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Challenges in platelet inventory management at a tertiary care oncology center during the novel coronavirus disease (COVID-19) pandemic lockdown in India



Shashank Ojha, Abhaykumar Malind Gupta*, P. Nagaraju, Minal Poojary, Sumathi S.H.

Department of Transfusion Medicine, Advanced Centre for Treatment Research and Education in Cancer, Tata Memorial Centre, Homi Bhabha National Institute, Navi Mumbai 410210, India

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ABSTRACT

The novel coronavirus disease (COVID-19) has been declared a pandemic by the world health organization and to limit the spread of the disease, many countries in the world, including India, had enforced a lockdown. Despite no restriction over the platelet donation activities, plateletpheresis donors became apprehensive regarding the possible risk of spread of the COVID-19 during the platelet donation and in the hospital premises. Many of them started hesitating for platelet donations. With this, the blood center started having an acute shortage of platelets. Various confidence-building steps were implemented by the blood center to promote voluntary plateletpheresis. The blood center staff and individual donors were educated to prevent the spread of COVID-19. The donor organizations and plateletpheresis donors were informed about the steps to be taken by the blood center during the donation and necessary steps for the prevention of the possible spread of COVID-19. With the help of these measures, the confidence of the individual platelet donors and the donor organizations was restored in the blood center and regular plateletpheresis was continued. These measures may also be useful to other blood centers in the COVID-19 pandemic and this experience may be useful if a similar pandemic lockdown happens in the future.

1. Introduction

The novel coronavirus disease (COVID-19) is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). On March 11, 2020, the COVID-19 has been declared as the pandemic by the World Health Organization [1]. To limit the spread of the disease, many countries in the world, including India, had enforced a 'lockdown'. The Indian government had declared an overall national lockdown from March 25, 2020, to May 31, 2020, with restriction to extend even further [2]. With the enforcement of lockdown, only essential grocery and medical facilities were allowed for the general population. With continuous COVID-19 reporting on 24 × 7 news channels and sometimes fake news on social media, the general population, including the plateletpheresis donors became very apprehensive regarding the risk of entrapping the COVID-19 infection while donating platelets or in the hospital premises. Due to this many regular donors started hesitating for plateletpheresis.

1.1. Challenges in platelet inventory management

Platelet has a short shelf life of only five days and hence platelets need to be collected as per the requirement and cannot be collected and stored similar to the Red Blood Cell units [3]. Our center is a tertiary care oncology institute with specialization in the bone marrow transplantation (BMT). Thrombocytopenia is frequent in oncology patients due to the disease and its treatments such as chemotherapy and radiotherapy. At the time of lockdown, many patients were already admitted to the BMT, hemato-oncology, and onco-surgery departments. Many of these patients require platelet transfusions regularly and it may be life-saving for a few of them. The present study was aimed to analyze the impact of lockdown on the plateletpheresis donations and various measures implemented to overcome them.

2. Materials and methods

The study was conducted at a tertiary care oncology hospital-based

* Corresponding author.

E-mail addresses: sojha@actrec.gov.in (S. Ojha), dr.abhaymgupta@gmail.com (A.M. Gupta), nagarajup1@yahoo.co.in (P. Nagaraju), mpoojary@actrec.gov.in (M. Poojary), sumathish@actrec.gov.in (S. S.H.).

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blood center. This was a combined prospective and retrospective analysis of plateletpheresis in the pre lockdown and lockdown phase. All the data was retrieved from the blood center registers. The lockdown started on March 25, 2020, and the 30-day data before that and 30-day data during lockdown was analyzed. All the plateletpheresis procedures had been performed as per the department standard operating procedures.

2.1. Statistical analyses

Data was computerized using Microsoft Excel spreadsheet and statistical analysis was carried out using statistical software SPSS for Windows, Version 23.0, IBM Corp. USA. Descriptive statistics such as mean, standard deviation (SD), and range values were calculated for normally distributed continuous variables. Frequency data across categories were compared using the Chi-square/Fishers Exact test as appropriate. A two-sided probability of P-value < 0.05 was considered to be statistically significant.

3. Results

3.1. Pre lockdown and lockdown effects (for 30 days each)

In the pre lockdown, a total of 1507 patients (out-patient and admitted) visited the hospital, whereas only 432 patients visited in the lockdown phase. In the pre-lockdown phase, our median daily single donor apheresis platelet (SDAP) inventory was 16 which reduced to 10 ($p < 0.001$) in the lockdown phase. In the pre lockdown phase, a total of 120 SDAPs was collected, whereas only 69 SDAPs were collected in the lockdown phase. The majority of SDAPs transfusions were group-specific in the pre lockdown phase as compared to the lockdown phase (76 vs 38, $p = 0.328$). As the number of hospital admissions decreased, the median number of SDAPs collected and issued had also decreased significantly in the lockdown phase; in pre lockdown, it was three SDAPs each whereas it was two SDAPs each in the lockdown phase ($p < 0.001$). The maximum number of SDAPs issued in a single day in pre lockdown was eight, while the same was four in the lockdown phase.

Various measures were implemented to minimize the catastrophic effect of the lockdown on the blood center and to ensure continuous plateletpheresis procedures. These measures were as follows.

3.2. Measures implemented to increase the voluntary plateletpheresis donors' database

3.2.1. Appeal to the voluntary blood donor organizers (VBDOs) and confidence-building measures

- 1 All the VBDOs active in the field of blood and platelet donation were informed about the shortage and continuous need of the platelets during the COVID-19 pandemic.
- 2 The organizers were informed about the steps to be taken by the blood center during the plateletpheresis and necessary steps for the prevention of the possible spread of COVID-19.
- 3 All the queries of VBDOs and individual SDAP donors were understood and resolved over the phone or with the help of the personal meeting with a medical social worker.

3.2.2. Organization of platelet awareness drives

To increase the number of voluntary plateletpheresis, the platelet awareness camps were organized. In these camps, a prior introductory lecture was given regarding platelet physiology, its need, and the procedure of plateletpheresis. A question-answer session was conducted for all the potential donor's queries. At the end of the camp, willing donors filled up the donor health questionnaire and a blood sample was withdrawn at the camp after the medical examination. Further testing

was done at the blood center for the eligibility of donation. Social distancing was observed and all the necessary precautions were implemented at the campsite. The camp was organized after due permission of the concerned authorities. After the confirmation of the eligibility, donors were called to the blood center in a staggered manner as per the requirement.

3.2.3. Demonstration of the plateletpheresis and conversion of the whole blood donors to plateletpheresis donor

Many regular and first time donors routinely come to the blood center for the whole blood donation. All these donors were demonstrated, plateletpheresis procedure, and the regular need for SDAPs in oncology patients was explained. Active discussion of explanation of the plateletpheresis was done and blood donors were requested to donate SDAP instead of whole blood.

3.2.4. Motivating the patient's attendants for plateletpheresis

As the voluntary donor database decreased during the lockdown, patient's attendants (family members) were requested to come forward and donate SDAPs. Attendants were also motivated to become a regular repeat SDAP donor in the future. None of the attendants were forced for the SDAP donations.

3.3. Steps to increase donor safety and confidence-building measures for the donors

3.3.1. Implementation of a modified donor health questionnaire

A modified donor health questionnaire was implemented at our blood center. This was in addition to the routine donor health questionnaire and was in accordance with the national blood transfusion council (NBTC) guidelines [4]. The addendum included donors and close contacts (family members) travel history, contact history with a confirmed or suspected case of COVID-19, and symptoms of active infection. If the donor gave any positive history or had symptoms suggestive of COVID-19, then the donor was deferred and advised to follow proper social distancing protocols, stay at home and seek medical care if required.

3.3.2. Education for Blood center staff members

- 1 Blood center staff was educated about the current COVID-19 crisis and important measures of its prevention like hand hygiene, cough etiquette, social distancing, etc.
- 2 The need and importance of the universal precautions were reiterated and the staff was instructed to follow the good laboratory practices.
- 3 Staff education aimed to make them more vigilant and to prevent the possible spread of COVID-19.
- 4 Staff members were advised to follow the AABB resource document for blood establishments regarding the COVID-19 outbreak and World Health Organization guidance document on the safety of the healthcare professionals [5,6].
- 5 The staff was trained regarding the proper use of N95 masks with its proper storage and disposal.
- 6 Proper donning and doffing of personal protective equipment were also demonstrated.
- 7 Staff members were asked not to use the wrist-watch or any other hand accessories during the pandemic.
- 8 Staff was instructed to clean cell phone, pens, and other potentially infected materials with hand sanitizers before entry and exit from the blood center.

3.3.3. Advice and instructions for the VBDOs and individual SDAP donors

- 1 Donor education material and expected precautions to be taken while plateletpheresis, were given to the VBDOs for the prior

circulation in the members and potential plateletpheresis donors.

- 2 VBDOs were informed to promote the self-deferral of any donor with fever and symptoms of cough, cold or close contact with anyone with these symptoms or history of travel outside India within the last 28 days.
- 3 For the first time plateletpheresis donors, questions were asked about their weight, major medical history, travel, and contact history by a medical officer. This was done to reduce the travel of ineligible SDAP donors. Later, the detailed medical history and physical examination were done at the blood center as per the routine.
- 4 Donors were requested to come alone without any non-essential accompanying person.
- 5 All the donors were advised to inform the blood center regarding any symptoms or confirmation of COVID-19, up to 14 days' post-donation. So that necessary corrective steps with staff who came in contact with the donor and patient who was transfused with donor's SDAP may be taken.

3.4. The process of the scheduling of plateletpheresis donors

3.4.1. Scheduling of the donors for plateletpheresis

- 1 A dedicated resident doctor and medical social worker were allotted for the donor schedule.
- 2 An SDAP donor schedule book was maintained and donor name, blood group, and date with the time of appointment were entered in the book to avoid errors in the scheduling.
- 3 Group-specific SDAP donors were called as per the estimated requirements of the admitted patient requiring frequent platelet transfusions with an extra buffer stock for emergencies.
- 4 As the majority of patients and hospital staff come in the morning to the hospital, donors were called late in the morning or in the afternoon to avoid the crowding and delay in the screening at the security gate.

3.4.2. The donor appointment letter/certificate (Supplementary Material-I)

A scanned copy of the donor appointment letter was sent to all the donors via email or smartphone technology (WhatsApp), indicating that the donor is scheduled for platelet donation on a particular date and time. The letter/certificate was signed by the medical officer and medical social worker with the date and stamp of the blood center. This letter was as per the state blood transfusion council's recommendations. The police and concerned authorities were requested to allow the donors to travel to the blood center.

3.5. The process of platelet donation

3.5.1. The screening protocol, while entry at the hospital

- 1 The face masks were compulsory for anyone entering the hospital premises.
- 2 An infrared thermometer was used to check the body temperature of all the patients and visitors.
- 3 If anyone was detected with high temperature, then they were referred to the fever clinic.
- 4 Plateletpheresis donors were informed about this extra security protocol and were asked to take out extra time while coming for the donation and co-operation with security personnel of the hospital was requested.

3.5.2. Precaution by the blood center staff at the plateletpheresis area

- 1 The use of alcohol-based hand sanitizers by donors at the entry and exit of the donation premises was ensured.
- 2 Namaste was the preferred mode of greetings instead of the

handshake.

- 3 Only two staff members were dedicated to working in the donation area.
- 4 Donors who did not have a proper face mask were offered the same from the blood center.
- 5 Personal protective equipment including N95 mask, hand gloves, etc. was made mandatory for the blood center staff in the donation premises.
- 6 Worn gloves were cleansed with alcohol-based sanitizer before and after coming in contact with donor and change of gloves was done after each plateletpheresis donation.
- 7 Safe disposal of gloves, masks, and other potentially infected materials was ensured.

3.5.3. Social distancing at the plateletpheresis area

- 1 VBDOs were informed to schedule donors in a staggered manner avoiding more than two donors at a time.
- 2 Only the donor was allowed in the blood center and other accompanying people (if any) were requested to make themselves comfortable in a separate waiting area.
- 3 As the position of donation couches is somewhat fixed in the donation area, hence donations were taken on the alternate couches.
- 4 The sitting arrangement in the waiting and refreshment areas were at least two meters apart.
- 5 Gathering of people for photos while donation was discouraged instead, donors were asked to take selfies if required.

3.6. The procedural changes at the blood center

3.6.1. The rotational duty of the blood center staff

The blood center staff was posted in 40–50 % of the regular strength in batches. If any of the staff members in any batch came positive with COVID-19 then the entire batch would have been quarantined and the next batch would take over. The staff allotted to the blood donation drives were different from the staff who were attending the regular blood center duties.

3.6.2. Cleaning measures taken in the apheresis area

- 1 All the plateletpheresis couches were cleaned with 1% hypochlorite in-between donations.
- 2 All the door handles in the blood center, especially in the donor area were cleaned regularly.
- 3 The dustbins of the donor area including the biomedical waste were changed at least twice a day or more as per the requirements.
- 4 The fumigation frequency of the apheresis area was increased to once in a week.

3.6.3. Food and the pantry facility for the staff

The main cafeteria of the hospital was closed for dining to limit the overcrowding and social gathering at lunch. Only take-away food parcels were available. The staff was advised to get the food from home. The refreshment area of staff and donors was separated and a temporary additional arrangement for staff lunch was done at the blood center to facilitate social distancing even during lunch hours.

3.6.4. Changes in the central air conditioning system

More than six air changes per hour (ACH) is the recommended level for any health facility and more than 12 ACH is recommended for the high-risk settings [7]. During the lockdown, the central air conditioning unit was shut down and the natural ventilation was used in the apheresis area.

3.6.5. Preparation of random donor platelet concentrates

Apart from SDAP, random donor platelet concentrates (RDPs) were

also prepared by the buffy coat method. Whole blood donations were also carried out in a staggered manner so that the RDPs from all the whole blood units may be prepared as per the requirements. As hemato-oncology and hematopoietic stem cell transplant recipients may require multiple platelet transfusions throughout treatment, SDAPs were the preferred component at our institution to reduce the chances of allo-immunization and platelet refractoriness. The collected RDPs were used in solid oncology patients, as they routinely do not require frequent platelet transfusions and SDAPs may be preserved for the hemato-oncology patients.

3.6.6. The dose/concentration of SDAP collected

Double dose SDAP ($\geq 6 \times 10^{11}$) was collected from donors eligible for double dose SDAP collection as per the institutional protocol (weight ≥ 70 kg and platelet count $\geq 300 \times 10^3/\mu\text{l}$) after informed consent. The department also made the policy that 'half SDAP' may be given to patients in the case of shortages but the sufficient SDAP inventory was managed and all the patients received the full dose. The total number of double dose SDAP collected was 35 in the pre-lockdown phase whereas 17 were collected in the lockdown phase ($p = 0.789$).

3.7. Logistical issues

3.7.1. The challenges with police and civil authorities

Despite clear communication from the government that the blood donations will be continued during the lockdown phase, there was some ambiguity and lack of information from some of the civil authorities and police members and they were not allowing the movement of the donors for the same. The authorities were convinced telephonically and presented with all the necessary documents for unrestricted blood donation activities [4,8,9]. The authorities were requested to allow the movement of the donors and their vehicles after following social distancing protocols.

3.7.2. Apheresis Kit and related disposables inventory management

During the lockdown, the distributors of the apheresis kits and other related materials were having logistical issues with the supply of the disposables. The constant communication was maintained between the blood center staff and the kit vendors so that any problem in the transport may be handled at the level of the hospital. The minimum threshold of apheresis kit stock was also increased to have extra kits for emergencies.

3.7.3. Troubleshooting and technical support for the apheresis equipment

The majority of our blood center staff were efficient in independently handling the trouble-shooting of the apheresis machine. If required company resource personnel were contacted via phone. If the problem persisted or in case of a major technical break-down, company personnel were called to the blood center. For ease of their movement across the checkpoints, a letter/certificate was issued, stating that the person is traveling for hospital-related essential activities and their unrestricted movement was requested. If required, a hospital vehicle was arranged for easier transport.

3.8. SDAP inventory management

Being a tertiary care oncology hospital, a minimum buffer stock of platelets has to be maintained for the regular requirements, and unexpected emergencies. Many oncology patients are not admitted in the wards rather they follow-up on the out-patient department basis. Sometime these patients may also require prophylactic or therapeutic platelet transfusions, and its prediction is not possible. In case, SDAPs were not getting utilized then the same was being informed to the nearby hospitals and they could procure SDAPs from our department or vice versa.

4. Discussion

Maintaining an adequate platelet inventory at a tertiary care oncology institution had been a challenging task in the time of COVID-19 but all the measures implemented by the blood center helped in achieving this herculean task. In the outbreak of an epidemic, the implementation of measures that minimize the chances of spread of infection to the staff and the donor populations are not only the responsibility but also the moral obligation of the blood center. All the above methods minimized the chance of spread of COVID-19 and build up the confidence of donors in the blood center.

4.1. Preparedness plan for future epidemics

Even after conquering the COVID-19, things may never remain the same, and blood centers may have to learn to work with this 'new normal' conditions. Blood centers may inculcate this extra cautiousness in their routine and this may also have a positive impact on the donor population. It will be crucial to gather data and knowledge regarding the experience of different blood centers after the epidemic, which may help in formulating policies for blood and platelet inventory management in future pandemic events. Blood centers must prepare standard operating procedures for these kinds of possible epidemics in the future.

4.2. Limitations of the study

This was a single-center study and measures implemented and expected outcomes may or may not apply to the other centers. As the number of hospital admissions decreased during the lockdown phase, the SDAP requirement had also decreased. This may give a false notion that the SDAP donations had decreased due to the lockdown effect.

5. Conclusions and impact of the measures taken

Donor confidence-building and resolution of logistical issues were the most important measures for the continuous plateletpheresis in the lockdown phase. The regular repeat platelet donors' confidence was maintained in the blood center for the safe collection procedure and multiple new plateletpheresis donors were enrolled in the platelet donor program. These measures helped in sufficient SDAP collection and adequate inventory management. These measures may also be useful to other blood centers in the COVID-19 pandemic and this experience may be useful if a similar pandemic lockdown happens in the future.

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Shashank Ojha: Conceptualization, Data curation, Formal analysis, Methodology, Project administration, Resources, Validation, Visualization, Writing - original draft, Writing - review & editing. **Abhaykumar Malind Gupta:** Conceptualization, Data curation, Formal analysis, Methodology, Project administration, Resources, Validation, Visualization, Writing - original draft, Writing - review & editing. **P. Nagaraju:** Conceptualization, Data curation, Formal analysis, Methodology, Project administration, Resources, Validation, Visualization, Writing - original draft, Writing - review & editing. **Minal Poojary:** Conceptualization, Data curation, Formal analysis, Methodology, Project administration, Validation, Writing - review & editing. **Sumathi S.H.:** Conceptualization, Data curation, Formal analysis, Methodology, Project administration, Validation, Writing - review & editing.

Declaration of Competing Interest

The authors declare no potential 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.2020.102868>.

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