

SARS-CoV-2 pandemic and its impact on blood transfusion services: challenges, experience and lessons learnt at king Abdullah medical city, Makkah, Saudi Arabia

Abstract

SARS-COVID (COVID-19) epidemic is a great challenge for blood transfusion practice. Hospitals were overwhelmed with increasing number of admitted patients with severe COVID-19 infections as well as limitation of variable medical and pharmaceutical resources partly due to lockdown. This retrospective study analyzes the transfusion medicine practice and approach of health institution toward the pandemics before and during the pandemic era over the four years period, 2018 through 2021. Data was collected from blood bank records and laboratory information system for the whole blood donors, apheresis platelets donors, numbers and types of prepared blood components, details of blood components storage and expiry, and blood components for the study period. The data analyzed showed that the total number of whole blood donors dropped during 2020. However, there is a steady increase in number of voluntary non-numerated whole blood donors. The production of packed Red Blood Cells units, Fresh Frozen Plasma units, and Cryoprecipitate units were actually more or less similar or slightly higher in 2020 compared to 2019 and 2018. However, the production of Platelets components showed a drop during 2020. The transfusion for patients at the institution has slightly increased for 2020 compared to 2019.

Therefore, the need to procure blood components from other facilities was increased in 2020 compared to pre COVID-19 pandemics. The percentage of expired and wasted blood components units steadily decreasing over the past few years. The data of expired and or wasted collected blood components were compared through the study period and it illustrates that the percentage of expired and wasted units was steadily dropped over the years. This to mention that automated blood transfusion system was implemented late 2019 and put in full effect in 2020. The presence of validated and secured electronic system supports blood bank to eliminate the number of expired and wasted units due to proper inventory management. Along with all the hard work to maintain adequate and safe blood supply to increasing requests of blood transfusion, blood bank at KAMC participated in the national multidisciplinary study of Convalescent Plasma use for critically ill COVID-19 patients.

Keywords: SARS-CoV-2, pandemic, blood transfusion, blood donation, recruitment, infection

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Introduction

Transfusion of blood and blood components is an integral part of medicine that treats thousands of patients every year, making blood transfusion management, safety, and storage of blood components a fundamental part in every country's national healthcare practice. Maintaining an adequate supply of blood components to match the patients' needs is difficult considering blood components have a short shelf life depending of type of blood component, and the fact that blood collection relies primarily on generous donations from the public. Procurement and maintaining adequate supply chain of blood components becomes critical for facilities during the periods of crisis, which is the case during the challenging time of SARS-CoV-2 (COVID-19) pandemic.

The first case of the COVID-19 infection in Saudi Arabia was announced 2nd March 2020.¹ Since the declaration of COVID-19 as pandemic by World Health Organization (WHO) on 11 March 2020, Kingdom of Saudi Arabia reported more than 758k cases of confirmed COVID-19 infection and about 9111 related deaths.² To limit the fast worldwide spread of the infection, significant loads of

effective measures were taken worldwide including lockdown, social distancing and wearing of personal precaution essentials such as facemasks and gloves. On top on that, fear of blood virus transmission adds to the challenges surfaced for the blood transfusion community. Furthermore, asymptomatic cases also soared, making it more difficult to detect and thus indirectly posed a risk in blood donors and health care professionals safety.^{2,3} In response to the decreased donations, hospitals were forced to preserve their supplies by postponing non-urgent surgeries and procedures or forcing implementation of lowering transfusion threshold triggers.^{4,5} Health care practice, among many other fields, was dramatically affected by the pandemics due to increase number of patients admitted to hospitals or in need of medical care due to COVID-19 infection and shortage of health care practitioners in parallel to increase demand. In particular, the Blood transfusion practice had been affected equally during the COVID-19 pandemic era leading to evolution in the practice to maintain adequate supply of continues demand of blood components. This include modification of the criteria for blood donors eligibility and methods of recruitments to be in concordance with our understanding and continuously updated knowledge of the infection methods of spreading, incubation periods, as well as it's vaccine related

precautions.^{3,4} In addition, blood utilization practice and guidelines were updated as well to face the dramatic deficiencies of blood components inventories in blood bank due to drop in blood donations.^{5,6} King Abdullah Medical City (KAMC) is a 500 bed specialized tertiary care hospital and is a part of the health care clusters in the Makkah region. It is the regional referral center for treatment of oncology cases, specialized surgeries, critical care centers, Neuroscience center, including specialized neuro-spinal surgeries, cardiac care center including cardiac surgeries, and renal transplantation center among many other specialties.⁷ The blood bank at KAMC is a hospital based blood collection center and performs blood components preparation, processing and storage. KAMC is accredited by the Saudi Central Board for Accreditation of Healthcare Institutions (CBAHI). Blood components produced at blood bank of KAMC hospital are pre-storage leukodepleted. Platelets components are prepared from whole blood donation units as pool of 4 to 6 buffy coats of ABO matched whole blood donations and by apheresis donations.

All Platelets components are pathogen inactivated using a validated process. KAMC blood bank has a controlled gamma irradiation unit to provide irradiation services to cellular components per local policies and guidelines. King Abdullah Medical specialized hospital is located in short distance to the holy place where religious people come from all over the world to visit and perform their rituals. It was reported about 2,489,406 pilgrims visited the city during the Hajj Pilgrim ritual season in 2019 and more than 19 million Pilgrims perform Umrah rituals during the year of 2019.^{8,9} This number dropped markedly during COVID-19 pandemics in 2020 and 2021 as the travel was closed and the health precautions necessitated temporary closure and controlling a limited access to defined eligible visitors to the holy places. However, it will be a great challenge once the outbreak is regressing or the epidemics becoming more of endemic activities since the crowd of pilgrims may increase the possibilities of return of outbreak or surge in number of infected people. This retrospective study analyzes the transfusion medicine practice and approach of health institution toward the pandemics before and during the pandemic era over the four years period, 2018 through 2021.

Research method and materials

Retrospective data was collected for the whole blood donors, apheresis platelets donors, numbers and types of prepared blood components, details of blood components storage and expiry, and blood components for the period of years; 2018, 2019, 2020 and 2021. Details were extracted from blood bank records and laboratory information system. The period of 2018 and 2019 was considered and referred to as pre COVID-19 period and compared to the period of 2020 and 2021, referred to as COVID-19 pandemic period. For the purpose of convenience, even though the first case of COVID-19 infection was discovered march 2020, yet the whole year of 2020 was included in the COVID-19 pandemic period considering the outbreak started worldwide earlier.

Results

The total number of whole blood (WB) donations through the study period indicates a clear drop during the year of peak of COVID-19 pandemics in 2020. However, there is a steady increase in number of voluntary non-numerated whole blood donors, starting by 4.8% of total whole blood donations on 2018 to be 69.5% for 2021 (Figure 1). There is a constant increase on collection of platelets units using apheresis throughout the study period, 1305 units for the year 2018 to 1315 units for year 2021, with obvious increase in 2020 to compensate the drop in whole blood donations (Figure 2). All apheresis platelets donors are voluntary non-numerated donors and all are male donors.

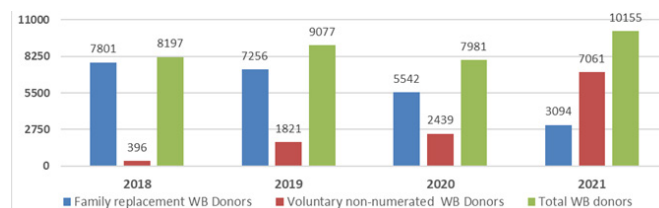


Figure 1 Whole blood donations.

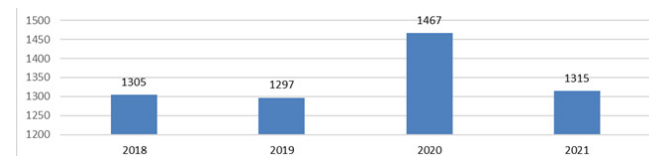


Figure 2 Number of collected platelets apheresis units.

The production of Red Blood Cells (RBCs) units, Fresh Frozen Plasma (FFP) units, and Cryoprecipitate (CRYO) units were actually more or less similar or slightly higher in 2020 compared to 2019 and 2018. However, the production of Platelets (PLT) components showed a drop during 2020 (Figure 3). In correlation to the in-house blood components collections and preparations, the transfusion for patients at the institution has slightly increased for 2020 compared to 2019 (Figure 4) despite the fact that admission for elective surgeries and other chronic non-urgent illness was restricted during the peak of COVID-19 outbreak in 2020 as part of health safety precautions. Therefore, the need to procure blood components from other facilities was increased in 2020 compared to pre COVID-19 pandemics (Figure 5). The percentage of expired and wasted blood components units to the total number of collected and prepared blood components is steadily decreasing over the past few years (Table 1).

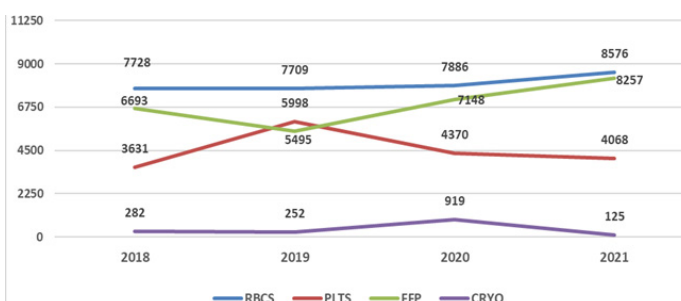


Figure 3 Blood components units prepare in house.

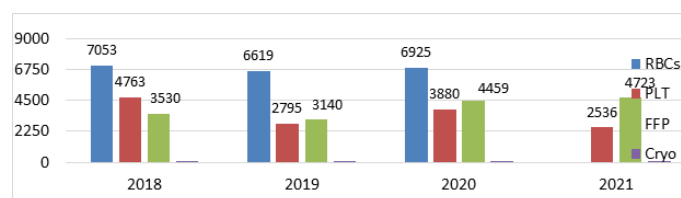


Figure 4 Transfused blood components.



Figure 5 Blood components received from outside facilities.

Table I Percentage of expired and waste blood components

Year/ discarded com ponents	RBC	FFP	PLT	CRYO	Total	% of inhouse prepared components
2018	85	329	569	24	1007	5.4
2019	77	236	519	2	834	4.2
2020	29	37	289	9	496	2.4
2021	56	104	5	86	251	1.2

Discussions

The blood donors may have concerns, confusion, and misleading rumors about blood donation during pandemic. People's priorities for blood donation may shift because of a dearth of necessities including concerns for their safety, lockdown and avoiding public gathering.^{4-6,14,15} To add more to the limitations, additional screening questions and requirements were implemented in many blood collection centers. Blood donors deferrals guidelines and recommendations were extended to include suspected cases and donors in contact with confirmed or suspected cases limiting the eligible number of blood donors.^{5,6,16,17} Therefore the recruitment and encouragement of blood donors took more creative methods including the involvement of Social media channels which found to be an effective tool^{18,19} As a result, many hospitals adapted variable methods to adapt with blood supply shortages including considering more strict transfusion triggers and threshold as well implementing alternative methods to blood usage such as pharmaceutical agents. In addition, donor accepting and deferral criteria were modified to increase number of eligible blood donors without risks on prospective donors neither the prospective recipients.

At KAMC, total number of whole blood donors dropped during the year of peak of COVID-19 pandemics in 2020 due to pandemics restrictions. However, noticeably the total number of volunteer WB donors was steady increasing even in the pandemic period. This is expected due to the possible change of prospective for blood donors toward voluntary blood donations. The approach of our blood donation center was more initiative to use more creative methods to recruit the blood donors including use of the social media such, online blood donation application sites, and mobile donation car allocated near the community centers and other suitable places in the districts. The prepared Red Blood Cells (RBCS) units, Fresh Frozen Plasma (FFP) units, and Cryoprecipitate (CRYO) units were actually not significantly affected during the year 2020 compared to 2019 and 2018. However, the production of Platelets (PLT) components showed a drop during 2020. With the drop in whole blood donations during 2020, there was obvious increase in 2020 to compensate the drop in whole blood donations. It is of important to mention that all apheresis platelets donors are voluntary non-numerated donors and all are male donors.

Many institutions rescheduled elective surgeries as needed and shifting elective urgent inpatient surgical procedures to outpatient settings when feasible in order to limit admissions and spread of infection as well not to occupy beds needed most to increasing numbers of COVID-19 patients.¹⁵⁻¹⁷ Even though working from home or remotely during the COVID-19 pandemic was implemented successfully by many institutions, yet this was not a practical

option for most of health care providers including those working in a transfusion service and blood donation collections facilities and therefore direct contact with blood donors was a necessarily. Shortage in staff was inevitable during the outbreak due them being infected or isolated for suspected symptoms or been in contact with COVID-19 case. For the safety of health care professionals, repeated cleaning and disinfection of the work environment along with universal precautions were promoted and implemented strictly in many institutions. Several conservation methods and options were considered by the transfusion service in order to conserve a rapidly dwindling blood supply. The above statements are true for KAMC as the needed precautions necessitate rescheduling of many elective surgeries and limitation of non-emergency admissions to hospital wards. In correlation to the in-house blood components collections and preparations, the transfusion for patients had slightly increased for 2020 compared to 2019 (Figure 4). Therefore, the need to pursue blood components from other facilities was increased in 2020 compared to pre COVID-19 pandemics (Figure 5). Finally, the data of expired and or wasted collected blood components were compared through the study period and it illustrates that the percentage of expired and wasted units was steadily dropped over the years. This to mention that automated blood transfusion system was implemented late 2019 and put in full effect in 2020. The presence of validated and secured electronic system supports blood bank to eliminate the number of expired and wasted units due to proper inventory management. Along with all the hard work to maintain adequate and safe blood supply to increasing requests of blood transfusion, blood bank at KAMC participated in the national multidisciplinary study of Convalescent Plasma use for critically ill COVID-19 patients.²⁰

Conclusion

Despite the shortage in number of whole blood donors, shortage of staff due to infection, postpone of nonemergency procedures and strict and enforced implementation of blood transfusion conservative program, KAMC blood bank managed to maintain adequate blood transfusion support to the needed patients even with increased demand compared to pre COVID-19. Being a tertiary center for oncology and special complicated surgical cases indicates some of cases still to be admitted and receive needed medical care necessitated, thus the number of transfused units is same or even slightly higher compared to the year 2019 with increase in outsourced units from the central blood bank in the region.

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Conflicts of interest

The authors declare that there is no conflict of interest.

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