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Survey based cross-sectional study to analyse the variation of practices at blood centres during COVID-19 pandemic in India

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ABSTRACT

India has almost 3,000 blood centres collecting more than 11 million units annually. Maintaining blood supply during the COVID-19 pandemic is a huge challenge. We conducted a cross-sectional study by an online survey to analyse the variation of practices across blood centers of India during this pandemic. A total of 196 blood centers completely responded to the online survey. Most of the blood centres who responded were part of Government hospitals (60 %), part of an academic institutes (55.6 %) and were directly supporting a COVID hospital (67.5 %). Almost 95.4 % blood centers reported reduction of blood donation mainly due to lockdown (50 %) and inability to conduct camps (17.3 %). Scheduling blood donations was one of the most difficult to implement strategy for maintaining adequate blood donation (40.2 %). Blood center manpower management was also a challenge and upto 48 % blood centers operated in two batches to ensure social distancing in blood banks and reduce the risk of exposure. Hemato-oncology (36.8 %) and obstetrics (33.7 %) were major utilizer of blood during the pandemic. There were marked variations in use of PPE by blood banks staff as well as strategies adopted while conducting immunohematology tests on COVID-19 positive patients samples. This pandemic has highlighted some of the major limitations of the health services but blood services have risen to the challenge and strived to maintain the blood supply chain while ensuring blood donor and staff safety. The wide variations in the practices adopted highlights the need for uniform guidelines for blood services in future pandemics.

1. Introduction

The COVID-19 pandemic has been a challenge of unprecedented scale for countries around the world. The healthcare infrastructures of even the most developed nations have struggled to manage the disease and contain its spread. This is because of its highly contagious nature and the associated morbidity and mortality.

Tough times call for tough measures and the Indian government took the call and announced a complete lockdown starting midnight of 24th March 2020 except essential services like the fire service, police, and health services. The COVID-19 pandemic and the ensuing lockdown posed an immense challenge to the blood centres. It had an adverse impact on collection of blood as blood donation drives and donations at blood centres were severely hit, as the movement of people was curtailed due to the lockdown rules. In addition, with the threat of COVID-19 looming large; the necessity of putting in place adequate protective measures to protect the blood services staff as well as the blood donors posed further challenges [1].

Blood is required to support essential and emergency services as well as cater to patients with hemoglobinopathies who require regular transfusions [2]. India has a very decentralized blood transfusion system with almost 3,000 blood centres in India. They collect roughly about 11 million units annually and around half of them have component preparation units. The guideline for donor selection and collections is governed by the Central Government. The donation from paid donors is banned since 1998 and there is an emphasis to collect blood majorly from voluntary blood donors.

Aim of this survey was to understand how the blood centres services were affected and adapted to the rapidly changing scenario of health care services across the country in response to the COVID-19 pandemic.

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The results of this survey will help us understand the variation in practices and provide necessary data on areas where improvements can be made and provide a basis for updating the guidelines and regulatory recommendations with regard to blood services.

2. Materials and methods

2.1. Design

This was a cross-sectional study targeting blood centres throughout the country. There are 28 states and 8 union territories in the country. We utilized purposive sampling to include blood centres representing all these 36 entities.

2.2. Approval and consent

The study was approved by the Institutional Ethics Committee. The Doctor-in-Charge of blood centres were contacted for their willingness to participate in the survey. Those who were willing to participate were sent the survey through a Google form link which is a web-based data entry mode linked to an email ID. The email detailed the purpose of the study and who were conducting it. The survey form did not have any identifiers of the participants/centres and was anonymous with respect to responders. No blood centre specific questions of any kind were included in the survey nor did the investigators know the responders of individual data. The survey was a completely anonymous voluntary exercise in nature. No incentives of any kind were offered to the responders for filling the survey.

2.3. Questionnaire and administration

The questionnaire was developed by brainstorming amongst five subject experts. Then the questionnaire was sent to three experts, for validation, in the field who were not a part of the initial brainstorming. Their comments were collected and incorporated after a discussion. The questionnaire was again sent to 4 different centres for a pilot trial to know the technical functionality of the survey and the feedback was collected. Necessary modifications were made to rectify the technical difficulties faced by the responders. The questionnaire consisted of about 25 questions with a single best option, multiple choices, and open questions wherever appropriate. The survey included questions regarding demographic characters, facilities available, and adaptations that were done to tackle the situation in the wake of the COVID-19 pandemic. The majority of survey questions had radio buttons and dropdown menus to select an appropriate option. A few questions required the manual entry of information. The options were not altered or randomized. No adaptive questioning was included as it was administered to purposively sampled responders. The questionnaire was in a single scroll down interface with no pages. It ran over about 8 screen pages. The responders had an option to mail back a copy of their responses to themselves for checking the completeness of the survey. There was a provision for revision of their responses if required. This was performed as a closed survey to avoid duplication of data from the same centre. The mail ID’s of the centres/In-charges were collected, and the questionnaire link was individually emailed. The survey was conducted in a time frame of one week from 4th to 10th May 2020. All questions were mandatory. The survey was in English language and incomplete responses were not accepted for analysis.

3. Statistical analysis

The responses were automatically embedded in the MS office excel sheet. All the categorical variables were summarised as proportions and frequencies with percentages at 95 % confidence intervals. Continuous variables were expressed as mean (SD) or median (range) and compared by Student’s t-test or Mann-Whitney U test as appropriate. The categorical data were analyzed using Chi-Square test. All the statistical analysis was carried out using Microsoft excel, and SPSS version 20 (SPSS IBM Corp. Ltd. Armonk, NY).

4. Results

The survey was responded by 196 blood centres (Fig. 1). The maximum participation from the state of Uttar Pradesh (n = 24) followed by Delhi (n = 11), Haryana (n = 6), Punjab (n = 5), Chandigarh (n = 5), Uttarakhand (n = 4), Jammu & Kashmir (n = 4) from North India. From eastern part of the country West Bengal (n = 16), Odisha (n = 11), Assam (n = 4), Jharkhand (n = 3), Arunachal Pradesh (n = 2), Bihar (n = 3), Meghalaya (n = 2), Nagaland (n = 2), Sikkim (n = 2), Tripura (n = 2). Kerala (n = 14), Karnataka (n = 14), Tamil Nadu (n = 11), Telangana (n = 5), Puducherry (n = 4), Andhra Pradesh (n = 2), Andaman and Nicobar (n = 1) reported from southern part and Madhya Pradesh (n = 10) from central part of the country. Gujarat (n = 12), Maharashtra (n = 11), Rajasthan (n = 6) reported from western part. A total of 195 responders (blood centres) from 25 states and 4 union territories completed the survey. Government/public sector blood centres constituted 60 % of the responding blood centres and the rest (40 %) were from the private sector (Table 1).

The majority of participating blood centres were part of teaching hospitals (55.8 %, n = 110) and 67.5 % (133 out of 196) of blood centres were supporting a COVID hospital and 20.3 % (n = 40) were located within the same building which kept COVID patients (Table 1).

A reduction in blood donations was observed in 95.4 % (188 out of 196) of the blood centres. The lockdown was the major cause of this reduction according to 50 % of the responders. The inability to conduct camps (17.3 %), the shutdown of elective surgeries (15.3 %) and a sense of fear among the donors (12.2 %) were the other important causes mentioned.

4.1. Measures for donor recruitment and travel

The common measures adopted by the blood centres for donor recruitment were connecting and counselling known donors registered at their centre (67.3 %) or motivating donors using social media (48.5 %). Blood centres also provided a travel pass to donors for transit to the blood centre and back (62.2 %). Even a pick and drop facility was provided by 31.6 % of the centres for the smooth travel of donors. One of the blood centres had made Arogya Setu mobile app as a prerequisite for coming to donate blood.

Hospital vehicles (transport specifically arranged for donors movement due to pandemic) for movement of the donors were provided by 43.8 % of the blood centres whereas 19.1 % utilized blood donation mobile vans (camps) for collecting blood. Seven blood centres collected blood from the homes of the donors themselves whereas two centres set up temporary offsite collection centres to allay fear among donors who were concerned about coming to a hospital for donation. An appointment system for blood donors to avoid crowding was started in 75.3 % of the blood centres.

4.2. Measures implemented for donor screening

Scheduling donation appointments at timely intervals was considered as the most difficult to implement by 40.2 % of the participants whereas maintenance of social distancing in the blood centre was reported as most difficult by 34.5 % (Fig. 2). Disinfecting the donor screening area (30.8 %), implementing mandatory hand sanitisation and face mask (7.7 %) were considered as the other few difficulties faced. As high as 36.4 % of the participants felt that some kind of screening of COVID patients (Table 1).
4.3. Measures implemented for blood collection

Routine outdoor camps were held by 36.9% of the blood centres. Five of the responders (2.6%) had received a call back by donors who had donated and subsequently developed COVID/COVID like symptoms later. The inability to organise outdoor camps during this period was reported by 55.6% of the participants due to refusal of permission from concerned local government authorities considering restrictions placed because of the COVID-19 pandemic (50.8%). Around 44% of responders highlighted that the camp organisers/donors were reluctant to hold blood donation camps, whereas 29.2% of respondent centres did not feel the necessity of organising camps due to decreased requirements. The inability to mobilize staff and organise the camps was reported by 16.9% of the participants.

4.4. Manpower management by blood centres

In 48% of the centres, the staff was divided into two batches and allowed to work alternately for set durations followed by a changeover to reduce exposure of all the staff at once. Working with two batches coming at different shifts was adopted by 23.2% of the centres, whereas 24.7% of the centres continued with usual strength and shifts. Given the reduction in the workload as well as to reduce exposure, 57% of the centres followed working patterns where after working for a certain duration ranging from one day (19.6%) to 15 days (2.2%) and, then the staff was given an off for a similar duration. The most common pattern followed was one-week work and one week off (21.7%) or 3 days’ work.
and 3 days off (21.7 %). To avoid overlap amongst staff and minimize contact among staff 58 % of the centres switched to shift duties. The most common pattern was an 8 h shift (42.3 %) in a day or a 6-6-12 hourly pattern (19.2 %) i.e. 8.00am-2.00 pm, 2.00 pm- 8.00 pm and 8.00 pm-8.00am. The other common patterns followed were a 12 h shift (15.4 %) or 24 h duty and then off (7.7 %). There was one centre which even followed a 36 h shift followed by off for the rest of the week.

4.5. Implementation of PPE by blood centre staff

The majority (32.8 %–37.2 %) of centres implemented the use of only a facemask (surgical) followed by centres using facemask with a head cap (19.2 %–28.1 %) and the remaining used a facemask, and head cap along with goggles (0.5 %–14.1 %). Some centres reported the use of an N95 mask (up to 10.1 %) and even a complete PPE kit (upto 6.6 %) by the staff when working in various areas of the blood centre. Type of PPE’s used in various sections of blood centre are summarised in Table 2.

4.6. Measures taken in compatibility testing and immunohematology lab

During the lockdown period, the major utiliser of blood products was Hematology and Oncology (36.8 %), followed by Obstetrics (33.7 %), surgical emergencies (8.2 %), and medical emergencies (6.1 %). 28.9 % responders reported that they used a special plastic bag while transporting the patient sample to the blood centre. 23.2 % responders reported no change in the sample-receiving policy whereas 21.1 % responders disinfected the sample on receiving. Around 8.2 % responders reported no change in the policy while testing samples of COVID-19 positive/suspect patients while 26.2 %

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Table 2

| Type of PPE used                      | Blood donation area | Immuno-hematology lab & Component lab | Issue counter |
|---------------------------------------|---------------------|--------------------------------------|---------------|
| Only Face mask (triple layer)         | 32.8 %              | 35.6 %                               | 37.2 %        |
| Face mask (triple layer) with head cap| 19.2 %              | 27.3 %                               | 28.1 %        |
| Face mask (triple layer), goggles with head cap | 14.1 % | 0.5 % | 1 % |
| Only N95 mask                         | 10.1 %              | 9.3 %                                | 9.2 %         |
| Complete PPE kit (as in isolation)    | 6.6 %               | 5.7 %                                | 4.6 %         |
centre tested samples in a biosafety cabinet, 24 % centres gave up testing in tubes and 19.7 % centres adopted skipping the centrifugation step while doing compatibility testing. The various responses in regard to sample handling are summarised in Figs. 4 and 5.

28.6% of centres reported discarding of the pre-transfusion testing samples after the transfusion completion report was received whereas 25 % of centre reported discarding of the sample after completion and validation of compatibility testing. The sample discard was done by the approved biomedical waste disposal rules. 23 % of responding centres reported storing the pre-transfusion sample for 7 days in a different location from the routine area whereas 10.2 % of the responders reported no change in the sample storage policy.

Many responders reported no change (51.8 % PRBC and 47.4 % platelets) in the overall discard of blood and blood components because of the pandemic and reduced demand for blood. Whereas some centres reported an increase in discard rate (31 % PRBC & 36.6 % platelets) due to a drastic reduction in demand for blood at their centres.

5. Discussion

The COVID-19 pandemic has affected the healthcare system in many ways. It has redefined and changed the way medicine will be practiced in the post-COVID-19 era. It raised many issues concerning the preparedness of the public health sector in response to such events. This pandemic has also placed the blood transfusion services in a unique situation, and it is expected that the blood transfusion services should respond to it appropriately [3]. The challenges include the maintenance of safe blood supply to the patients and ensuring the safety of both blood donors and staff at blood centres. In the absence of specific guidelines or guidance documents for addressing these issues, each blood centre adopted policies and protocols based on the available knowledge of the virus with available resources. In this survey, we tried to capture the various practices adopted by the blood centres in the month of May across India to respond to these challenges.

This survey attempted to cover all parts of the country to have a comprehensive overview of the situation. The survey represented all categories of blood centres and included metropolitan, district, semi-urban and rural blood centres. The practices varied among blood centres due to the level of awareness about the transmission dynamics of SARS-CoV-2. As was expected the academic institutes which were treating COVID patients were better updated and regulated their practices in a better way.

Reduction in the number of potential blood donors opting to donate during a pandemic is a major challenge for the blood transfusion services. Major factors limiting blood donations were fear of being infected during a visit to the blood centres and the inability to travel to the blood center due to restrictions on movement. WHO recommends a clear, proactive, and consistent communication strategy as a key to addressing and overcoming donor anxiety [4]. In our survey many blood centres (67.3 %) connected with the registered voluntary blood donors and motivated them to come to the blood centres for blood donation.

WHO recommends relaxation of some donor-selection criteria because of reduced donations during the pandemic but additional screening questions may be added given the pandemic. Excluding the exposure of the donor to SARS-CoV-2 during the screening process was an important strategy of the blood centres to assure blood safety. Use of “Arogya Setu” app was not analysed in this study.

Inventory management is a major challenge in blood centres during the pandemic, as it is very difficult to predict the demand for blood components during different phases of the pandemic. Most of the blood centres reported no change in the discard rates of blood components but some centres reported increased discard due to reduced demand. Blood centres need to keep a close watch on the changing trend of blood component requirement and the number of elective or emergency surgeries and transplantations planned by their hospitals by remaining in continuous touch with clinicians and hospital administration.

The blood centres staff is always at risk of the infection as many blood donors visit the donation area and they may transmit infection to the blood centre staff or other donors if they are asymptomatic carriers. Use of appropriate PPE by the staff, frequent hand washing, maintaining social distancing, and screening of donors for fever may be a few key steps can be considered to prevent the spread of infection. There was a huge variation reported by the blood centres in the use of various levels of PPE used by the personals working in various laboratories of the blood centre (Table 2). Lack of proper guidelines specific to blood centres in this regard may be the main reason for this variation which should be addressed by national regulatory authorities for its uniformity.

Considering the guidelines to maintain social distancing and reduced workload in the blood centres flexible scheduling of work hours and roster were adopted by the reporting blood centres. It is recommended that each blood centre should prepare a contingency plan for staff replacement given illness, quarantine, and fear of disease. Similar flexibility was also reported by the responding centres.

Blood centre laboratories are also at risk as they receive samples for COVID positive or suspect patients. Blood centres need to optimize workplace-related exposure risk and take appropriate mitigation steps. COVID-19 has shown to be stable on plastic surfaces and may stay viable for a long time [5]. Surface contamination of plastic tubes and vacutainers is possible and surface contamination of various areas of the isolation room in which patients were kept was also observed but no data is available confirming transmissibility of the virus through a surface contamination [6,7]. The risk of transmission depends on the viral
The risk of infection while working on the samples due to aerosolization of the viral particle has also been identified. As RNA is detectable in blood hence inhalation of potentially infectious aerosols may be due to inhalation of aerosol generated during de-capping, centrifugation, mixing, and shaking or pipetting [8]. It is recommended that aerosol-generating processes should be performed in the biosafety cabinet (BSC) and automation with reduction of manual steps needs to be adopted [9]. A lot of variation in modifications in steps of pre-transfusion testing was reported by the blood centres (Fig. 5). Although processes like skipping the centrifugation step may not provide additional benefit. As the samples usually sent to the lab in vacutainers.

A number of transformations are required and have been adapted by blood centres as community activities are disrupted thus affecting the blood collection activities. Hospital activities have been switched to cater to the COVID-19 pandemic and hence the requirements and expectations from the transfusion services also has changed [10]. Many centres across the world reported similar adaptation to the challenges posed by the pandemic for the transfusion services [11–16].

6. Strength and Limitation of the survey

The major strength of the survey was that it was representative of all categories of blood centres across the country. It also highlighted the awareness of blood centres regarding the SARS-CoV-2 virus, its infectious nature and transmissibility. The variability in practice in the absence of uniform guidelines was also brought to the fore.

The major limitation of this survey was the nature of the questionnaire which was made with an aim to make it simple and short, this precluded descriptive answers related to the subject. Repetition or more than one entry from the same center though was vastly minimised by sending invitation to one person from each centre however this cannot be completely ruled out as the survey was anonymous. Few centres did reported no reduction in blood shortage which may be due to corresponding reduction in cases requiring blood transfusion. These centres may have been majorly supporting a surgical facility which was limited to emergency surgeries only. Inability to represent the remote areas of many states was another notable limitation.

7. Conclusions

The COVID-19 pandemic has brought to light the major limitations of the Health services in dealing with pandemics of highly contagious nature. The Blood services have risen to the challenge and strived to maintain the blood supply chain while putting in place measures to ensure blood donor and staff safety. The wide variations in implementing these measures bring to light the need for uniform guidelines on biosafety measures for blood services.

CRediT authorship contribution statement

Abhishekh Basavarajegowda and Satyam Arora conceptualized the study. Meenu Bajpai, Ashish Maheshwari and Seema Dua formulated and validated the survey. Abhishekh Basavarajegowda, Satyam Arora, Ashish Maheshwari and Seema Dua wrote the manuscript. Meenu Bajpai and Dibyajyoti Sahoo reviewed and proof read the manuscript.

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Declaration of Competing Interest

The authors report no declarations of interest.

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