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The impact of blood campaigns using mobile blood collection drives on blood supply management during the COVID-19 pandemic

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ABSTRACT

Background and objectives: Blood transfusion is a lifesaving procedure for transfusion-dependent patients. Therefore, maintaining blood supply is extremely crucial. The coronavirus disease 2019 (COVID-19) pandemic has negatively affected blood supply by affecting donor attendance. This study aimed to investigate blood supply and demand during the pandemic and demonstrate the positive impact of blood donation campaigns through mobile blood drives.

Materials and methods: A cross-sectional study was conducted based on data of the blood bank at Prince Muhammad bin Nasser Hospital (PMBNH) in southwestern Saudi Arabia. Data on the attendance of blood donors at PMBNH were retrieved and retrospectively reviewed to assess the impact of mobile blood drives during the COVID-19 pandemic.

Results: Blood supply and donor attendance during the COVID-19 pandemic dropped by 17.32%. However, blood supply increased between March and May 2020 due to national blood donation campaigns conducted through mobile blood drives. The drop in blood supply after 3 months of mobile blood drives significantly decreased to 0.17% ($P < 0.01$). This means the blood supply was increased as follows; (March 2020 = 32.67%, April 2020 = 45.54%, and May 2020 = 19.47%). On the other hand, blood demand decreased by 12.83%.

Conclusion: This study demonstrated the significant impact of establishing blood donation campaigns through mobile blood drives. Our results showed that the strategy can contribute to sufficient blood units to patients during pandemics and emergencies.

1. Introduction

An outbreak of a novel coronavirus strain in Wuhan City, China, called the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has led to the global spread of coronavirus disease 2019 (COVID-19), which has since been declared a pandemic by the World Health Organization [1]. Symptoms that appear 2–14 days following exposure to SARS-CoV-2 include fever, headache, cough, sore throat and shortness of breath [2]. Furthermore, gastrointestinal symptoms such as vomiting and diarrhoea have been observed [3]. Different routes of transmission have been identified, including respiratory droplets, saliva, urine and stool [4]. However, the chance of transmission via blood transfusion has not been reported [5]. The first COVID-19 case in Saudi Arabia was reported on 2 March 2020. On 13 October 2021, the Saudi Ministry of Health announced the numbers of positive cases and deaths to have reached 547,761 and 8,753, respectively [6].

SARS-CoV-2 has negatively affected the blood supply chain, as well as the blood donation process [7–10]. The U.S. Food and Drug

Administration has changed some policies on the deferral of blood donors due to the COVID-19 pandemic. For example, people who have travelled to an area endemic with malaria are now deferred for only 3 months compared with 12 months in the past [11].

In southwestern Saudi Arabia, many transfusion-dependent patients such as those with beta-thalassemia and sickle cell disease require regular blood transfusions [12]. Therefore, a sufficient supply of blood and blood products is crucial. Hospitals may require more stringent guidelines, including mitigating strategies on blood transfusion orders [13]. Direct blood donation, particularly voluntary donation and replacement donation (i.e. donation for relatives), is the principal source of blood [14]. In addition, campaigns conducted through mobile blood collection drives are valuable for maintaining supply. Therefore, maintaining blood supply either through direct donation or mobile blood drives is vital for transfusion-dependent patients.

In 2003, blood supply was negatively impacted due to the outbreak of severe acute respiratory syndrome [15]. Similarly, hospitals as well as blood banks are currently facing big challenges during the current

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COVID-19 pandemic, which signify the need for a proper management plan to sufficiently meet the demands for blood and blood components during emergencies [13].

This study aimed to assess the impact of the COVID-19 pandemic on blood supply and demand in Prince Muhammad bin Nasser Hospital (PMBNH) in Jazan Province, southwestern Saudi Arabia, before and during the pandemic. Furthermore, the impact of the blood donation campaigns using mobile blood drives was evaluated.

2. Materials and methods

2.1. Study design and procedure

A cross-sectional study was conducted to retrospectively assess the blood supply and demand at the blood bank at PMBNH before and during the COVID-19 pandemic from October 2019 to August 2020. The mobile blood drives conducted through the national blood donation campaigns supported by the Saudi Ministry of Health ran from March 2020 to May 2020.

2.2. Statistical analysis

The blood supply and demand data prior to and during the pandemic were tabulated, and the averages for both were calculated. A line graph was generated to demonstrate the number of units per month for both blood supply and demand. The frequencies in the drop of blood supply with and without mobile blood drives were expressed as percentages. P-values were calculated using the Z-test for two groups to compare the differences in blood supply with and without mobile blood drives [16]. R Software (version 4.0.4) was used to perform statistical analysis.

2.3. Ethical consideration

This research was approved by the Jazan Health Ethics Committee (No. 2014), Ministry of Health, Kingdom of Saudi Arabia.

3. Results

The total amount of blood collected by PMBNH from other blood banks prior to the COVID-19 pandemic showed a fluctuating pattern

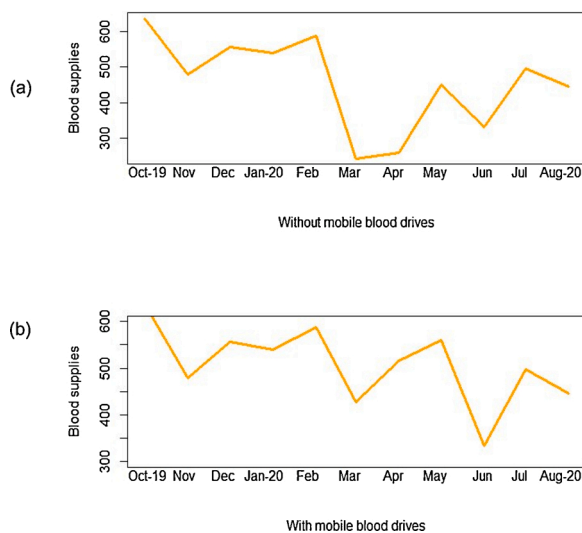


Fig. 1. Blood supply before and during the COVID-19 pandemic (a) without mobile blood collection drives (October 2019 to August 2020) and (b) with mobile blood collection drives (March to May 2020). The average blood supply before the pandemic (October 2019 to February 2020) was 560 units, whereas the average during the pandemic (March 2020 to August 2020) was 463 units.

(Fig. 1). The average blood supply before the COVID-19 pandemic (from October 2019 to February 2020) was approximately 560 units (Table 1). The mean blood supply since the start of the pandemic (between March 2020 and August 2020) was 463 units. The difference in pre-pandemic and pandemic blood supply was 17.32 %. Interestingly, the blood supply started to increase between March and May 2020, reaching 559 blood units through the mobile blood drives (Fig. 1). However, the number of blood units dropped to 333 in June 2020 as presented in Table 2.

Table 3 depicts the fluctuations in blood supply from March to May 2020 with and without mobile car drives. A significant difference was observed from March to May 2020 (P < 0.01). The frequencies in the drop in blood supply without mobile blood drives were as follows: March 2020, 56.42 %; April 2020, 53.57 % and May 2020, 19.64 %. In contrast, the frequencies in the drop in blood supply during the mobile blood drives were as follows: March 2020, 23.75 %; April 2020, 8.03 % and May 2020, 0.17 % (Table 3). This means the blood supply during these 3 months was boosted as follows; (March 2020 = 32.67 %, April 2020 = 45.54 %, and May 2020 = 19.47 %).

Blood demand was defined as the number of blood transfusion units requested that underwent crossmatching for use within PMBNH and other hospitals. Fig. 2 shows the demand for blood transfusion units before and during the COVID-19 pandemic. The blood demand dropped in April and May 2020, increased in June 2020 and remained steady thereafter. The average blood demand before the COVID-19 pandemic was 709 units. After the pandemic began, the demand dropped to 618 units, a 12.83 % decrease from that during the pre-pandemic period.

4. Discussion

Blood transfusions are extremely crucial for patients in regular need of transfusions such as those with sickle cell disease and beta-thalassemia [17,18]. Due to the limited shelf-life of blood and its components, long-term storage is difficult. Therefore, suitable planning to provide a steady supply of blood and blood components is indispensable during pandemics [19]. Furthermore, the COVID-19 pandemic has affected blood supply around the world. This may be due to lockdowns, precautions against transmission and infection, social distancing mandates and inability to donate [20].

The decrease in blood supply observed in the present study was comparatively small compared with that of a study conducted in Bisha, Saudi Arabia, in which the blood supplies and donor attendance dropped by 39.5 % [21]. A study by Al-Riyami et al. (2021) on 12 national blood banks and 4 hospitals in the Middle East region showed a 10%–75 % decrease in blood supply due to the closure of institutions and cancellations of mobile blood drives [22]. In China, donor attendance saw a 67 % drop in blood supply and collection. The study found that the recruitment of donors was largely conducted through text messaging by patients’ family and friends, as well as by medical personnel [23].

However, the efforts of the Ministry of Health in Saudi Arabia in running blood donation campaigns that allowed home blood collection helped stabilise blood supply. After the first COVID-19 case in Saudi Arabia was reported on March 2, 2020, blood donation campaigns were immediately initiated on March 3, which brought the blood supply to 427 blood units by the end of March 2020. In April, the number

Table 1
Blood supply at Prince Muhammad bin Nasser Hospital prior to the COVID-19 pandemic.

| Month | Blood units |
|---------------|-------------|
| October 2019 | 637 |
| November 2019 | 479 |
| December 2019 | 557 |
| January 2020 | 540 |
| February 2020 | 588 |

Table 2

Blood supply at Prince Muhammad bin Nasser Hospital during the COVID-19 pandemic.

| Month | Blood supplies |
|-------------------------|----------------|
| March 2020 ^a | 427 |
| April 2020 ^a | 515 |
| May 2020 ^a | 559 |
| June 2020 | 333 |
| July 2020 | 497 |
| August 2020 | 446 |

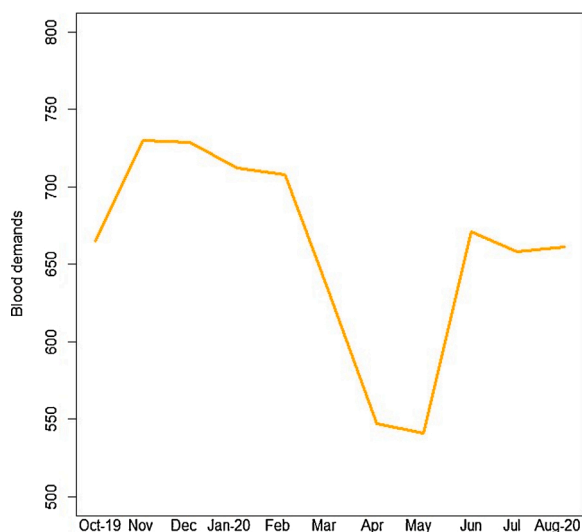
^a A total of 631 blood units collected through mobile blood drives that visited donors' homes.

Table 3

Frequencies of the drop in blood supply with and without mobile blood drives.

| Month | Frequencies of decrease without mobile blood drive (%) | Frequencies of decrease with mobile blood drive (%) | P-value |
|------------|--|---|--------------------|
| March 2020 | 0.5642 | 0.2375 | <0.01 ^a |
| April 2020 | 0.5357 | 0.803 | <0.01 ^a |
| May 2020 | 0.1964 | 0.0017 | <0.01 ^a |

^a Highly significant.



Before and during COVID-19 pandemic

Fig. 2. Blood demand before and during the COVID-19 pandemic. The average blood demand before COVID-19 pandemic (October 2019 to February 2020) was 709 units. The average during the COVID-19 pandemic (March 2020 to August 2020) was 618 units.

increased to 515 blood units and reached a peak of 559 units in May 2020.

Unfortunately, following the end of the campaign in June 2020, the number dropped to 333 units. This is similar to the situation in the USA, where approximately 2,700 mobile blood drives were cancelled, resulting in a significant drop in the number of donations by 86,000 donations [24]. Interestingly, mobile blood drives accounted for more than 80 % of the total blood donations.

The impact of the blood donation campaigns through mobile blood collection drives carried out by the Ministry of Health and the Saudi Government notably boosted the supply during the pandemic and demonstrates an effective approach to resolving the issue of blood

donation during pandemics. In the present study, the blood supply was boosted by the mobile blood drives during 3 months (March to May 2020) as follows; (March 2020 = 32.67 %, April 2020 = 45.54 %, and May 2020 = 19.47 %). Similarly, an Italian study reported an initial 10 % decrease in donor attendance and blood supply in the first week of March 2020. After that, a 12 % increase in blood collection was reported after a blood donation campaign was launched, encouraging more people to donate blood [25].

The decrease in blood demand observed at the start of the pandemic in the present study could be due to the cancellation of surgeries. Indeed, the decrease in demand and donation during the COVID-19 pandemic was also reported elsewhere [26]. These findings reinforce the importance of assessing the blood demand and blood supply and wisely managing the deferral of non-emergency situations and elective surgeries during pandemics [20].

In summary, this study showed that blood supply and demand decreased during the COVID-19 pandemic. However, blood donation campaigns through mobile blood collection drives can boost the blood supply remarkably and increase donor attendance; thus, mobile blood drives present a valuable component of blood supply management in hospitals and blood banks during pandemics and emergencies.

Statement of ethics

Ethical approval was obtained from Jazan Health Ethics Committee (No. 2014), Ministry of Health, Kingdom of Saudi Arabia.

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Data availability

Data will be made available on request.

Declaration of Competing Interest

The authors have no conflicts of interest to declare.

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A.J.H. designed the project, analysed the data, and wrote the manuscript. The author would like to acknowledge Hisham I. Abu-Tawil for the data collection.

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