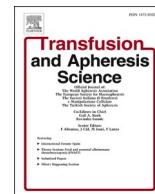




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Awareness about Coronavirus (COVID-19) and challenges for blood services among potential blood donors

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ABSTRACT

Background: The Coronavirus-19 disease pandemic had a significant impact on the blood supply around the world. Physical distancing measures and many other factors contribute to this impact. Misinformation about methods of disease transmission and lack of knowledge among potential blood donors may contribute to this.

Aim: To assess the knowledge and awareness of blood donors about COVID-19 as well as their reasons and fears that prevent them from donating blood during this period.

Methods: This is an exploratory; survey based cross sectional study targeting Saudi population.

Results: A total number of 3841 persons responded to the survey; 58 % were between the ages of (31–50) years. Most participants 74.5 % were males. More than 60 % of participants donated blood previously, and many were repeat donors. The majority of participants were concerned about the transmission of the virus during the blood donation process mostly secondary to concerns about contact with other blood donors.

Conclusion: Fear of contracting COVID-19 during donating blood is an important concern for potential blood donors. Blood collection facilities must take optimum precautionary measures to minimize this risk and are encouraged to communicate these efforts to potential donors for reassurance to maintain an adequate and safe blood supply.

1. Introduction

Since the first case of Coronavirus disease (COVID-19) was identified in December 2019, the pandemic has had a significant impact on several sectors of the economy and healthcare services around the world. Its impact involved the supply of blood and other essential services. Many blood centers were affected and there was a shortage in blood and blood component supply [1]. For example, a retrospective study from King Abdullah Hospital, Bisha, Saudi Arabia revealed a decrease in blood flow in blood banks by 39.5 % during the pandemic. In contrast, blood demand was decreased during the same period by 21.7 %, likely secondary to cancellation of many surgeries [2].

Shortage in blood supply may be attributed to physical distancing measures including curfew, and the limited numbers of individuals attending universities and other gathering sites that function as potential sites for blood drives [3]. Lack of adequate knowledge and

awareness on the COVID 19 disease, and fear of contracting it are additional reasons for the reduction in the number of potential donors.

The possibility of COVID-19 transmission through blood has not been proven [4]. Measures taken to reduce risks are precautionary and many are put in place to reduce the risk of disease transmission to blood collection staff and other blood donors. These measures include donor education, self-deferral of donors at risk, physical distancing, wearing personal protective equipment, application of safety measures to blood donation area, provision of quarantine services for different components of blood, pathogen inactivation technologies, and following a haemovigilance system. Each step plays a role in improving safety of donors and staff, and preventing "contaminated" units from entering the blood supply [4].

The WHO provides guidelines on how blood collection centers should be operated during infectious disease outbreaks. They recommend the application of health measures that apply to public facilities

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since these facilities, unlike medical facilities, are not meant for care of acute patients. They also highlight the importance of keeping prospective donors aware of the reasons why they should postpone their visits to the centers whenever they are feeling unwell. Furthermore, steps should be taken to ensure personnel applying protective procedures to ensure safety of donors and staff during blood donation [5].

Cooperation among blood supplier, rather than competition, is expected to result in assurance of maintenance of a safe and adequate blood supply. Cooperation would enable these organizations to share information on the best ways to increase the number of donors during a pandemic. They would also cooperate in raising the level of COVID-19 awareness among potential donors, which would in turn increase their willingness to donate blood. It is also necessary to issue deferrals for donors potentially infected. This will facilitate the creation of a healthy environment for both the donors and the staff members [4].

There is a number of ways to assess knowledge and attitude of potential blood donors, and surveys are commonly used for this purpose. Results are used to assess the knowledge gap among blood donors and plan for interventions to improve their knowledge and potentially improve rates of blood donation. A network sampling survey done in china to analyze the current situation of the knowledge, attitudes and practice about novel corona virus pneumonia (NCP) of the residents in Anhui Province revealed a high awareness rate of the main symptoms, transmission routes, using of masks, hand washing and treatment information [6]. A study published in April 2020 indicated that almost 25 % of the study participants expressed worry over contracting the disease, and 29 % percent of had no idea what the symptoms of the disease were, while 31 % did not know how to prevent the disease. This is evidence of the low level of COVID 19 awareness among members of the public [7]. A cross-sectional survey was conducted in March 2020 among Egyptian adults revealed that the Egyptians had good knowledge about COVID-19, and a positive attitude towards using protective measures, which is important to limit the spread of the disease. This knowledge is mainly acquired through social media platforms and the internet. However, knowledge was lower among older, rural, less educated, and lower income groups [8].

Blood Transfusion Services (BTS) in the Kingdom of Saudi Arabia are hospital-based, fragmented services where blood banks in most hospital are responsible for the entire transfusion process, starting with the recruitment of donors, testing donated blood, preparation, storage, patient testing and issuing components. The source of donated blood is a combination of replacement and voluntary non-remunerated donors. The latter source is expanding through donor campaigns arranged by various hospitals, voluntary groups, and professional societies [9].

Given the effect of COVID-19 on the blood supply, and the possibility of future waves of the same disease, or development of other pandemics. It is important to assess the knowledge and attitudes towards COVID-19 and blood donation, to better plan educational interventions and measures to improve rates of voluntary donations.

2. Aim of the study

The aim of this study is to assess the knowledge, awareness, and attitudes of the general public in Saudi Arabia in regards to blood donation and the COVID-19 pandemic

3. Materials and methods

This is an exploratory survey-based study. Questions were designed by a number of experts in transfusion medicine. The survey was tested on 10 users before it was launched for the general public. All questions were mandatory (except when indicated by being linked to the answer of a prior question).

The survey was in Arabic, it included 27 questions in the following sections:

1 Socio-demographic Information and Items Associated with Blood Donation

Items include: age, gender, nationality (Saudi or non-Saudi), geographic region, city, blood group (if known to the donor), employment status, being a health practitioner or not, history and frequency of blood donation, and whether the participant considers being a voluntary non-remunerated blood donor.

2 Knowledge about COVID-19:

Items include: awareness about COVID-19 and its different ways of transmission and source of information, concerns about transmission of the virus during donation of blood and the source of these concerns, opinion and perception about the safest way to donate blood during a COVID-19 outbreak, precautions and safety measures currently being implemented in hospitals and blood donation centers.

3 COVID-19 Disease Risk Factors and Symptoms

Items include: participant's signs, symptoms during the past 28 days (fever and respiratory disease), traveling outside the Kingdom of Saudi Arabia and if they have been diagnosed, suspected to have COVID-19 or contact with confirmed cases.

4 Knowledge about Convalescent Plasma (CP)

Items include: knowledge about CP and how to utilize it.

Survey questions are provided as Supplementary material.

The survey was designed on an online survey tool, self-administered online, and was distributed through social media channels (mainly twitter and WhatsApp). The sample was a convenience sample. The survey invitation stated it targeted citizens and residents of Saudi Arabia, but it was not password protected and no emails or other identifying information of participants were collected. No incentives were offered. Responses were received between March 2020 and May 2020. Data was collected using the online questionnaire then analyzed. Data analysis was performed using Microsoft Excel and Statistical Product and Service Solutions (SPSS).

The Checklist for Reporting Results of Internet E-Surveys (CHERRIES) [10] and The Survey Reporting Guidelines (SURGE) [11] were utilized to ensure completion of the manuscript.

4. Ethical approval

Approval for this study was obtained from the ethics committee of King Abdulaziz University- Jeddah (Reference No. 225-20).

5. Results

5.1. Demographics

A total number of 3841 individuals participated in the survey; the majority of them being males. Most of the participants (3639) were Saudi. Many of the participants were health practitioners (2363, 61 %). Participants belonged to all 13 regions of Saudi Arabia; with 2571 (66.9 %) being from Makkah region. Socio-Demographic characteristics of the participants are shown in [Table 1](#).

5.2. Self-reported blood groups and history and attitude towards donation

Most participants (96 %) reported knowing their blood groups.

Among all participants, 2363 individuals (61.6 %) previously donated blood; only (149) 6.3 % of them being females. Among those who donated before, 481 (20.3 %) had a single previous donation, 1350

Table 1
Socio-Demographic Characteristics.

Item	Options	Number of participants	Percentage
Age	17–30 years	1243	32.36 %
	31–50 years	2231	58 %
	51–65 years	367	9.64 %
Gender	Male	2861	74.48 %
	Female	980	25.52 %
Occupation	Government Employee	2340	60.92 %
	Non-Government Employee	553	14.39 %
	Unemployed	510	13.27 %
Nationality	Student	438	11.40 %
	Saudi	3639	94.7 %
	Non-Saudi	202	5.3 %
	Makkah	2571	66.94 %
	Riyadh	422	10.99 %
Region	Eastern Province	150	3.90 %
	Asir	127	3.31 %
	Madinah	106	2.76 %
	Jizan	103	2.68 %
	Qassim	65	1.69 %
	Ha'il	65	1.69 %
	Northern Borders	61	1.59 %
	Bahah	55	1.43 %
	Tabuk	53	1.38 %
	Najran	33	0.86 %
Jouf	30	0.78 %	

(57.1 %) donated more than once and 532 (22.5 %) had donated blood more than ten times. Furthermore, 2660 (69 % of all participants) were willing to become volunteer non-remunerated blood donors. The majority of participants (2442, 63 %), were aware of the presence of patients who regularly needed blood transfusion.

5.3. Knowledge of COVID-19

The majority of participants (3598, 93.6 %) had general information about COVID-19, and 3739 participants (97.3 %) had information about its transmission. The most common source of information was social media (80.8 %). Choices of participants are represented in Fig. 1.

5.4. Blood donation during the pandemic

Most of the participants (2321, 60.4 %) had concerns about getting infected with COVID-19 while donating blood during the pandemic. The majority (1526) were worried about contact with other blood donors, 1386 were concerned about getting into contact with health practitioners, 1069 had concerns about going to donation centers

which are located within hospital buildings, 1066 were worried about leaving the house and 448 had concerns about the entire donation process. Distribution of answers is represented in Fig. 2.

When asked about measures that would encourage them to donate blood during the pandemic, 2497 participants (65 %) thought it would be safer to donate blood in a mobile unit close to the donor's address, 1661 (43.25 %) suggested donation separately (in a single-bed/chair room) within the donation center while 1118 (29.1 %) preferred holding blood donation campaigns outside hospitals. Nonetheless, 70 % of participants were satisfied with the current precautionary measures that have been put in place to reduce the risk of COVID-19 during blood donation. Some participants made further suggestions including holding blood donation campaigns in open spaces to minimize the risk of transmission of COVID-19, emphasis of using masks and other PPE, and utilizing appointment systems at donation centers to reduce crowdedness.

5.5. Risk factors and symptoms of COVID-19

When answering questions about symptoms and risk factors for Covid-19, 148 participants (percentage) acknowledged that they had experienced fever in the previous 28 days. In addition, 228 (percentage) had experienced respiratory symptoms.

Fifty-two donors (1.4 %) reported travelling outside the kingdom of Saudi Arabia 28 days preceding the survey and 149 participants (3.9 %) had contact with infected people or people suspected to have the virus.

5.6. COVID-19 CP

When asked about whether they had suspected or confirmed COVID-19, 36 participants chose an affirmative answer, and 26 of these reported full recovery. Most of the individuals who recovered (20, 77 %) were interested in donating CP. Awareness among all participants about the use of CP in the treatment of other patients was high; with 2469 participants (64.3 %) being aware of CP and its uses.

6. Discussion

Understanding the awareness, knowledge and attitudes of potential blood donors during emergency situations allows for better planning of the resources needed to avoid blood shortages, and this was one of the most important goals of this study conducted at a national level.

A convenience sampling approach was utilized in in this study. Although all 13 regions of Saudi Arabia were represented, most responses were received from Makkah and Riyadh regions, collectively making up for around 78 % of the responses. The responses show that participation was highest among health practitioners and individuals

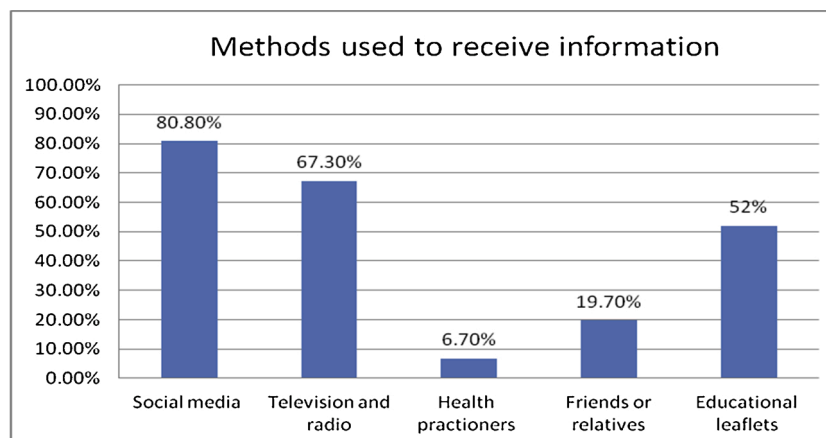


Fig. 1. Methods used by participants to receive information.

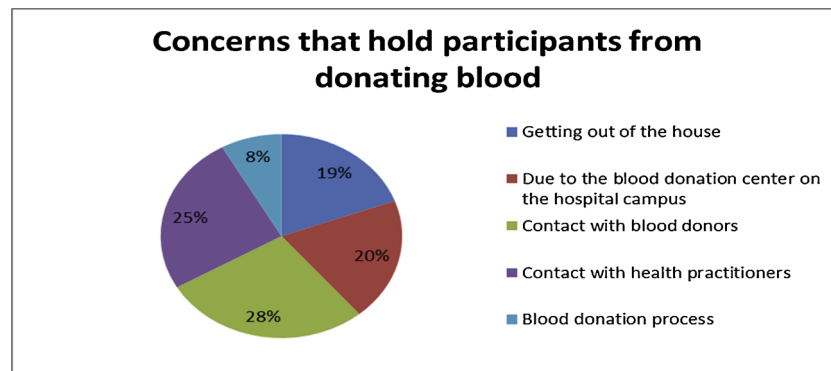


Fig. 2. Concerns that prevent participants from donating blood.

with history or interest in blood donation. The high percentage of responses from males (75 %) also support the idea that the sample represented “potential blood donors”, as males constitute more than 90 % of blood donors in KSA [12]. This is further illustrated through the fact that many of the participants knew their blood group unlike other studies [13].

The most common reported blood group among participants was O+ (47 %), which is the blood group of the highest demand in Saudi Arabia (reference about blood group distribution in Saudi Arabia), also shared by 37 % of the world’s population has the same most common blood group [14]. In this study; only 12 participants (0.31 %) had the AB-blood group. This is also in the same line with other studies that indicated this blood group as the least common one, with only 1 % of the population [14].

The study revealed that the general attitude of the participants towards blood donation was mostly positive especially for males. In a previous study conducted in Ethiopia in 2019, most of the members had a general negative attitude towards blood donation [15]. In another study from Nigeria, only a few of the participants indicated that they would be interested in becoming voluntary donors [16]. And in a study conducted at a public university in West Malaysia (62.4 %) agreed that donating blood is pleasant and (49.5 %) think donating blood is a good idea [17]. Since these studies were conducted before COVID-19 pandemic, it may be that the willingness of donors to donate blood has decreased significantly during the surge of the outbreak.

A study [18] from Saudi Arabia showed that the population of Saudi Arabia have a high potential for voluntary donation at the time of crisis. It was reported that the inventory increased from 3 times in the Central (Ministry of Health) Blood Bank to 7 times for King Khalid University Hospital (KKUH) Blood Bank, and the total inventory of packed RBCs in Riyadh increased about 4 times during the Gulf War [18]. The study suggests that depending on voluntary non-remunerated donors for expanding the donor pool requires proper planning backed by appropriate legislation to integrate donor recruitment activity, targeting a specific total donor input to cover the needs for blood and its derivatives.

Most of the participants indicated the interest in donating blood, but 34 % of them never donated before. Our study did not elaborate on the reasons, and whether the participant is not interested in donating because of a health condition that prevents them from donating is unclear. However, it is recognized that the number of voluntary donors in Saudi Arabia is still below the benchmark [19] in the same time, the fact that 1882 of blood donors (79.6 %) had donated blood more than once shows a good rate of donor retention. More strategies should be put in place to educate and inform people about the recommended frequency of blood donation. People also need more information about the need for blood and the role they could play in saving the lives of others. The fact that 35 % of participants did not recognize that many patients require blood transfusion on regular basis illustrates this knowledge gap. This is a surprising finding among this group of participants from a country

with high prevalence of thalassemia and sickle cell disease.

This study shows that the knowledge of participants about COVID-19 and its modes of transmission were adequate. This is supported by another survey-study of the general Saudi population [20]. Studies from other countries show different results. Low levels of knowledge have been attributed to the low levels of education in developing countries and indicate the need for intensive educational interventions on a community level [21,22].

Our survey revealed that people get information from social media, television and radio, as well as from educational leaflets. Different studies indicated that the major source of misinformation is social media, and more measures should be put in place to ensure the information that is shared on social media regarding the disease is accurate [8].

As expected, many participants had concerns about transmission of the virus during the blood donation process. This is in line with many studies, which indicated that most donors failed to donate blood during infectious disease pandemics over fear of getting infected [4], [23].

The most common concern was getting infected from other donors in the donation area. Most of the studies showed that donors who had no information on the safety of blood donation choose to stay away from donation centers, and those may be encouraged to present to donation centers through reassurance and emphasis on safety measures implemented there [24,25].

Many participants in this study (65 %) felt that the best way to donate blood during a pandemic would be within a blood donation mobile vehicle close to donor’s residence. This option is expected to be attractive to donors to minimize their worry about coming in contact with many other donors or coming to the hospital, but definitely raises many financial and logistical challenges for collection centers [26].

Our study revealed that most of the participants who had been confirmed positive and recovered from the disease were willing to donate CP to help patients still suffering from the illness. Although the number of these potential CP donors in our study is small, it explains the success in collection of CP from Saudi donors presented in a national collaborative study [27].

Our study has a number of limitations. It was not possible to know the number of individuals who received the survey, so it was not possible to calculate the response rate. Although the study’s goal was to be representative of the Saudi population, participants reflected “potential blood donors”. Nonetheless the information collected will be very useful for planning and implementation of measures targeting this specific group of individuals.

7. Conclusion

In this survey-based study, participants had high interests in donating blood with many of them being repeat donors. Knowledge about COVID-19 and its transmission methods was adequate. Many

donors indicated fear of donating blood secondary to concerns of contracting the infection. A number of solutions were presented and agreed upon by various percentages of donors, including utilization of blood donation mobiles and establishing collection centers out of hospital buildings.

Building and maintaining trust between donors and collection centers is essential to maintain an adequate and safe blood supply. This requires adoption of international recommendations and guidelines for infection control and maintenance of a safe and sufficient supply of blood during pandemics.

Workers in blood collection centers must receive continuous education and up to date accurate information about the status of the pandemic, which will allow them to perform their roles safely and raise awareness among potential donors about safety of blood donation. Blood collection centers are encouraged to communicate with donors regarding the efforts put in place to minimize the risk to donors and staff. Collaboration among collection centers and sharing experiences and learned lessons is expected to help plan and manage current and future crisis affecting the blood supply [28].

Authors' contribution

Salwa Hindawi and Saud Almalki designed the survey and the study, Tarek Elgemmezi, and Saud Almalki wrote the initial draft, Maha Badawi, Nehal Yakout, Mohamed Asseri, Yehya Khawaji, Riad Alqurashi collected the data. Salwa Hindawi and Maha Badawi participated in revising the manuscript and all authors approved the final version.

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Declaration of Competing Interest

The authors declare that they have no conflict of interest.

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.transci.2021.103211>.

References

- [1] Al-Riyami AZ, et al. The impact of COVID-19 pandemic on blood supplies and transfusion services in Eastern Mediterranean Region. *Transfusion Clinique et Biologique* 2021;9. <https://doi.org/10.1016/j.traci.2020.11.002>. TRACLI-3159.
- [2] Amar IO. Management of blood supply and demand during the COVID-19 pandemic in King Abdullah Hospital, Bisha, Saudi Arabia. *Transfus Apher Sci* 2020; 59(Oct(5)):102836. <https://doi.org/10.1016/j.transci.2020.102836>. Epub 2020 Jun 4.
- [3] Cai X, Ren M, Chen F, Li L, Lei H, Wang X. Blood transfusion during the COVID-19 outbreak. *Blood Transfus* 2020;18(2):79.
- [4] Maintaining a safe and adequate blood supply during the pandemic outbreak of corona virus disease (COVID-19). WHO; 2020 (20 March). Available at, [https://www.who.int/publicationsdetail/maintaining-a-safe-and-adequate-blood-supply-during-the-pandemic-outbreak-of-coronavirus-disease-\(covid-19\)](https://www.who.int/publicationsdetail/maintaining-a-safe-and-adequate-blood-supply-during-the-pandemic-outbreak-of-coronavirus-disease-(covid-19)).
- [5] World Health Organization. Coronavirus disease 2019 (COVID-19): situation report, 72. 2020. <https://apps.who.int/iris/handle/10665/331685>.
- [6] Chen Y, Jin YL, Zhu LJ, Fang ZM, Wu N, Du MX, et al. The network investigation on knowledge, attitude and practice about Novel coronavirus pneumonia of the residents in Anhui Province. *Zhonghua yu Fang yi xue za zhi [Chin J Prevent Med]* 2020;54. E004-E004.
- [7] Wolf, et al. Awareness, attitudes, and actions related to COVID-19 among adults with chronic conditions at the onset of the U.S. outbreak. *Ann Intern Med* 2020. <https://doi.org/10.7326/M20-1239>. 9 Apr.
- [8] Abdelhafiz AS, Mohammed Z, Ibrahim ME, Ziady HH, Alorabi M, Ayyad M, et al. Knowledge, perceptions, and attitude of Egyptians towards the novel coronavirus disease (COVID-19). *J Community Health* 2020;1-10.
- [9] Hindawi Salwa. Evolution of blood transfusion medicine in Saudi Arabia. *Transfusion* 2020;60(February).
- [10] Eysenbach Gunther, et al. Improving the quality of web surveys: the Checklist for Reporting Results of Internet E-Surveys (CHERRIES). *J Med Internet Res* 2004. <https://doi.org/10.2196/jmir.6.3.e34>. Sep 29, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1550605>.
- [11] Grimshaw J. SURGE (The SURvey Reporting Guideline). In: Moher D, Altman DG, Schulz KF, Simeria I, Wager E, editors. Guidelines for reporting health research: a user's manual; 2014. <https://doi.org/10.1002/9781118715598.ch20>.
- [12] Gader Abdelgalil, et al. Attitude to blood donation in Saudi Arabia. *Asian J Transfus Sci* 2011;5(July (2)):121-6.
- [13] Elsayid Mohieldin, et al. A study of prevalence of blood group of Saudi patients in King Abdulaziz Medical City-Riyadh. *Sci J Public Health* 2015;3(June (4)):559.
- [14] Mahat B, Shrestha L, Adhikari S, Thapa B, Limbu P, Banstola D, et al. Blood groups and their association with academic performance among medical students in a Nepalese Medical College. *J Inst Med Nepal* 2019;41(3):74-7.
- [15] Malako D, Yoseph F, Bekele ML. Assessment of knowledge, attitude and practice and associated factors of blood donation among health care workers in Ethiopia: a cross-sectional study. *BMC Hematology* 2019;19(1):10.
- [16] Salaudeen AG, Durowade KA, Durotoye IA, Ahmed A, Sanni EO, Musa OI, et al. Determinants of voluntary blood donation among adults in communities of north central region of Nigeria. *Res J Health Sci* 2019;7(2):144-54.
- [17] Muhammad S, Halain AA, Geok K, Soh K. Knowledge, attitude and practice of blood donation among undergraduate students in a public university, Malaysia. *Int J Pharm Res* 2018;10(4).
- [18] Gader Abdel, Alqahtani Farga H, Albanayan Abdulmajeed A. Blood supply in the Kingdom of Saudi Arabia- self-sufficiency and safety considerations. *J Appl Hematol* 2011. Abel Galil M.
- [19] WHO Global status report on blood safety and availability. 2016. ISBN 978-92-4-156543-1.
- [20] Baig M, Jameel T, Alzahrani SH, Mirza AA, Gazzaz ZJ, Ahmad T, et al. Predictors of misconceptions, knowledge, attitudes, and practices of COVID-19 pandemic among a sample of Saudi population. *PLoS One* 2020;15(12):e0243526. <https://doi.org/10.1371/journal.pone.0243526>.
- [21] Singhal T. A review of coronavirus disease-2019 (COVID-19). *Indian J Pediatr* 2020;1-6.
- [22] World Health Organization. Coronavirus disease 2019 (COVID-19): situation report, 72. 2020. <https://apps.who.int/iris/handle/10665/331685>.
- [23] Abera B, Mohammed B, Betela W, Yimam R, Oljira A, Ahmed M, et al. Knowledge, attitude, and practice towards blood donation among health care providers in hospitals at Bahir Dar City, Ethiopia. *Transfus Apher Sci* 2017;56(3):434-8.
- [24] Shander A, Goobie SM, Warner MA, Aapro M, Bisbe E, Perez-Calatayud A, et al. Essential role of patient blood management in a pandemic: a call for action. *Anesth Analg* 2020;131(Jul(1)):74-85. <https://doi.org/10.1213/ANE.0000000000004844>.
- [25] WHO Guidance on maintaining a safe and adequate blood supply during the coronavirus disease 2019 (COVID-19) pandemic and on the collection of COVID-19 convalescent plasma. 2020. Available at <https://www.who.int/publications>, 10 July.
- [26] Sachdev S, Singh L, Marwaha N, Sharma RR, Lamba DS, Sachdeva P. First report of the impact on voluntary blood donation by the blood mobile from India. *Asian J Transfus Sci* 2016;10(January-June (1)):59-62. <https://doi.org/10.4103/0973-6247.164274>. PMID: 27011672; PMCID: PMC4782496.
- [27] Al Hashmi Hani, et al. A national collaborative multicenter phase II study for potential safety efficacy of convalescent plasma to treat severe COVID-19 patient. In: 62nd Annual ASH Meeting; 2020. <https://ash.confex.com/ash/2020/webprogram/Paper138496.html>.
- [28] Stanworth Simon J, et al. Effects of the COVID-19 pandemic on supply and use of blood for transfusion. *Lancet Haematol* 2020. [https://doi.org/10.1016/S2352-3026\(20\)30186](https://doi.org/10.1016/S2352-3026(20)30186). July 3.