



Do You Need More Blood Product or No! Use of Blood and Blood Products During COVID-19 Pandemic

Daha Fazla Kan Ürününe İhtiyacınız Var mı, Yok mu? COVID-19 Salgını Sırasında Kan ve Kan Ürünlerinin Kullanımı

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ABSTRACT

Objectives: The COVID-19 pandemic caused a serious reduction both in blood donation and use of blood. The number of volunteer blood donors reduced to a great extent. Planning of blood transfusion services during a pandemic is essential to ensure appropriate management of blood reserve. The objective of this study was to define the transfusion needs of COVID-19 patients who needed to be hospitalized and to evaluate the impact on total hospital blood supply.

Methods: This is a single-center retrospective observational study evaluating blood transfusion requirements over a 1-year period between March 11, 2020 and March 1, 2021 at the transfusion center. The clinical data were obtained from the hospital information management system records, and transfusion data were obtained from the laboratory information management system.

Results: One hundred and eighty-one (44.5%) of 406 COVID-19 patients who were hospitalized needed blood transfusion. A total of 4106 (17.6%) units of blood were transfused to these individuals. The majority of blood products used were fresh frozen plasma (FFP). The number of transfusion of platelets (PLT) and erythrocyte suspensions (ES) were lower. The ES, PLT, and FFP transfusion rates in COVID-19 patients were found lower compared to patients who did not have COVID-19. The total number of transfusions of blood components was found significantly reduced compared to the same period in previous years. There was a 10.4% decrease in total blood component count, 15.4% decrease in ES, 40.2% decrease in PLT, and an 11% increase in FFP.

Conclusion: While pandemics may reduce blood supply, our study showed that the rate of use of blood products was low in COVID-19 patients who were hospitalized. Studies examining patient factors may help to elucidate the mechanisms that affect the use of blood products in hospitalized COVID-19 populations to a greater extent.

Keywords: Blood; blood transfusion; infection; pandemic.

ÖZET

Amaç: Koronavirüs hastalığı (COVID-19) hem kan bağışlarında hem de kan kullanımında ciddi azalmaya neden oldu. Gönüllü bağışçıların sayısı büyük ölçüde azaldı. Pandemi sırasında kan transfüzyon hizmetlerinin planlanması, hastaların ihtiyaçlarını karşılamak amacıyla kan stoğunun uygun şekilde yönetilmesini sağlamak için gereklidir. Bu çalışmanın amacı, hastaneye yatırılması gereken COVID-19 hastalarının transfüzyon ihtiyaçlarını tanımlamak ve hastanenin toplam kan temini üzerindeki etkisini değerlendirmektir.

Yöntem: Bu çalışma, transfüzyon merkezinde 11 Mart 2020-01 Mart 2021 tarihleri arasında kan transfüzyonu gereksinimlerini değerlendiren tek merkezli retrospektif gözlemsel bir çalışmadır. Klinik veriler hastane bilgi yönetim sistemi kayıtlarından, transfüzyon verileri ise laboratuvar bilgi yönetim sisteminden elde edildi.

Bulgular: Yatırılarak tedavi edilen 406 COVID-19 hastasının 181'inin (%44,5) kan transfüzyon ihtiyacı oldu ve bu kişilere 4.106 (%17,6) ünite kan transfüzyonu yapıldı. Kullanılan kan ürünlerinin büyük çoğunluğu taze donmuş plazma (TDP) idi. Trombosit (PLT) ve eritrosit süspansiyonu (ES) transfüzyonları daha düşüktü. COVID-19 hastalarında ES, PLT ve TDP transfüzyon oranları, eş zamanlı COVID-19 olmayan hastalara göre daha düşük saptandı. Kan

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bileşenlerinin toplam transfüzyon sayısında önceki yılların aynı dönemine göre önemli ölçüde azalma saptandı. Bir önceki yıla göre toplam kan bileşen sayısında %10,4, ES'te %15,4, PLT'de %40,2'lik bir azalma olurken, TDP'de ise %11 artış gözlemlendi.

Sonuç: Pandemiler kan arzını azaltabilirken, çalışmamız hastanede yatan COVID-19 hastalarının düşük kan kullanımına sahip olduğunu gösterdi. Hasta faktörlerinin etkisini inceleyen çalışmalar, hastanede yatan COVID-19 popülasyonlarında kan kullanımını etkileyen mekanizmaları daha fazla aydınlatmaya yardımcı olabilir.

Anahtar sözcükler: Kan; kan transfüzyonu; enfeksiyon; pandemi.

An acute respiratory tract disease (COVID-19) named as coronavirus disease-2019 was reported for the 1st time on December 31, 2019 in the city of Wuhan, China, and was defined as severe acute respiratory distress syndrome coronavirus 2 (SARS-CoV-2) on January 7, 2020. The disease spread rapidly and caused a global pandemic. On March 11, the World Health Organization (WHO) declared the rapidly spreading coronavirus and virus-related disease a global pandemic.^[1] In Türkiye, the first case of COVID-19 was detected on March 11, 2020. As of October 17, 2021, the number of 7,654,277 cases and 67,623 deaths have been determined in Türkiye.^[2]

COVID-19 pandemic caused a serious reduction both in purchase and the use of blood products. The number of volunteer donors reduced substantially. This influenced blood resources worldwide and endangered blood reserves required for clinical transfusion. Therefore, hospitals and blood centers initiated blood preservation strategies and efforts for maintenance of blood donations in a proactive manner.^[3,4]

A significant reduction was observed in the number of regular and volunteer blood donors during the COVID-19 outbreak because of fear of exposure to the virus. Therefore, a significant reduction occurred in Turkish Red Crescent's blood supply and blood reserves. In addition, the number of eligible donors was inevitably reduced during the pandemic, because infected individuals or people who were exposed to infected individuals were in quarantine. Closure of universities, schools, and assembly areas from which donors were predominantly provided, reduced the number further. Finally, the fact that elderly people who mostly represented the most reliable donor pool were among the people who were most vulnerable to COVID-19 epidemic, considerably influenced the amount of blood donation.

Another important problem is virus transmission by way of donated blood. It is thought that an important percentage of the population is unknowingly infected by SARS-CoV-2 including the young blood donor population who would prevalently involve asymptomatic cases. Albeit theoretical, potential transmission by blood transfusion has not been ex-

cluded in some studies.^[5] Therefore, we are facing significant unknown issues and the real risks of SARS-CoV-2 transmitted by transfusion will only be elucidated with future studies.

Fortunately, most hospitals postponed almost all elective surgeries and non-urgent medical therapies during the pandemic. Thus, the request for "routine" blood products decreased. However, need for blood supply continues for emergency medical interventions. There is still need for adequate blood reserve for conditions such as trauma, bleeding, or emergency operations. Similarly, need for blood products constantly continues for patients who are chronically dependent on transfusion including cancer patients, individuals with hematological diseases (for example, sickle cell, thalassemia, and myelodysplastic syndrome), and individuals with chemotherapy-induced anemia. Thus, blood preservation strategies have been initiated, and a need for finding donors among patient relatives has emerged. It is not easy for relatives to find a donor every 3–4 weeks for patients who receive regular blood transfusion. However, very little data have been reported in relation with the need of blood components in COVID-19 patients.

During pandemics, planning of blood transfusion services is essential to ensure appropriate management of blood reserve with the objective of meeting patients' needs. As the needs of COVID-19 patients for transfusion support are not known well, the impact on hospital blood supply is unclear. Therefore, it is imperative to have information about COVID-19 patients' needs for blood components and the effect of this on total hospital blood supply. The objective of this study was to define transfusion needs of COVID-19 patients who needed to be hospitalized and to evaluate the impact on total hospital blood supply by evaluating the use of blood products in our hospital since the beginning of the pandemic.

Methods

Our hospital in Istanbul is a third-level city hospital with 758 beds, 27 operation rooms, and 96 intensive care beds, which conducts education and training activities. This is a single-center retrospective observational study evaluating blood

transfusion requirements over a 1-year period between March 11, 2020, and March 1, 2021 at the Transfusion Center. The clinical data were obtained from the hospital information management system records and transfusion data were obtained from the laboratory information management system. The number of blood inventory during the specified 6-month period was identified on a daily basis. These data were compared with the data belonging to the same period of the years 2019 and 2018. In addition, the number of transfusions given to COVID-19 patients and the number of transfusions given to the patients who were hospitalized because of other causes in the time period when the study was conducted, were compared. Thus, it was investigated how many of the transfusions were given to COVID-19 patients during the pandemic. Only hospitalized patients were included in the study. All diagnoses of COVID-19 were confirmed with the SARS-CoV-2 PCR test at the time of admission. Adult and pediatric patients who were clinically diagnosed as having COVID-19, but had negative PCR test, were not included in the study.

Ethical Approval

This study was conducted in compliance with the ethical standards of the Helsinki Declaration of Human Rights. It was

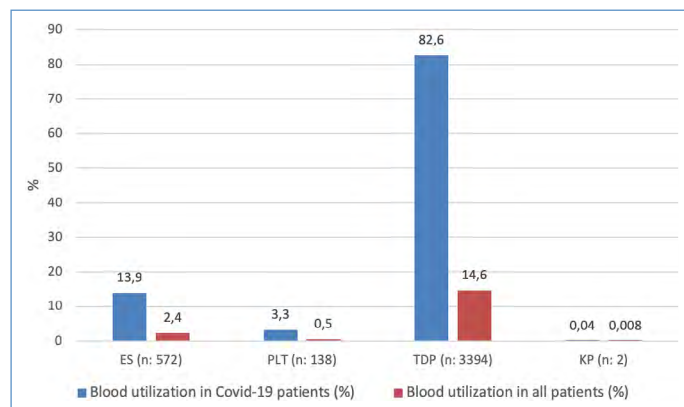


Figure 1. Types of blood products given to COVID-19-positive patients, transfusion numbers, and transfusion rates.

also approved by Turkish Ministry of Health, and local ethical committee approval was obtained from the ethical committee of the Medeniyet University Goztepe Research and Training Hospital (Decision date and number: January 27, 2021/0074).

Statistical Analysis

The data obtained were analyzed using the statistical program (IBM statistical package for the social sciences, Version 22.0, IBM Corp., Armonk, NY). Mann-Whitney test, χ^2 -test, and Student's t-test were used to compare quantitative variables. Statistical significance was set at $p < 0.05$.

Results

In our hospital, patients who were mild or asymptomatic were followed up as outpatients and were not hospitalized. A total of 406 COVID-19 patients, of whom 229 (56.4%) were male, were included in the study. The mean age of the patients is 63.46 ± 17.43 (7–97). While the total number of patients hospitalized in the ward was 335 (82.5%), the number of patients admitted to the intensive care unit was 256 (63.1%). Of the patients admitted to the intensive care unit, 218 (85.2%) were intubated. In addition, the number of patients who died among all patients was 187 (46.1%). Asymptomatic patients and patients with mild disease were not hospitalized and were followed up as outpatients by our hospital.

One hundred eighty-one (44.5%) of 406 Covid-19 patients who were hospitalized needed blood transfusion. The number of all blood products used in our hospital during the one-year period of the study was 23 203 units. The rate of Covid-19 positive patients in all blood use was found to be 17.6%. Figure 1 shows the types of blood products, the number of transfusions and their rates for Covid-19 positive patients. The majority of the blood products used were fresh frozen plasma (FFP). Platelet (PLT) and erythrocyte suspension (ES). transfusion counts were lower. The rates of transfusion of ES, PLT and FFP in Covid-19 patients were lower compared to the patients who did not have Covid-19 (Table 1).

Table 1. Transfusions given to the patients who did and did not have COVID-19 disease

| Blood products | COVID positive (n, %) | COVID negative (n, %) | Total |
|-----------------|-----------------------|-----------------------|--------|
| ES | 572 (2.4) | 11 924 (51.3) | 12 496 |
| PLT | 138 (0.5) | 2 426 (10.4) | 2 564 |
| FFP | 3 394 (14.6) | 4 283 (18.4) | 7 677 |
| Cryoprecipitate | 2 (0.008) | 464 (1.99) | 466 |
| Total | 4 106 (17.6) | 19 097 (82.4) | 23 203 |

ES: Erythrocyte suspension, PLT: Platelets, FFP: Fresh frozen plasma.

In our hospital, nearly 24,000 blood components (14 000 U ES, 3 500 U PLT, and 6 500 U FFP) are transfused each year. Figure 2 shows the distribution of our transfusions in the past 2 years. When the rates of use of blood products during the COVID-19 epidemic were evaluated, compared to the previous year, a decrease of 10.4% in the total number of blood components, 15.4% in ES, 40.2% in PLT was observed, (Table 2) whereas an increase of 11% in FFP was observed. As seen in Table 2, between March 11, 2020 and March 1, 2021, the total number of blood components transfused decreased compared to previous years.

Discussion

Our study showed reduced use of blood products in patients hospitalized because of COVID-19 during the pandemic. Among hospitalized COVID-19 patients, 44.5% needed transfusion and this constituted 17.6% of all blood transfusions given to hospitalized patients throughout the study. COVID-19 patients who were hospitalized had significantly lower rates of transfusion of ES, PLT, and plasma compared to the patients who did not have COVID-19 infection and were hospitalized simultaneously.

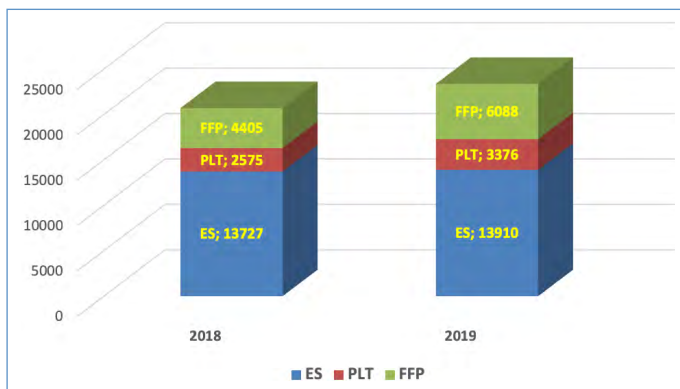


Figure 2. Numbers and types of blood products used in the past 2 years.

Low rates of use of blood products in hospitalized COVID-19 patients may reduce the impact of COVID-19 epidemic on general blood resource. There are no plentiful studies related to the use of blood in COVID-19 patients. A Chinese hospital reported that the number of blood components transfused was low but did not give the number of the patients.^[6] The data related to hematological variables in COVID-19 patients published showed that most patients had normal or slightly decreased hemoglobin (Hb) and PLT numbers, the minimum median Hb value was 13.3 g/dL, and the minimum median PLT number was $185 \times 10^9/L$.^[7] These hematological indexes are similar to the results of 2005 SARS epidemic which involved slightly reduced PLT and Hb values and rare requirement for blood transfusion.^[8]

In this study, we found a decrease of approximately 10.4% in total blood components transfusion during the pandemic compared to the previous 2 years. In the recent reports obtained from Maryland, Singapore, China, and Chicago, similar results have been obtained with a reduction in transfusion of blood products ranging between 12% and 42%.^[6,9,10] In this period, we observed that erythrocyte transfusion decreased by approximately 15.4%, PLT transfusion decreased by 40.2%, and FFP transfusion increased by 11% compared to previous years. Other groups also showed minimal use of FFP among COVID-19 patients.^[6,10,11] Although COVID-19 patients with critical disease specifically develop coagulopathy, thrombotic events are generally associated with increased D-dimer and fibrinogen, and they generally do not influence transfusion requirements.^[12] However, the use of FFP has increased due to therapeutically applied plasma exchange for patients with severe late-stage COVID-19 infection.

COVID-19 epidemic is the most important health, economic, and social problem of recent years. Since the beginning of the epidemic in December 2019, it has been reported that there is a reduction in the number of donations, blood supply, and

Table 2. Comparison of blood products used during the pandemic period compared to the previous year

| Blood products | March 2018–March 2019 | March 2020–March 2021 | Increase/Decrease |
|-----------------|-----------------------|-----------------------|-------------------|
| ES | 14 780 | 12 496 | % 15.4 ↓ |
| PLT | 4 338 | 2 564 | % 40.2 ↓ |
| FFP | 6 385 | 7 677 | % 11 ↑ |
| Cryoprecipitate | 402 | 472 | % 17.4 ↑ |
| Total | 25 905 | 23 203 | % 10.4 ↓ |

ES: Erythrocyte suspension; PLT: Platelets; FFP: Fresh frozen plasma.

blood safety in the literature.^[3,13,14] However, no evidence showing that SARS-CoV-2 is transmitted by blood products has been published up to the present time, albeit theoretically accepted.^[15] On the other hand, most hospitals especially in the countries, which have been affected by the pandemic, have become COVID-19 centers with a significant reduction in elective operations, pediatric care, other medical hospitalizations, and obstetric care. Our hospital has also become one of these centers. In conclusion, use of blood products has decreased in these institutions.^[9,16,17] Development and implementation of patient blood management (PBM) programs during the pandemic might also have played an important role in reduction in the number of transfusions.^[4]

PBM and efforts to stabilize and preserve blood supply can be implemented during pandemics and in normal times. Our recommendations related to blood preservation in our hospital might have influenced the reduction in blood transfusion. Proactive implementation of blood deficiency management strategies may limit blood use. Cancellation of elective operations in our hospital during the COVID-19 epidemic was associated with a more significant reduction in the use of blood products.

In conclusion, a very important reduction was observed in transfusion of blood products during the first wave of COVID-19 epidemic which might help us to design our transfusion policy (blood supply, processing, and use) and to be prepared against other potential epidemics. The number of COVID-19 cases is gradually increasing all over the world. In this unprecedented situation, we continue to evaluate operations and resources daily to provide a balance between blood requirement and blood accessibility. As hospital operations shift from routine operations to pandemic-focused activities and emergency care, transfusion services will adapt to this condition.

The medical world should adopt different solutions to continue and/or pursue care of our patient population as a response to the reduction in blood reserves. Therefore, urgent and global implementation of PBM should be mandatory.^[18] PBM is defined as “the optimization of patients’ medical and surgical outcomes by clinically managing and protecting their own bloods” or alternatively as “the timely application of evidence-based medical concepts”. It was designed to maintain Hb concentration, optimize hemostasis, and minimize blood loss in an effort to improve patient outcome.

In the transient guideline of WHO dated March 20, 2020, about maintenance of safe and adequate blood supply during COVID-19 epidemic, “good PBM” was recommended to preserve blood reserves.^[19] Under present pandemic conditions, both serious limitation of present health-care resources and increased deficiency of donor blood clearly support that rapid implementation of PBM is the best prospective way. Beyond the beneficial effects on the use of blood, developments related to PBM in clinical outcomes, and especially reduction in nosocomial infections and shortening in lengths of hospital stay may further decrease the burden on a troubled health-care system.

Conclusion

While pandemics may reduce blood supply, our study showed that hospitalized COVID-19 patients had low use of blood products. Future studies examining the effects of patient factors may help to further elucidate the mechanisms that influence the use of blood products in hospitalized COVID-19 patient populations.

Disclosures

Ethics Committee Approval: This study was approved by Medeniyet University Goztepe Research and Training Clinical Researches Ethics committee (Decision date and number: 27.01.2021/0074).

Peer-review: Externally peer-reviewed.

Conflict of Interest: None declared.

Authorship Contributions: Concept – A.B.T.; Design – A.B.T., S.İ.; Supervision – A.H.T.; Materials – A.B.T.; Data collection &/ or processing – A.B.T.; Analysis and/or interpretation – S.D.; Literature search – A.B.T., S.D.; Writing – A.B.T., S.D.; Critical review – A.B.T., S.D., A.H.T., S.İ.

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