



## Blood transfusion service in a tertiary hospital in sub-Saharan Africa during the COVID 19 pandemic: Experience from Lagos University Teaching Hospital, Nigeria

## Service de transfusion sanguine dans un hôpital tertiaire en Afrique subsaharienne pendant la pandémie COVID 19: Expérience de l'hôpital universitaire de Lagos, Nigéria

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### ABSTRACT

Blood transfusion services are as pivotal to the health system during a pandemic as before the pandemic. The effect of a pandemic on transfusion services depends on the nature, potential for community spread and risk of transfusion transmissibility. As the total number of cases and deaths from COVID-19 rises, and to prevent the community spread of the SARS-CoV-2 virus, governments worldwide, as well as the Nigerian government, announced national lockdowns. Lockdowns have affected blood transfusion services. In Nigeria, blood transfusion services are still decentralized and tertiary health centres run independent transfusion units. The Lagos University Teaching Hospital blood transfusion unit was also impacted by the pandemic and the consequent lockdown. The major challenges experienced are in recruitment of voluntary blood donors, follow-up of donors and patients with concomitant reduction in blood and blood component supply derived from family replacement donation, inventory and consumable management, staff safety and adequacy for emergency work. These challenges were compounded by the inadequate infrastructure and policies at the outset of the pandemic. Countries in sub-Saharan Africa should invest in health infrastructure and their transfusion services and encourage local manufacture of basic laboratory reagents and consumables. The blood transfusion services and units should put in place strategic continuity of operations plans (COOP) to respond adequately to challenges generated during a pandemic which should focus on shortage, wastage and supply of blood and components in a cost-effective manner and human resource management.

### RÉSUMÉ

Les services de transfusion sanguine sont aussi essentiels au système de santé pendant une pandémie qu'avant la pandémie. L'effet d'une pandémie sur les services transfusionnels dépend de la nature, du potentiel de propagation communautaire et du risque de transmissibilité transfusionnelle. Alors que le nombre total de cas et de décès dus au COVID-19 augmente et pour empêcher la propagation communautaire du virus SRAS-CoV-2, les gouvernements du monde entier, ainsi que le gouvernement nigérian, ont annoncé des verrouillages nationaux. Les verrouillages ont affecté les services de transfusion sanguine. Au Nigéria, les services de transfusion sanguine sont encore décentralisés et les centres de santé tertiaires gèrent des unités de transfusion indépendantes. L'unité de transfusion sanguine de l'hôpital universitaire de Lagos a également été touchée par la pandémie et le verrouillage qui en a résulté. Les principaux défis rencontrés concernent le recrutement de donneurs de sang volontaires, le suivi des donneurs et des patients avec une réduction concomitante de l'approvisionnement en sang et en composants sanguins provenant du don de remplacement familial, la gestion des stocks et des consommables, la sécurité du personnel et l'adéquation au travail d'urgence. Ces défis ont été aggravés par des infrastructures et des politiques inadéquates au début de la pandémie. Les pays d'Afrique subsaharienne devraient investir dans les infrastructures de santé et leurs services de transfusion et encourager la fabrication

locale de réactifs et de consommables de laboratoire de base. Les services et unités de transfusion sanguine devraient mettre en place des plans stratégiques de continuité des opérations (COOP) pour répondre de manière adéquate aux défis générés pendant une pandémie, qui devraient se concentrer sur la pénurie, le gaspillage et l'approvisionnement en sang et en composants de manière rentable et la gestion des ressources humaines.

## INTRODUCTION

Blood transfusion services are an integral part of medical services that are affected by disasters such as conflicts, wars, epidemics and natural devastations that disrupt the flow of health services. The effects of natural disasters on transfusion services have been well reported with recommendations proposed to the transfusion practitioners in charge of these services during such disasters. (1-4). The main goal of the transfusion service during disasters is to maintain a safe and adequate blood supply. The COVID-19 pandemic is the biggest pandemic of the 21st century, having infected over 26 million people across the globe as at the end of August 2020 (5). Before the COVID-19 pandemic, disasters such as floods, earthquakes, conflict and wars seem to be the more common causes of disruptions of transfusion services with several reports of impact and recommended responses of transfusion services to these occurrence (1). There have also been reports of epidemics e.g. severe acute respiratory syndrome (SARS) and Influenza pandemics affecting transfusion services with recommendations from many organizations on appropriate responses (2-4). These reports and recommendations formed the preliminary knowledge base for our transfusion service response to COVID-19 before literatures on specific impact and responses of transfusion services to COVID-19 became more available. The reported impacts experienced in previous epidemics/pandemics include shortage of workforce, loss of blood donors, inability to organize donor drives, changes in pattern of demand of blood and blood products and fear that the infectious agent can be transmitted through blood transfusion.

The Lagos University Teaching Hospital is a 800-bed tertiary health centre with its own blood transfusion unit that collects and processes an average of 12,000 units of blood per annum, 80-85% of which is sourced from family replacement donation and the remaining from voluntary non-remunerated donor. This report highlights the impacts and responses of its blood transfusion service unit to the COVID-19 pandemic and makes recommendations from lessons learnt for other resource limited countries in sub-Saharan Africa.

## METHOD

Informal interviews were conducted with staff, family replacement blood donors and transfusion recipients for their experiences and insights, while voluntary donors on our register were contacted by telephone to explore their concerns and issues related to their ability or otherwise to visit the donation clinic. The hospital health research

ethics committee (HREC) approval (No: ADM/DSCT/HREC/APP/3819) was obtained to retrieve and analyse data from the hospital blood bank records: donor, compatibility testing, reception/request and issue registers and the blood component separation records for weeks 1 to 13 (January-March; pre lock-down), weeks 14-48 (April-June; lockdown) and weeks 29-35 (July to early August; post lock-down) for year 2020 and the previous year 2019 for comparison. The reports obtained addresses operational changes that were implemented to deal with the pandemic. A standard literature search was also conducted for published articles on blood transfusion service response to disasters and epidemics.

## RESULTS AND DISCUSSION

### HUMAN RESOURCES

Reduction in workforce is among reported effects on transfusion services. The first confirmed case of COVID-19 in Nigeria was announced on 27<sup>th</sup> February 2020, when an Italian citizen in Lagos tested positive for the virus. On 9<sup>th</sup> March 2020, a second case of the virus was reported in Ewekoro, Ogun State, a Nigerian citizen who had contact with the Italian citizen. By 11<sup>th</sup> March 2020, WHO declared COVID-19 a pandemic and by the 24<sup>th</sup> March, there was a state-wide ban on gatherings of more than 20 people, and a full lockdown by 30<sup>th</sup> March 2020 banning movement of individuals allowing only those on essential duties to operate, such as health personnel, fire service, security personnel, environmental officials, power and water supply agencies, media and telecommunication officers. However, many staff could not make it to work as the public transport system was also totally shut down without provision for transport for health workers. This affected the available manpower to man this essential service and the available workers had to work exceptional longer hours and cover extra benches. A few of the blood transfusion service personnel were also trained and mobilised for the COVID-19 response. For example, the blood mobile driver was trained and converted to an ambulance driver for the COVID-19 response team thereby affecting the prospect and planning of blood donor drives. Despite gradual easing of the lockdown in the first week of July (week 29), social distancing measures still have to be maintained, and a decision was made to keep staff strength to about 50% of the total workforce. This drastic reduction in manpower will have to be maintained for an unforeseeable time span depending on the control of community transmission.

**EFFECTS ON BLOOD DONATION**

Countries have reported significant reduction in blood donation due to restriction in movement and cancellation of donor drives (6). Our hospital blood transfusion service also experienced a significant decline in blood donation. Hitherto, the hospital blood bank is dependent on family replacement donation with voluntary non-remunerated donation making up approximately 15-20% of blood supply. With the advent of the pandemic came the suspension of all outpatient clinical services and a migration to telephone or virtual clinical consultation, and there was cancellation of all elective surgeries and planned procedures. There was also a reduction in available hospital beds for other condition with 180 beds dedicated for COVID-19 admissions. This affected the overall hospital services and patients' attendance and hence our major source of blood supply, which is the pre-elective surgery/pre-procedure blood donation by family members. In addition, all scheduled voluntary blood donation drives were suspended. In the first month of the state-wide lockdown, blood donation declined to 45.8% of donation of the previous month (Table 1). Other contributing factors to the decline in blood supply

included fear of visiting our hospital which is one of the designated COVID-19 isolation and treatment centres. Conversely, the blood bank staff also had anxiety and feared being exposed to the infection, but with the preparation and implementation of a COVID-19 infection control policy and training, confidence and willingness to work improved over time. We also observed a sharp decline in voluntary non-remunerated blood donation to zero in the first month of the lockdown. This prompted the transfusion unit to make phone contacts with VNRD on register to explore their challenges and concerns regarding their visits to the donation centre. The information obtained was used to implement operational changes that address their concerns such as the fear of viral transmission at the donation centre. Though the world blood donor day was celebrated on 14<sup>th</sup> June 2020 as per our usual practice, the number of blood donors that attended, as well as the glamour of the events compared to previous years, was significantly reduced because of the physical distancing policy in place. As shown in figure 1, the trend in blood donation has started to improve gradually as restrictions were gradually lifted, though it is yet to attain the pre-COVID-19 era.

**Table 1: Records of Transfusion Service during Covid-19 Pandemic compared with previous year at Lagos University Teaching Hospital.**

	2019 Weeks 1-13	2020 Weeks 1-13 Pre-lockdown	2019 Weeks 14-28	2020 Weeks 14- 28 Lockdown	2019 Weeks 29-35	2020 Weeks 29-35 Post lockdown
<b>Blood Donation</b>						
Average weekly blood donation	220	203	268	93	212	79
Average weekly Voluntary donation.	32	29	54	2	42	10
<b>Cross-match and Usage</b>						
Average unit of blood request/week	552	408	678	229	506	154
Number of crossmatch/ Week	330	295	358	122	360	104
Average unit of blood Issue/ week	237	217	316	122	229	85
C/T Ratio	1.4	1.4	1.1	1.0	1.6	1.2
Average Platelet request/ week	312	189	330	107	315	62
Average Platelet Issue/week	190	110	210	63	201	37
Average FFP Request/week	42	35	50	9	45	21
Average FFP Issue/week	42	35	50	9	45	21
<b>Blood/blood component Discard</b>						
Number of units discarded for *TTI/week	21	17	23	7	16	5
Expired/week	3	4	8	3	10	3
Total discard/week	24	21	31	10	26	8
Discard Rate	10.9%	10.3%	11.6%	10.8%	12.3%	10.1%

\*TTI: Transfusion transmissible infectious agents

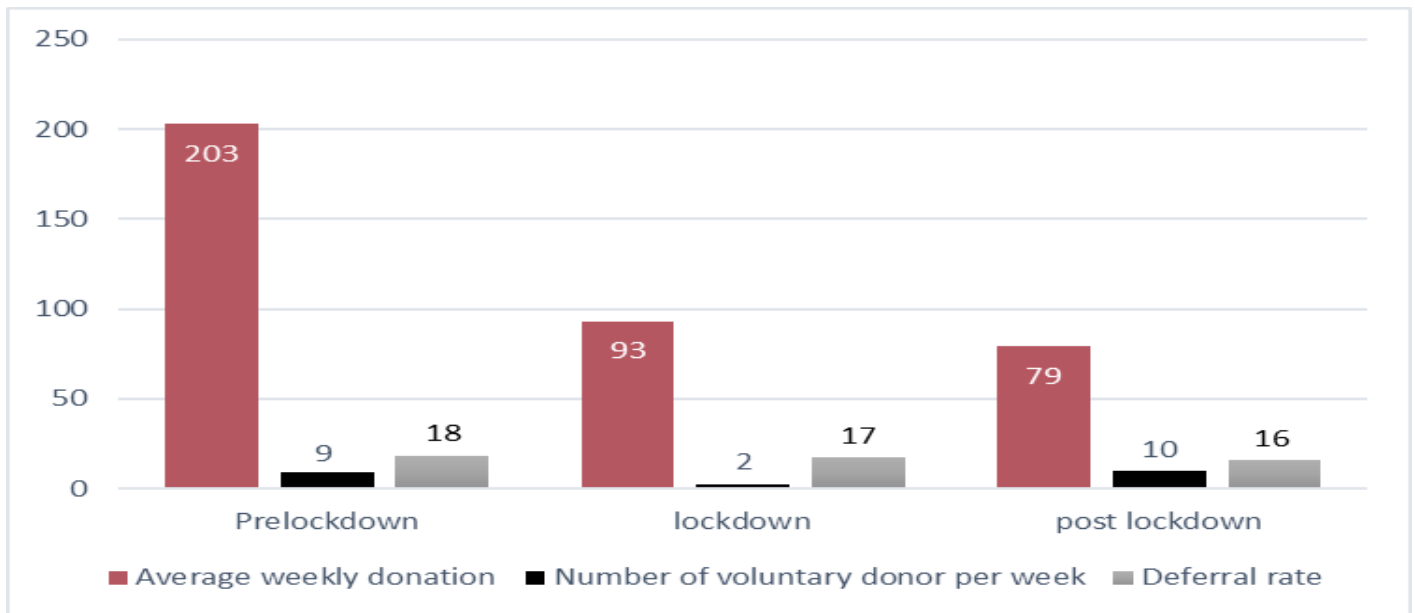


Figure 1: Donation rate pre and post lockdown

#### CHALLENGES OF BLOOD INVENTORY MANAGEMENT

The outpatient and in-patient care of all other patients were affected by the pandemic, as the hospital had to shut down some or limit some non-emergency clinical services to ensure physical distancing measures and infection control. Many scheduled surgeries were cancelled; some prospective recipients also expressed fear of receiving blood products that might contain the virus. All these led to decline in blood request (Table 1). As there was a corresponding decline in blood donation and supply, the blood bank managed blood issue for already hospitalised in-patients and emergencies by actively engaging each requesting clinician on the indication for transfusion and reasons for the number of units being requested, to ensure judicious use of blood and blood products. We also advised clinicians to adopt restrictive transfusion strategies and reconsider thresholds for transfusion. These approaches were well received by the clinicians, as it helped them in their responsibility of making difficult transfusion decisions for their patients, while also positively impacting our transfusion service indices such as the “blood request to issue ratio”. There appears to be a significant reduction in over-ordering and avoiding wasted cross-matches (7,8). Hitherto, public hospitals in Nigeria including ours do not have a patient blood management policy and the available but poorly publicized national guideline on the use of blood and blood product has not been widely acknowledged and utilized by clinicians. This pandemic serves as another opportunity to put policies and guidelines in place and ensure outspread application.

We did not experience any increase in blood/blood component wastage (Table 1). We however experienced an increase in request for blood and blood products from peripheral health facilities. This was anticipated as patients who could not access care in our centre had to seek health care services in private hospitals closer to their place of residence that do not have the capacity to collect and process blood and blood components.

#### BLOOD PROCESSING

Prior to the COVID-19 era, the blood bank processed all collected blood units into packed red cell, single donor buffy coats platelet concentrate, fresh frozen plasma and cryoprecipitate and routinely screened for HIV antibodies and p24 antigens, HBsAg, HCV antibody and syphilis by enzyme linked immunosorbent assay (ELISA). We aware that the International Society for Blood Transfusion (ISBT) and other transfusion bodies have recommended that during COVID-19 the pandemic donated blood units during COVID-19 should be screened for IgG and IgM antibodies for SARS-COV 2, the infectious agent of COVID-19 where possible, and that units positive for these antibodies should be considered for pathogen inactivation (9). The facilities for pathogen inactivation and screening kits for SARS-COV 2 antibody are not yet available in our hospital, and in the meanwhile, prospective blood donors are screened with an additional questionnaire focused on symptoms of COVID-19 and history of possible contact with persons with or probable coronavirus infection. Reports so far have shown that transfusion of blood units positive to COVID-19 have not been found to be associated with infection in the recipients (10).

#### REDUCTION OF TRANSMISSION RISK AT THE DONATION CENTRE & DRIVES

To reduce possible staff exposure and as part of the infection prevention and control (IPC) protocol to prevent viral transmission at the blood donors’ clinic considering the widespread community transmission, the donors’ clinic instituted restricted entry of unauthorized personnel, education of staff and staff rotation roster to decrease exposure, regular cleaning and sterilization of blood centre area and provide adequate PPE to staff. Other efforts are mandatory hand hygiene practices with alcohol-based sanitiser, mandatory use of medical facemask, and screening of the prospective blood donors before entry into the donor clinic by temperature check and administration of a questionnaire focused on symptoms of COVID-19

and history of possible contact with persons with or probable coronavirus infection. Voluntary blood donors are encouraged to call in to book an appointment prior to presenting to the blood donation centre. Similar IPC processes will be applied to blood donor drives when it is restarted. So far, there has been no report of any of our staff testing positive to COVID-19 as at the time of this report.

#### **IMPACT ON REAGENTS AND CONSUMABLES**

Incidentally the blood bank had just received a 2 months stock supply of consumables and reagents prior to the lock-down. This avoided major stock outs of reagents and consumables that could have occurred during the intense phase of the restrictions considering most of these reagents are imported from other countries. In particular, there was a transient shortage of multiple blood bags, which affected blood processing and separation into components. Locally manufactured consumables like plastic sample bottles, gauze, cotton balls were less affected.

#### **MEETING BLOOD DEMAND OF COVID- 19 PATIENTS**

Transfusion service to patients with COVID-19 became a necessity as community transmission became widespread and the number of infected persons increased. Some of these patients have to undergo procedures that may require unavoidable blood transfusion including caesarean section, exchange blood transfusion and renal dialysis. At the outset of the pandemic, our hospital blood bank decided not to receive blood samples of confirmed or suspected COVID-19 patients due to a belief that processing such as centrifugation could generate infectious aerosols. This belief has not been substantiated in scientific literature, yet current evidence shows that even though there are fragments of viral RNA particles in blood, the clinical risk of infection due to such RNA particles remains uncertain (11). Blood group O Rhesus D negative units were issued for the purpose of transfusion for these patients. Over time our transfusion services for these patients progressed to a blood typing but no routine crossmatch policy for these patients, where group identical blood units are issued for transfusion. Our transfusion service is unable to offer convalescence plasma as an option in managing severe patients because of the lack of aphaeresis machine, inability to determine antibody titre and lack of facilities for pathogen inactivation. Given the fact that SARS-CoV-2 virus is stable at 4°C and denatures at 56 to 60°C, heat treatment of blood and its products for a period of 10 hours or 15 minutes with addition solvent detergent has been proposed as the more appropriate pathogen reduction technology for SARS CoV-2 (11,12). However, we do not have the facility for pathogen inactivation to ensure extra caution, and allay the anxiety of those with concerns of risk of transmission of SARS-CoV-2 via blood or blood product.

#### **LEARNING POINTS**

1. Family replacement donation is still an indispensable source of blood supply for our transfusion services and was the only available source during this disaster response, however, efforts must be made to retain them as regular returning non-remunerated donors which has been proven to be the safest type of blood donor.
2. There is a need for a clear and consistent message to the healthcare community, donors, and the public regarding the status of blood supply before and during a disaster.
3. A donor management and engagement strategy to support donors especially VNRD to be available for blood donation should be part of the disaster response.
4. Ensure disaster preparedness by:
  - Ensuring the maintenance of inventories that is disaster-ready at all times.
  - Having stockpiles of consumables and reagents reserved for disaster purposes.
  - Promotion of the use of locally manufactured reagents and consumables where such products comply with minimum regulatory requirements.
5. Cooperation between the blood service and clinicians ensure rational use of blood and blood products, improving transfusion indices and transfusion practices. There is a need to develop patient blood management guidelines.
6. Continuous staff engagement, training and retraining in disaster response, continuous disaster planning, participation in disaster drills and close coordination with local, state, and federal response agencies is required.

#### **CONCLUSION**

There are significant impacts of the present pandemic on our transfusion service. These impacts were worsened by the inadequate infrastructure and policies available at the outset. Transfusion services in under-resourced settings should use the lessons learnt from this pandemic to put in place a suitable, applicable and technological appropriate continuity of operations plan (COOP) to ensure continued operation of their essential functions in the event of an emergency or disaster. Governments should include these plans in the national blood transfusion policies, invest in health infrastructure and implement minimum acceptable standards for blood transfusion services.

**Conflict of interest:** The authors have no conflict of interest to declare.

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