Africa Sanguine 2020, Volume 22, Number 2

Original Research

Coronavirus Pandemic: The Impact on the Zonal Blood Service of a Developing Country

Pandémie à coronavirus: l'impact sur le service de sang de zone d'un pays en développement

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Conflict of Interest:
The authors report no conflict of interest.

Cite as: Damulak OD, *et. al.* Coronavirus Pandemic: The impact on the regional blood service of a developing country. *Africa Sanguine.* 2020;22(2):11-17. https://dx.doi.org/10.4314/asan.v22i2.5

Keywords: Impact, Coronavirus, Pandemic, Blood, Service, Transfusion

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ABSTRACT

Introduction: COVID-19 pandemic has affected all facets of life, sparing no country or continent. Its impacts on the health care system of nations have been unprecedented, overwhelming in most developed and developing nations.

Aims and objectives: This study sought to determine the impact of the COVID-19 pandemic on the zonal blood service in North-Central Nigeria.

Methods: Registers of the donor clinic and laboratory departments of the North-Central zonal blood service in Jos were reviewed from February to April 2020, for the number of blood drives fixed and carried out, number of people sensitised, number of donors recruited, counselled, deferred, bled and failed bleed. The unit screened for Transfusion Transmissible Infections (TTIs), expired and units returned from hospitals and hospitals that accessed blood were determined and compared with that of the same period in the preceding year. The trend of the TTIs screening outcome of blood units collected during COVID-19 outbreak was also evaluated.

Results: COVID-19 pandemic had both negative and positive impacts on the blood service in North-Central Nigeria. There was reduction in blood drive fixtures, executions, number of donors counselled, donations, number of first time donors, units screened, hospitals served, and the number of safe units issued. However, repeat donations, failed bleed, crude transfusion transmissible infections rate, returned and expired units increased. The trend of Transfusion Transmissible Infections (TTIs) outcome of units collected during COVID-19 pandemic improved towards safety.

RÉSUMÉ

Introduction: La pandémie de COVID-19 a touché toutes les facettes de la vie, n'épargnant aucun pays ni continent. Ses impacts sur le système de santé des pays ont été sans précédent, et accablants dans la plupart des pays développés ou en développement.

Objectifs: Cette étude a cherché à déterminer l'impact de la pandémie à COVID-19 sur le service de sang de zone dans le Centre-nord du Nigéria.

Méthodes: Les registres du département en charge de la gestin du donneur de sang et des services de laboratoire du service de sang de zone du Centre-nord de Jos ont été examinés de février à avril 2020, pour le nombre de collectes de sang effectuées, le nombre de personnes sensibilisées, le nombre de donneurs recrutés, conseillés, ajournés, prélevés. Les poches de sang testées pour le dépistage des infections transmissibles par la transfusion (ITT), périmées et les unités retournées des hôpitaux et des hôpitaux ayant eu accès au sang ont été déterminées et comparées à celle de la même période de l'année précédente. La tendance du résultat du dépistage des ITT des unités de sang prélevées pendant l'éclosion de COVID-19 a également été évaluée.

Résultats: La pandémie de COVID-19 a eu des impacts négatifs et positifs sur les services de transfusion sanguine dans le centre-nord du Nigéria. Il y a eu une réduction des installations de collecte de sang, des exécutions, du nombre de donneurs conseillés, des dons, du nombre de premiers donneurs, des unités dépistées, des hôpitaux desservis et du nombre d'unités sûres délivrées. Cependant, les dons répétés, les échecs de prélèvement, le taux brut d'infections transmissibles par transfusion, les unités retournées et expirées ont augmenté. La tendance des résultats des infections transmissibles par transfusion (ITT) des unités collectées pendant la pandémie de COVID-19 s'est améliorée vers la sécurité.

Conclusion: la pandémie de COVID-19 a augmenté les activités de collecte de sang en salle dans le centre-nord du Nigéria, accompagnées d'une rétention accrue des donneurs et de la sécurité transfusionnelle.

INTRODUCTION

Coronavirus disease 19 (COVID-19) is a new respiratory tract infection caused by the novel coronavirus, SARS COV-2, first identified in Wuhan, China in 2019.[1] Most patients infected with this virus suffer mild to moderate symptoms, while 14% are likely to develop disease severe enough to warrant hospitalisation with 5% requiring admission into intensive care units equipped for ventilator respiratory support.[2]

Surviving patients continue to shed viral nucleic acid for a median of 20 days while the longest nucleic acid detection was 37 days in life patients.[3] The infectivity of this virus through blood and blood products transfusion is entertained but not certain in non-symptomatic nucleic acid positive patients.[4] Pathogen reduction technology is recommended to prevent infection of recipients through the transfusion of blood particularly labile blood products.[5] The ease with which the disease is acquired and spread from person to person through droplets, contamination of hands and surfaces; and aerosols has made community infection globally rapid and widespread, sparing no continent. Global non-pharmacological interventions to stem the rising tide of COVID-19 infection have been implemented in countries.[6] Exposed individuals are recommended to stay in self-isolation, report to relevant authorities of their country and follow medical advice, while in Nigeria, those who tested positive are moved to isolation and treatment centres.[6] Some countries had to issue enforceable orders including restriction of movement, state lockdown and wide spread testing. The position of governments in guiding citizens' response to this pandemic varied from one state to another with no resources for mass testing.

COVID-19 has impacted negatively on many spheres of life of all nations economically, socially, culturally and has strained health care services globally with attendant inadequacy of human capital, resources and commodities. The known impact of COVID-19 on blood transfusion services is scantly documented.

Figure 1: Map of Nigeria National Blood Transfusion Service zones (Extracted from IDREAM Workshop Presentation November 27 2017)
Key: N-North; S-South; C-Central, E-East; W-West.

Nigeria is a low middle income country within the sub-Saharan Africa sharing borders with Chad and Niger republics to the north, Cameroon to the east, Benin Republic to the west and the Atlantic Ocean to the South. A centralised blood service (National Blood Transfusion Service) with six Zonal Centres was established over a decade ago with the mandate to source blood from at low risk volunteers.

Lack of robust legislation and weak funding has kept the operations of the blood service centres low in Nigeria. The North Central Zonal Centre located in Jos, Plateau State, serves six north central geopolitical states of Nigeria. The centre collects blood from volunteer donors who have been sensitised on the need to voluntarily and safely donate blood, and its appropriate life saving benefit.

Counselling of such volunteers lays emphasis on self-deferral based of previous risk exposure to contracting TTIs and encourages lifestyle that maintain safe donors suitable for voluntary repeat donations. Voluntary donors could walk into the centre and donate (indoor) or may be recruited at blood drive clinics away from the centre (outdoor). All blood units collected are screened routinely for the markers of the Human Immunodeficiency Virus (HIV), Hepatitis B and Hepatitis C viruses and Syphilis as recommended in the National Operational Guidelines.[7] We are not aware of any published works on the impact of the COVID-19 pandemic on the blood service in Nigeria. We aimed to determine the impact of COVID-19 pandemic on the North Central Zonal Blood Service in Jos, North Central Nigeria.

METHODS

A retrospective descriptive study was performed to determine the impact of the COVID-19 pandemic on our blood service. Registers of the North Central Blood Service in Jos were reviewed for the number of blood drives scheduled in collaboration with organisations (fixed) and carried out, number of people spoken to in groups (sensitised), number of people who willingly submitted to donate blood (recruited), number of recruited donors whose completed donor forms and vital signs were critically reviewed by the counsellor (counselled), deferred, bled, and those who had failed bleeds. The units routinely screened for TTIs, expired and units returned from hospitals were determined. The number of hospitals that accessed safe blood from the blood service were examined. These data were then compared with that of the same period in the preceding year (2019). The trend of blood units collected during COVID-19 and the TTIs outcome was also studied. Microsoft Excel 2010 version was used to input, analyse and compare the data. The p value <0.05 was considered statistically significant.

Ethical approval for this work was obtained from the ethics committee of the North Central Zonal Centre of the National Blood Transfusion Service, Jos, Nigeria. The data generated will be useful in informing policy decisions for sustainable quality blood service during a disease outbreak in developing countries.

Table 1: ***Activities of the blood service during Covid-19 versus same period in 2019 in North-Central Nigeria***

	Year: 2019				Year: 2020			
Activity	**February**	**March**	**April**	**Total**	**February**	**March**	**April**	**Total**
Fixed blood drives	9	10	11	30	10	10	0	20
Executed blood drives	9	10	11	30	10	6	0	16
No. sensitised	6078	6217	3010	15305	3105	2028	350	5483
No. recruited	1238	1592	1240	4070	1641	1128	254	3023
No. counselled	1238	1592	1240	4070	1641	1128	254	3023
No. deferred	21	73	10	104	44	12	3	56
No. of donations	1217	1519	1230	3966	1597	1106	251	2954
No. of failed bleed	12	12	12	36	7	4	1	12
No. of first time donors	885	1077	1018	2980	1212	486	30	1728
No. of repeat donors	326	417	177	2980	335	566	30	1728
No. of units screened	1217	1519	1230	3966	1559	805	251	2615
No. of units TTIs positive	131	280	170	581	282	135	11	428
No. of hospitals served	51	55	59	165	50	47	30	127
No. of units issued	902	1155	1055	3112	836	915	754	2605
No. of units returned	33	53	43	139	33	105	45	183
No. of expired units	60	97	135	292	37	111	361	509

Key: TTIs-transfusion transmissible infections

RESULTS

The opportunities to fix and execute voluntary blood donation drives declined from 30 each for February to April 2019, to 16 drive fixtures and 14 executions (about 50% reduction) in February, March and April 2020 (Table 1). The total number of prospective volunteer donors sensitised, recruited and counselled between February and April 2020, are much lower than in the same period in 2019 (Table 1). Consequently, the deferred donors were fewer (50%) from February to April 2020, when compared to the total deferrals in 2019 for the same period (Table 1). During the study period (February to April 2020), 2954 blood donations were made compared to 3996 in the same period in the preceding year. The failed bleed rate was 0.41%, during the study period compared to 0.91% over the same period in the preceding year (Table 1).

Donations from repeat blood donors accounted for 1098 (38.9%) of blood collections during the study period, while first time donors accounted for 2980 (76.4%) collections for the same period in the previous year (Table 1). The higher repeat donations during the study period in the early months of the COVID-19 pandemic over the same months in 2019 is significant; p=0.0001.

The total number of blood units screened (2615) during the study period is more than a thousand units less than those screened in the months of February to April 2019. Four hundred and twenty eight units of blood out of 2615 (16.3%) screened tested positive for TTIs in the period February to April 2020, while 581 (14.6%) of 3966 blood units screened tested positive for TTIs in the same period in 2019 (Table 1). This difference in the crude TTIs rates was however not significant; p=0.06. The total TTIs rates for March and April 2020 was 146 (13.8%), while that of 2019 for the same period was not significantly higher [450 (16.4%)]; p=0.05 (Table 1). The number of TTIs detected was significantly lower in blood units screened in the months of March and April 2020 [146(13.8%)], when COVID-19 was active in Nigeria, compared to 282 (15.1%) positivity in February when only the first case of the infection was detected in the country; p=0.004. A significantly higher number of blood units collected at outdoor blood donation drives was acquired from first time donors in Nigeria's second month (March 2020) of COVID-19 infections compared to the number in April 2020; p=0.0001. Indoor repeat donations were however significantly higher in April 2020 compared to the previous month of March; p=0.001 (Table 2). Failed bleed accounted for 4(0.38%) of March blood collections against 1 (0.04%) in April 2020; p=0.65. The TTIs rates were low during the study period, higher in March than in the succeeding month of April 2020 in which all the donors were walk-ins (Table 3). Only Hepatitis B virus surface antigen positivity was significantly lower among donors in April (2020) than those who donated earlier in March (Table 3).

The number of hospitals that accessed blood during the study period was 77% of those that accessed blood during the same period in 2019 (Table 1). A similar reduction was observed on the blood units issued to hospitals for transfusion over the same periods analysed. The number of blood units returned from hospitals and the expired units were both higher during the study period than was observed over the months of February to April 2019 (Table 1). Data of the blood service's activity output in February 2020 are generally similar to those of the same month in 2019 (Table 1). The outputs for March and April 2020 were markedly and progressively lower with time than recorded in February, except for the marked increase in returned and expired blood units (Table 1).

Analysis of blood units collected in the blood service centre during the study period showed a decline from 1597 units in February 2020 to 1052 (65.9%) in March and further lowered sharply to 227 (14.2%) units in April 2020. Indoor and outdoor blood collections continued in the second month of the COVID-19 pandemic (March 2020), while indoor collections from walk-in donors in the centre accounted for all the collections in April 2020 (Table 2). Failed bleed and TTIs were more frequent among donations at drives than among the indoor collections (Table 3).

Table 2: Analysis of blood units collected from walk-in donors (indoor) and donors recruited at donation drives (outdoor) in active COVID-19 pandemic (March and April 2020) in Jos, North-Central Nigeria

Outcome	March (%)		April (%)		
Variables	Indoor	Outdoor	Indoor	Outdoor	p value
First time donors	30 (5.8)	492 (94.2)	30 (100.0)	0 (0.0)	0.0001
Repeat donors	562(81.6)	104 (18.4)	197 (100.0)	0 (0.0)	0.0001

Table 3: Transfusion transmissible infections identified in the period March and April 2020 at the Jos North Central Zonal Centre, Jos, Nigeria

TTI's	March (%)		April (%)		
	Negative	Positive	Negative	Positive	p value
HIV	1045 (99.3)	7 (0.7)	227 (100.0)	0 (0.0)	0.2
HBV	956 (90.9)	96 (9.1)	223 (98.2)	4 (1.8)	0.001
HCV	1029 (97.8)	23 (2.2)	220 (96.9)	7 (3.1)	0.4
Syphilis	1047 (99.5)	5 (0.5)	226 (99.6)	1 (0.4)	0.9

Key: TTI's-Transfusion Transmissible Infections; HIV-Human Immunodeficiency Virus; HBV-Hepatitis B virus; HCV-Hepatitis C virus.

DISCUSSION

The marked reduction in donor clinic activities in this study particularly outdoor blood collections in communities and organisations negates an earlier report of productive engagements with organisations in blood collections in North-Central Nigeria.[8] The advent of COVID-19 in Nigeria towards the end of February 2020 and the subsequent necessary imposition of stringent restrictions on movement, lockdown and prohibition of congregations by the various levels of governance, resulted in the suspension and closure of all organisational activities and the ultimate reduction and loss of blood donation drive opportunities. The reduction in donor recruitment and blood collection in this work concurred with the observations of Raturi and Kusum (2020) who documented a reduction in the number of blood donors, blood collections, stocks, demands and issuances during the COVID-19 pandemic.[9]

The policy decision of government and the wide local and international media projections of the pandemic combined might have deterred prospective donor sensitisation, recruitment and counselling, further precipitating the blood shortage we observed. The donor deferral rate was lower (56(1.9%) of 3023 total recruited donors) in this study than the same period in the preceding year (Table 1). This significant reduction in donor deferral may be due to the pressure to replenish blood stock depletion, occasioned by the general populace compliance on steps that deter the spread of COVID-19 with the attendant reduction in the contacts between the blood service and population groups for blood donation activities.

The lower number of blood donations over the period February to April 2020 compared to the corresponding period in 2019 concurred with the lowering trend of blood collections documented during this pandemic in Western China.[10] The sharp reduction during the study period to the lowest in April 2020 suggests that the blood service should develop strategies for safety at blood donation facilities during disease outbreaks similar to the recommendations of Leung and Lee (2020).[11] A suggestion has been made to the United States congress for a directive to health and human services to initiate distribution of blood to transfusion centres as the need arises.[10] Local initiatives of recalling safe donors, which should be improved upon urgently, has resulted in higher repeat donations during the COVID-19 outbreak in North-Central Nigeria (Table 1). Picking committed donors from and back to their homes, provision of transport fares to others, adherence to infection prevention and control measures as well as provision of medical protective gear including face masks could further encourage blood donation commitment and mitigate the acute blood shortages being experienced.

The proportion of blood collection from repeat donors during the study period is similar but higher than 37% we recorded earlier.[11] Allocation of registered donors to recruiters and provision of internet communication data had enhanced donor call-up for repeat donation during the study period. We recommend the assigning of a unique and perpetual donor number to be retained by each blood donor on the donor card with ease of recognition and interpretation, such as $X^{y/z}$, where X is the serial donor number given at first donation, y is the year of first donation (year X is allocated) and z is the number of the current (latest) donation. For example Donor A; number is $2278^{08/63}$, that is, the serial number is 2278, first donated in 2008 and current donation is the sixty-third. At a glance of the donation records on the donor card, the number of times a donor had donated is seen and the donor's annual frequency of donation is calculated. This will be useful for donor reminder calls by the assigned recruiter and or post donation counsellor to commit safe donors to continue with regular donations. The need to invest in donor retention in Nigeria with high prevalence TTI's, to preserve safe donors may be cost-effective.

The number of units routinely screened for TTI's in the study period is not surprisingly over a thousand units lower than that during the same period in the previous year as it is the ripple effect of adherence to restriction of movement placed on citizens by governments and personal fear of being at risk of infection while in the line of donation. The reduction in the number of blood drives consequently reduced donor recruitment, blood collections and available units for screening during the study period. The higher prevalence [428 (16.4%), Table 1] of crude TTI's in blood units screened during the

study period may further point to possible weaknesses in the application of donor selection criteria, increasing the risk of disease transmission in blood and blood products therapy during epidemics and pandemics. The blood service must adhere to strict application of suitable donor selection, emphasising self-isolation to promote overall transfusion safety.[12,13]

The reduction in the number of health facilities that sourced blood from the centre was accompanied by a decline in the number of safe units issued from the blood service in North-Central Nigeria. The restriction on movement might have hindered access to secondary and tertiary healthcare centres, limiting patients to closely located primary and private health facilities for care in the pandemic. The lower number of blood units issued to requesting hospitals might have been a reflection of the low patient turnout during lockdown and restriction on movement, agreeing with Raturi and Kusum (2020).[10] The restriction of care of non COVID-19 patients to emergency services could have necessitated some of these patients obtaining care at alternative centres where transfusion might have been unwholesome as only the blood service could screen blood appropriately with the fourth generation enzyme-linked immunosorbent assay (ELISA) in the region. Review of all transfusions that were administered during the COVID-19 outbreak would determine any transfusion-related infections and forestall future occurrences.

While hospitals' requests and access to safe blood decreased during the COVID-19 pandemic, the number of returned and expired units increased remarkably (Table 1), despite low donations and inadequate safe blood stock to meet the transfusion demands placed on the centre. This is in contrast to an earlier report where returned and expired units did not constitute part of the blood discarded in our centre.[14] Scaling down on the care of non COVID-19 patients in advanced public health facilities resulted in combined reduced transfusion and accessing of safe blood from the blood service. This suggests the need to build and equip separate hospitals in times of contagious pandemics, or at least reserve an existing wing of a functional health centre to treat such patients while those with other disorders requiring transfusion such as leukemia, lymphoma, carcinoma, severe malaria and obstetric haemorrhage continue to access appropriate care.

Blood service operations during the study period markedly reduced from outdoor collections in February 2020 to marked increases in indoor donations, in the donor clinic, in March (Table 2). This change in the site of collection was occasioned by measures taken by government, obeyed by citizens, to prevent the spread of the coronavirus disease. Transfusion transmissible infection among the blood donations during the active COVID-19 pandemic in our study is lower than that reported by Nwanko and co-workers among Kano blood donors in 2012.[15] The prevalence of TTI's also declined from February 2020 to the values in March, similar to that which we earlier documented among 6-10 times retained donors in our centre.[16] This low rate of infections in March and April 2020, among entirely walk-in donations from mainly repeat donors simulates the report by Song et al. (2014) who noted the association between decreasing TTI's prevalence and increasing frequency of blood donation.[17] Strengthening of the blood service in Nigeria to retain and commit its safe blood donors to repeat donations could improve further on efficiency and safety in the face of limited resources. Work leave from offices and the refund of transportation fares among other motivations may just increase donation commitment of safe blood donors and sustain blood availability even in pandemics.

CONCLUSION

We conclude that there was a marked reduction of activities in the blood collection unit of the National Blood Transfusion Service in North Central Nigeria during the early months of the COVID-19 outbreak. This resulted in reduction in safe blood unit availability to meet infrequent demand from hospitals despite superior safety. We further concluded that blood unit return and the expiration of safe whole blood units could be higher during epidemics and pandemics in settings not equipped to produce blood components and products with a long shelf-life.

RECOMMENDATIONS

Safe blood transfusion must not stop during COVID-19 or any disease outbreak that may progress to an epidemic or pandemic. The blood service should be strengthened and included in the task-force team set by governments to contain any disease outbreak to ensure that blood transfusion services remain optimal to provide quality blood for appropriate clinical use. There is a need to study convalescent plasma from recovered patients who may present for voluntary donation for possible local and international therapeutic applications. Continuation of this study to complete a year circle may reveal more changes in the impact of COVID-19 on the blood service as we adapt to this disease and the relaxation of enforced restrictions by governments unfolds in Nigeria.

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