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Original article

Assessment of blood supply and usage pre- and during COVID-19 pandemic: A lesson from non-voluntary donation

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ABSTRACT

Background. – Ensuring steady stream of safe blood is the ultimate goal of blood transfusion practice. The current COVID-19 pandemic has affected almost every part of life and economy. Consequently, this study sets off to assess the effect of the pandemic on blood supply and blood transfusion in the University of Calabar Teaching Hospital.
Methods. – Data from the Donor Clinic and Blood Group Serology Unit of the University of Calabar Teaching Hospital were retrospectively extracted to evaluate supply and use of blood before and during COVID-19 pandemic.
Result. – A total of 1638 donors were recorded within the study period. Age range 15–29 and 30–44 years constituted majority of the subjects (58.9% and 33.4%, respectively). The donor pool were male-dominated. Commercial donors (61.7%) and family replacement donors (30.6%) constituted majority of the donor pool. Most of the donor pool were students (37.1%), public servants (22.8%) and artisans (18.6%). A concomitant decrease of 26.1% and 18.9% were recorded in blood donation and request during the COVID-19 pandemic.
Conclusion. – Blood supply was not significantly affected in our study center as both requests and donations decreased. Consideration for improving family replacement donation was advised.

1. Abbreviations

COVID-19	Coronavirus disease 2019
WHO	World health organization
VNRD	Voluntary non-remunerated donation
TTIs	Transfusion transmissible infections

2. Background

On December 31, 2019, China reported outbreak of pneumonia caused by a novel virus to the World Health Organization in her Wuhan city of Hubei province [1]. The disease was later found to be caused by a novel strain of coronavirus belonging to the Beta *coronavirus* genus of *coronaviridae* family and was subsequently named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), while the disease was named coronavirus disease 2019 (COVID-19) [2,3]. The virus rapidly spread worldwide and the disease was declared pandemic by the World Health Organization (WHO) [4]. As of August 24, 2020, approximately 23,311,719 confirmed cases have been reported globally with 806,410 associated deaths [5]. Nigeria confirmed its index case on February 27; a 44-year-old Italian who entered Nigeria on February 22 via Murtala Muhammed International Airport Lagos from Milan, Italy. [6] The pandemic has affected a good number of health services including blood donation [7]. Maintaining a steady stream of safe blood is very important as it plays vital role in medical and surgical procedures [8]. Blood banks across the globe are currently faced with increased cost of blood screening, extra cost for personal protective equipment, shortage of blood donors, scarcity of laboratory logistics and other spiral effects by the COVID-19 pandemic. While there are reports of donor shortage across the globe among countries that have differing blood transfusion practice, we deemed it necessary to assess the effect in Nigeria, a sub-Saharan country.

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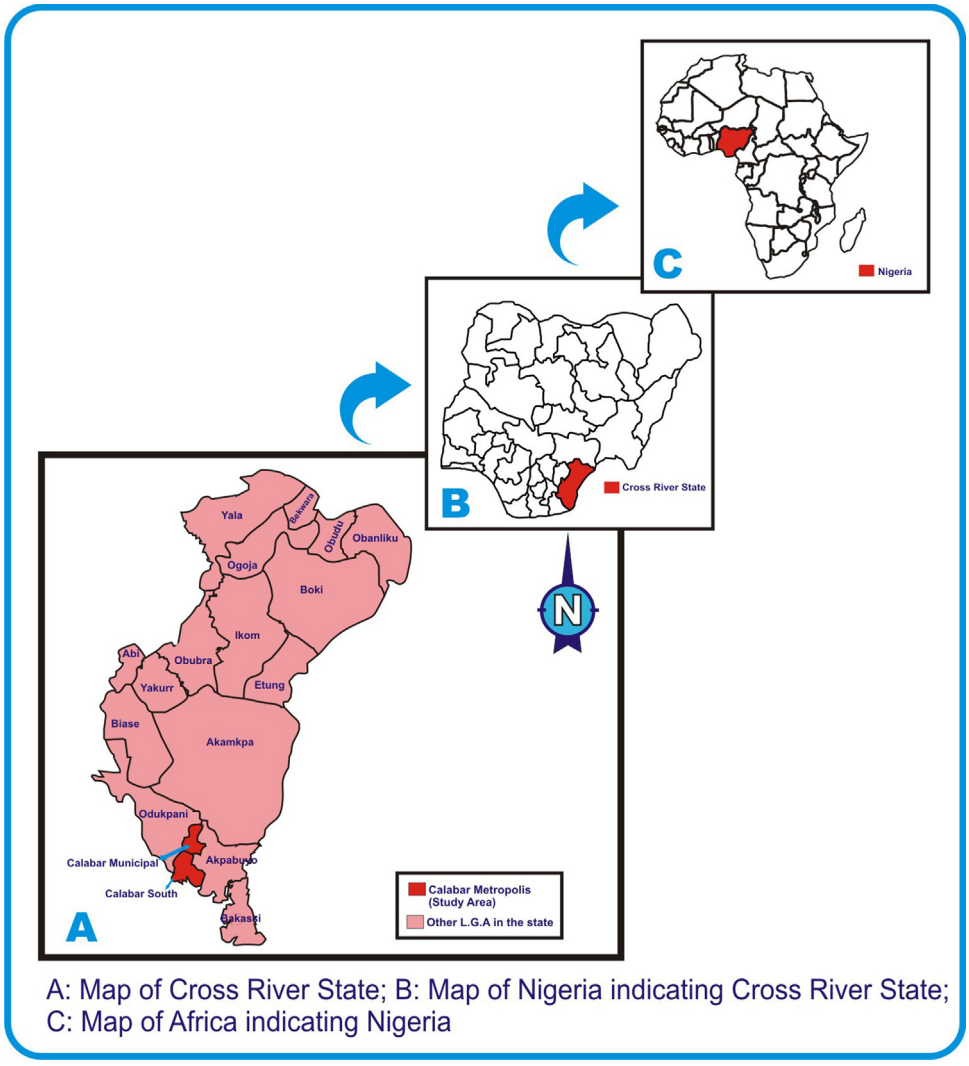

Fig. 1. Map showing study area [9].

3. Methods

3.1. Study design and area

This study made use of descriptive cross-sectional approach. It was conducted at the Donor Clinic and Blood Group Serology Unit of University of Calabar Teaching Hospital, Calabar, Nigeria from August 2019 to May 2020. University of Calabar Teaching Hospital is a major tertiary health institution in Cross River State, Southern Nigeria. It is located in the Calabar metropolis (which is fusion of Calabar South Local Government and Calabar Municipal local Government) (Fig. 1) [9]. The hospital has a 410-bed space capacity with 15 wards and 11 clinics [10].

3.2. Data collection

Data were retrospectively extracted from the donor register, crossmatch and dispatch records. The data included the number of donors, number of requests, number of dispatched units and number crossmatched. Demographic data of the donors were extracted. The donor data was extracted from the donor clinic while the data of requests, crossmatch and dispatch were extracted from blood group and serology unit of the hematology laboratory of University of Calabar Teaching Hospital, Calabar. Data extraction was performed by the first author together with two trained research assistants and a medical laboratory scientist in donor clinic. The procedure was repeated by the fifth author with another set of two research assistants for quality control purpose. All donors within the time of study were captured (no sampling). All donations within the time of analysis were whole blood donations (which is a common practice in the study center). While demographic data (such as sex, age, occupation and more) were self-reported, donor serological screening in the study center was performed by trained medical laboratory scientists.

3.3. Ethical consideration

Ethical approval was obtained from Health Research Ethical Committee (HREC) of the University of Calabar Teaching Hospital. As only secondary data was used in this study, consent to participate was not required following HREC guidelines. Donor confidentiality was guaranteed as data were extracted using the serial numbers rather than their names.

3.4. Time definition

Pre-COVID period was defined as period before the date of report of confirmed COVID-19 case in Nigeria (On or before March, 2020, though August 2019 to February 2020 was conveniently chosen). COVID-19 index case was recorded in Nigeria on February 27, 2020

[6]. The COVID-19 period refers to the ensuing months, which started from March 2020 to May, 2020 when the study was undertaken.

3.5. Definition of donors

Voluntary non-remunerated blood donor (VNRD): Refers to those who give blood or blood components on their own freewill without receipt of any payment either in the form of cash or kind which could be considered a substitute for money.

Family/replacement donors (often called family replacement donors): This refers to donors who are either friends or relatives of the patient who donate blood or blood components as per requirement of their patient without being paid in cash or in kind.

Commercial/remunerated donors: Refers to donors who donate blood or blood components in return for payment or other benefits that satisfy a basic need.

3.6. Statistical analysis

Data generated in this study were analyzed using SPSS version 20. The categorical variables were represented as frequency and percentage. Continuous variables were represented as mean ± standard deviation. Chi square was used to access associates between request and donations within the two periods. Alpha value was placed at 0.05.

4. Results

Table 1 shows the demographic characteristics of the blood donors studied. A total of 1638 donors was recorded within the study period. Majority of the donors were in the age range of 15–29 years (58.9%; n = 965), followed by the age range 30–44 years (933.4%; n = 547). The age range 45–59 represented 2.2% (n = 36) of the donors. Approximately 5.9% (n = 90) of the donors declared adult without mentioning their specific age. The donor population showed male preponderance (95.0%). Commercial (61.7%) and family replacement (30.6%) donors represented the bulk of the donor population. Most of the donor population were students (37.1%), public servants (22.8%) and artisans (18.6%). Business men/women, applicants and clergy represented 13.1%, 2.3% and 0.7 of the donor population, respectively.

Table 2 shows the blood supply and demand before and during COVID-19 pandemic. The average blood donation per month before COVID-19 pandemic was 177.7 ± 8.4 donations per month while that during the COVID-19 pandemic was 131.3 ± 29.5 donations per month yielding approximately 26.1% drop from the pre-COVID-19 period. On the other hand, the mean monthly request, dispatch, crossmatch and crossmatch/transfusion ratio of 178.8 ± 22.5, 170.1 ± 23.7, 185.3 ± 23.4 and 1.07 respectively, were observed, while that of the post COVID-19 period corresponded to 145.0 ± 31.0, 131.0 ± 31.4, 156.6 ± 22.8 and 1.17, respectively.

Table 3 shows the analysis of the distribution of request and donation in the two periods; pre- and during COVID-19. There was no significant difference in the manner of request-donation pattern (P > 0.05).

Table 1
Demographic characteristics of blood donors in the studied population[a].

Demographic characteristics	Frequency (%)
Total number = 1638	
Age	
15–29	965 (58.9)
30–44	547 (33.4)
45–59	36 (2.2)
≥ 60	0 (0.0)
Not recorded	90 (5.9)
Sex	
Male	1556 (95.0)
Female	82 (5.0)
Donor type	
Voluntary	126 (7.7)
Family replacement	502 (30.6)
Commercial	1010 (61.7)
Occupation	
Students	608 (37.1)
Clergy	12 (0.7)
Artisans	305 (18.6)
Business men/women	214 (13.1)
Applicants	37 (2.3)
Public servants	374 (22.8)
Not recorded	88 (5.4)

Note: Age, sex, occupation were self-reported: Applicants here are defined as persons who just finished secondary school and are yet to enroll in university of get employment

[a] Refers to whole blood donors (All donors were whole blood donors).

5. Discussion

In this study, we observed a male-dominated donor population. It is a common observation in the sub-Saharan Africa and it is in consonance with previous reports [11–13]. This male preponderance has been attributed to higher deferral of female donors and the cultural dogma of women abstaining from blood donation in view of their monthly menstrual blood loss [11,14].

Bulk (86.2%) of the donor population were commercial and family replacement donors. Remunerated donor dominated pool in most hospital-based blood transfusion centers in sub-Saharan Africa is well documented [11,14,15]. The finding of this low

Table 2
Blood supply and demand pre- and during COVID-19 pandemic.

Period under assessment	No. donated	No. requested	No. dispatched	No. crossmatched	C/T ratio
Pre-COVID 19					
August 2019	197	186	184	191	1.03
September 2019	214	212	212	219	1.03
October 2019	168	146	145	152	1.05
November 2019	165	179	162	173	1.07
December 2019	147	163	145	163	1.12
January 2020	183	199	178	211	1.18
February 2020	170	167	165	178	1.05
Mean (± stdev) per month	177.7 ± 8.4	178 ± 22.5	170.1 ± 23.7	185.3 ± 23.4	1.07
COVID-19 period					
March 2020	110	118	109	126	1.15
April	119	138	117	151	1.29
May 2020	165	179	167	181	1.08
Mean (± stdev) per month	131.3 ± 29.5	145.0 ± 31.0	131.0 ± 31.4	156.6 ± 22.8	1.17

No: number; Stdev: standard deviation.

Table 3
Analysis of difference in blood transfusion practice pattern before and during COVID-19.

Period of study	No. of donations	No. of requests	Chi square	*P*-value
Pre-COVID-19	1244	1252	1.332	0.133
During COVID-19	394	435		
Total	1638	1687		

voluntary non-remunerated blood donation is a reflection of ineffective logistics, organizational problems and ineffective implementation of national policies on blood transfusion by the Nigerian government. The WHO recommend blood donation from non-remunerated voluntary donors owing to their long established low prevalence of transfusion-transmissible infections [15].

In the present study, we observed approximately 26.1% drop in blood donation. However, this was with a concomitant 18.9% decrease in request. This value is lower than 39.5% reduction in donation and 21.7% reduction in request reported in Saudi Arabia [7]. There has been outcry of reduction in donor pool across the globe owing to the current pandemic [16–18]. Most of the studies attributed the decline to donors' fear of exposure to SARS-CoV-2. A closer look at the data of this study and that in Saudi Arabia will reveal a pattern of corresponding decrease in both request and donation pre- and during COVID-19 pandemic. The statistical analysis showed no significant difference in the pattern of request and donation. The demographic data showed a commercial and family replacement donor dominated pool. The gap between request and donation pattern observed in this study is typical of commercial and family replacement donation. There is often tight (very close) gap between requests and donation, which is a reflection of donations that are induced by request for blood transfusion for a patient. This is a common statistics among many hospital based blood transfusion centers in sub Saharan Africa including the study center [8,19]. Unlike the western reports that had reduction in donation owing to fear of infection, the reduction seen in this study and that in Saudi Arabia were due to reduction in hospital admission, decrease in cases of trauma injuries as a result of the lock down. The WHO has been proposing 100% voluntary non-remunerated donation [20]. However, the data of this study showed how the "high risk" behavior of remunerated and family replacement donors can be harnessed in "difficult times" as this. The remunerated and family replacement donors defied odds to maintain the steady chain of blood supply in our study center. Though some proponents lump paid donors and replacement donors together, however, both are driven by different motives. While commercial donors are motivated by remuneration, replacement donors are motivated by family ties or simply "directed altruism". Directed altruism in the sense that voluntary non-remunerated donors donate out of pure altruism to people they don't know while replacement donors does same towards people they know without being paid. The family replacement donors are actively exhibiting altruism as argued by Allain in his article "Moving on from voluntary non-remunerated donors: who is the best blood donor? [21]. Just as democracy [22], voluntary non-remunerated donation has eluded the sub-Saharan region. This is owing partly to poverty, limited funds by government and lack of willingness in part of policy makers to completely execute voluntary non-remunerated donation. In the face of this study and other evidence from previous studies, one is posed with the question of "do we continue to have the wild goose chase of attaining 100% voluntary non-remunerated donation"? For instance, only South Africa and later Namibia and Botswana that has met the WHO benchmark of VNRD of 10 units/1000 inhabitants [21,23–25]. While discarding commercial donation, family replacement shouldn't be discarded, rather, a round table should be convened to better the practice considering the unique nature of sub-Saharan Africa. Allain in his article [21] argued that family replacement donors are the cheapest form of safe blood as they require no formal recruitment process and takes almost zero logistics as opposed to the high logistics required for VNRD which might not be affordable to most hospital based blood transfusion centers. For instance, a comparative study showed the average cost of replacement donation ranged from $12 to $18 per unit while VNRD blood cost about $26 to $60 [26,27]. The extra cost of VNRD is from advertising, staff recruitment, mobilization logistic, cost of gift items, and more [21]. Allain in his article argued that the emphasis should be on repeat donors as they have lesser risk of having infections after scaling negative for TTIs on the first donation [21]. Africans in the sub-Saharan region are mostly communally living people. Consequently, for policies to succeed, they need to be tailored according to their lifestyle and culture. An effort to harness the communal life of sub-Saharan Africans will go a long way to sustain available and safe blood transfusion practice in the region.

The results of this study is potentially prone to varying limitations. The study method took a retrospective approach, hence inherent limitations of retrospective method such as selection bias may not be ruled out. More so, the study was a hospital based blood transfusion service, hence, extrapolation of the data to central blood transfusion centers need to be done with caution. However, though the study is a single institutional based, it is the major tertiary health institution in the studied state and reflects the activities of most hospital based blood transfusion centers in Nigeria. Also the all-inclusive nature (non selection) approach utilized will go a long way to minimize the effect of selection bias.

6. Conclusion

The study showed a commensurate decline in both blood request and donation indicating a sufficiently managed system as opposed to shortage of blood supply reported in other side of the globe. This particular trend can be harnessed in future policies of blood transfusion practice in the region.

Availability of data and material

The datasets supporting the finding of this study is available from the corresponding author on request.

Authors' contributions

COO performed data curation, analyzed data and edited the final manuscript. HUO conceived and designed the study, performed literature search, performed statistical analysis and wrote the initial manuscript draft. EIO analysed data and edited the final manuscript. JEE analysed data and edited the final manuscript. DAA analysed data and edited the final manuscript. All authors read and approved the final manuscript.

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Disclosure of interest

The authors declare that they have no competing interest.

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