week twenty-one until twenty-eight the number of blood donations in SGH-BC was just starting to increase again. Although there were social distancing measures, people already adopted it as new normal behavior. This increase was primarily caused by blood donation initiatives, which were launched by the SGH-BC. For example, we had a plan to organize medical staff and family members, friends, and colleagues of patients to donate blood. This initiation was accompanied by an intense campaign through social media. Mass media education and awareness campaigns are also motivated to overcome the distraction and prejudices of the potential donor. A major campaign was given to communicate with the public, potential donors, and the staff to sustain the motivation and provide information and knowledge on how to behave professionally without increasing the risk of

infection "safe donation during the pandemic". SGH also provided a new standard operating procedure to maintain staff and public discipline, personal and operational hygiene, also routine disinfection. Thankfully, all measurements made led to positive feedback during this pandemic. The Ministry of Health also actively supported the blood establishments by the issuance of regulations on blood donation services during the COVID-19 pandemic.

From week twenty-nine until thirty-four, the number of donors in SGH-BC was just starting to decrease again. Although people already adapted to the COVID-19 pandemic, the public took additional preventive measures due to increasing confirmed cases of COVID-19 in Yogyakarta. Once again, strategies to overcome this blood donation reduction by raising public awareness about the importance of maintaining an adequate blood supply were needed. Also provided mobile donation sites outside SCH-BC while implementing COVID-19 prevention measurement. Moreover, the national armed forces also released official blood donation proposals and ordered its members to donate blood at their local blood donation sites. After a series of such measures, it was expected that the number of donations would increase again in the next few months.

The COVID-19 pandemic not only caused decreased blood supply but also blood usage.<sup>18</sup> This condition also happened in SGH-BC. Although the average number of blood donations during the COVID-19 pandemic declined in SGH-BC, it was also followed by a decreased use of the average blood component. Needed to be able to meet supply within acceptable limits of their clinical demands. This included regular recipients, particularly for thalassemia patients although blood donation shortages were about to develop. To minimize blood wastage, the hospital needed to implement new hospital policies on blood usage. In this situation, transfusion professionals needed to conserve blood and decrease blood product usage. These efforts included minimizing elective procedures, but in some locations, there was a more dramatic choice to cancel the procedures.<sup>18,10</sup> This strategy was also implemented by SGH. There was a declined requirement because SGH attempted to reduce elective surgery and non-cito surgery by postponing it. Although there was an increasing number of confirmed COVID-19 patients in SGH hospital, most of them did not need a blood transfusion. This also happened in some other countries in which a low number of blood

transfusions in COVID-19 patients was reported, even in patients who are critically ill.<sup>8,19</sup> The hospital-based blood donor centers have some benefits such as providing rapid identification of individuals who have recovered from a disease and collecting convalescent plasma, which may be one of new hope in this pandemic.<sup>10</sup> Convalescent plasma collection and use showed a growing interest globally during this pandemic; however, not all blood centers in Indonesia could run this procedure. As one of the referrals to hospital-based blood centers, SGH-BC also provided a collection of convalescent plasma from recovered COVID-19 patients.

During this pandemic, also implemented Patient Blood Management (PBM) actively. Researchers proactively concentrated on the patient's needs and conditions that usually assist in transfusion. Patient blood management moved the choice of active transfusion with allogeneic blood components as a preventive attempt to attempt to manage the patient's hemostatic state most favorably. Recommendations for transfusion should conform to general messages of restrictive use of blood.<sup>8,10</sup> During this situation transfusion professionals needed new strategies to lead rational use of blood; in this case, a new scenario of PBM was mandatory to be implemented. Patient blood management was an evidence-based strategy in which the need for blood use was managed to provide better patient outcomes despite limited resources via anemia management, bleeding/clotting risk optimization, and hemodynamic support.<sup>20</sup> PBM optimized patient outcomes by clinically managing and preserving the patient's blood. This conservation will lead to a better choice for the one who's in absolute need. Patient blood management was multi-professional and multimodality approaches; however, the stakeholders also needed to implement the practical and common-sense principles of PBM.<sup>13</sup> As a result, of this action we could decrease the blood demand and blood use during this pandemic.

Two characteristics of donors who participated in this study remained unchanged between 2019 and 2020. Most of them were males 79.72% in 2019 and 82.11% in 2020, and the majority were younger than 25 years. There was a shifting characteristic of donors in blood group, weight, and hemoglobin level (Table 1).

The capacity of the pandemic spread made some concern in blood centers, especially about blood donors. Social distancing minimized donor mobilization, which further lead to donor shortage.<sup>9,14</sup> Donors felt uncertain, about how could



**Table 1.** Donor characteristics in SGH-BC between February to May 2019 vs. 2020

	Feb-May 2019		Feb-May 2020		p
	Number	%	Number	%	
<b>Age (years)</b>					
18-25	3482	38.58	2195	32.06	0.0007
26-35	2362	26.17	1905	27.82	
36-50	2451	27.16	2172	31.72	
>50	730	8.09	575	8.40	
<b>Blood group</b>					
A	2207	24.45	1571	22.94	<0.0001
B	2451	27.16	2224	32.48	
AB	669	7.41	431	6.29	
O	3698	40.98	2621	38.28	
<b>Weight (kg)</b>					
45-60	2731	30.26	2580	37.68	<0.0001
61-75	3615	40.06	2444	35.69	
>75	2679	29.68	1823	26.62	
<b>Hemoglobin (g/dL)</b>					
12-15	4906	54.36	4046	59.09	<0.0001
15-18	3258	36.10	2622	38.29	
>18	861	9.54	179	2.61	
<b>Gender</b>	2019	%	2020	%	
Male	7195	79.72	5622	82.11	<0.0001
Female	1830	20.28	1225	17.89	

they donate blood to a blood center located within the hospital of COVID-19-treated patients.<sup>12</sup> In this situation transfusion professionals needed new approaches to minimize the impact of blood donor availability, both to promote blood donation and attract the attention of the potential donor. Transfusion professionals not only needed to promote proactively but also needed a strategy that could encounter the deepest motive of the donors. Some critical roles that drove the greatest intentions to donate blood were self-efficacy, approval from others, appraisals, and organizational trust. Maintaining trust with potential donors was also very important.<sup>21</sup> Some blood centers also implemented community promotion in the fixed donor site.<sup>9</sup> Comprehensive approaches based on blood donor motivations such as biology, psychology, philosophy, economics, and sociology of altruism are also needed to maintain the trust of potential donors.<sup>22</sup> The sifting characteristics of blood donors indicated that maintaining regular donors was very important instead of the recruitment of new potential donors. The new donor was very familiar with hospital-based blood centers compared to regular ones. The new donor was usually a one-time donor, they came to the hospital for some reason and then suddenly donated their blood. There were

two types of this donor i.e., those who spontaneously donated at blood collection sites (so-called random donors) and who donated blood for their family, friends, or relatives (so-called family donors). It was later observed that the biggest motivation of our donors was social altruism, although there were other motivations such as spontaneous inspiration from a friend/relative/colleague who was a blood donor, or one of their family, friends, or relatives who needed a blood transfusion before. With the campaign, we also tended to change family donors became a random regular donors.

SARS-Cov-2 usually infects the respiratory tract, but viral shedding in plasma and serum<sup>23</sup> during the incubation period is common.<sup>24</sup> Therefore, virus transmission via blood transfusion remains possible.<sup>23-25</sup> The safety of blood is still questionable, although it is not very likely that the virus can be transmitted via allogeneic blood transfusion.<sup>24,26,27</sup>

Transfusion professionals needed to consider this matter because there was also an asymptomatic infection of SARS-Cov-2. To minimize this risk, some procedures such as Pathogen inactivation/Reduction Technologies (PRT) were needed. This aimed to decrease the risk of SARS-Cov-2 transmission via blood. There was no such general PRT method for all blood products because some

blood components were damaged by the PRT treatment. Many of them inactivate the viruses by heat, solvent, detergent, or illumination treatment.<sup>23</sup> In this case not only detection and blood quarantine was needed, but also education and multilevel coordination of blood center staff. In serious COVID-19 infection regions, another recommendation was blood quarantine until fourteen days for all RBCs, plasma, and cryoprecipitate. Testing all the blood products for SARS-CoV-2 nucleic acid using RT-PCR was presumed to be a better option. After quarantining until the 14th day, the potential risk of SARS-CoV-2 transmission through blood transfusion reduced by at least 65.77%, even by 77.48% after RT-PCR. In these regions, blood can also be allocated from the region with a less confirmed case of COVID-19.<sup>24</sup>

Modifications to the production, specification, and storage of blood components were also needed in addition to minimizing blood used to prevent blood shortage. Modification of component testing criteria and additional safety measures should be addressed. These actions will not be the same from one to another region. A more complete consideration of this action should be based on the magnitude of gain, the perceived effect on clinical risk, the regulatory requirements, and the extent of complexity and ability to deliver change in the system. Changes which required substantial resources to implement might not be easy to be implemented during a pandemic, and therefore simplicity and forward planning were the keys. Therefore, the choice of whether this action should be implemented or not depended on a regional decision based on the nature of the pandemic in each region.

## CONCLUSIONS AND SUGGESTIONS

The COVID-19 pandemic gave a major impact on the blood supply. However, SGH-BC could overcome the most common challenges such as shortages in donors and supply, the safety of staff, donors, and the public, and the collection of convalescent plasma.

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