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Letter to the Editor

Seroprevalence of Transfusion-Transmissible Infections among Family Replacement Donors and Voluntary Non-Remunerated Blood Donors During the COVID-19 Pandemic in Sub Saharan Africa

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To the editor.

Blood transfusion is a supportive therapy improperly performed in sub-Saharan Africa (SSA).[1] The World Health Organization (WHO) recommends establishing national blood transfusion systems based on voluntary unpaid blood donors. Unfortunately, countries of SSA continue to struggle with inadequate resources and infrastructure for a safer blood supply despite the important need for blood transfusion to treat severe and chronic anemia resulting from tropical diseases, sickle cell disease and other haemoglobinopathies, severe parasitic infections, nutritional anaemia in a condition of low or moderate safety of transfusion.[1,2] As a routine practice in front of a deficit of blood products, prescribers appeal to the patient's family members to donate to minimize the impact of blood shortages on patient care. This type of family-aware blood donors, known as familial/replacement donors (FRBD), despite the risk of transfusion safety, account for 20% of blood donation in Senegal, for 88.6% in Nigeria,[3] and in several other African countries (69.5% in Yaounde and 80.2% in Sierra Leone). During the COVID-19 pandemic, the supply of safe blood was threatened by the measures taken to fight this virus spread, like the advice to stay at home and the fear of infection at the blood transfusion centers, limiting donors' access to blood services. These measures to prevent the spreading of the COVID-19 pandemic have led to a sharp decline in stocks of blood products and to an increase of the number of FRBD. To evaluate the impact of this COVID-19 pandemic on the infectious safety of blood transfusion, we performed a descriptive and analytical study carried out during the first period of COVID-19, aiming to compare the seroprevalence of HIV, HBV, HCV, and syphilis in FRBD *versus* voluntary unpaid blood donors (VUBD). The goal is to evaluate the threats to familial blood donation during catastrophic periods such as pandemics, wars, and so on and to help define a policy in improving the recruitment, retention, and medical screening of blood donors in SSA. After answering a pre-donation questionnaire, a social worker received the blood donor, who opened the donor file with an identifier in the donor management software (Inlog®). At this stage, the blood donor indicates whether he has come for a voluntary or family/replacement donation. Subsequently, the donor was interviewed by the medical practitioner for the pre-donation medical screening, based on questionnaires of effective blood donors, to verify if the serological results were indeterminate or discordant in our analysis. The donors' serology and blood grouping results were taken from the Inlog® software. The serological tests for HBV, HIV, and HCV were performed with Alinity^{TM} automated, which uses Chemiflex^{TM} (ABBOTT, Germany) chemiluminescence technology to screen for infectious markers. According to the manufacturer's instructions, the Rapid Plasma Reagent test was used to find treponemal antibodies. The determination of ABO and Rh, blood group typing, was performed with the standard methods as a globular method with monoclonal antibodies of blood grouping antisera and serologic method with red blood cells (globule tests) on a plate. Data analysis was performed using Epi-info software (version 3.5.4). This software allows the application of the Chi2 test to accept or reject the statistical hypotheses posed ($p < 0.05$) and to give the odd ratio (OR) between the dependent variables and the independent variables, as well as their 95% confidence interval (CI). During this pandemic period, 5002 blood donors were collected at the fixed location of the National Centre of Blood Transfusion. The mean age of the donors was 32.23 ± 9.9 years. Young people aged from 25 to 34 years constitute the majority of blood donors (35.7%). Male donors represented 75%; new donors (52.6%) and FRBD (54%) were the majority of blood donors (**Table 1**). Analysis of donor status by type of donation showed

Table 1. Characteristics of blood donors.

	Number (N)	Percentage (%)
Sexe		
Male	3746	75%
Female	1251	25%
Age		
18-24	1578	31.6%
25-34	1787	35.7%
35-44	993	19.9%
45-54	538	10.8%
55-60	104	2.1%
Donor Status		
Known donors	2369	47.40%
New donors	2633	52.6%
Type of donor		
Voluntary donor	2303	46.0%
Family/Replacement donor	2699	54.0%

more FRBD donors among new donors (66.7%) ($p<0.001$). Voluntary donors were more represented in the regular known donor group (63.8%) ($p<0.001$). Blood group O Rh+ was more represented in this population (49.4%), followed by group A+ (20.6%) and B+ (17.8%); Rh-negative donors represented only 8.8%. This study revealed a higher number of FRBD than VUBD ($p<0.001$) during the blood shortage due to the COVID-19 pandemic. This was the case in Nigeria, where 61.7% of paid donors and 30.6% of family/replacement blood donors were reported. All these results highlight that family replacement blood donation is still a common practice in Africa and is exacerbated during times of blood shortage such as COVID-19 pandemic period. The prevalence of transfusion transmissible infections (TTIs) was statistically higher in the FRBD group (9.2%) compared to VUBD (4.3%) ($p<0.001$). The prevalence of infectious markers was higher in new unknown donors (10.6%) than in regular known donors (2.9%) ($p<0.001$, OR=1.9) (**Table 2**).

The prevalence of TTI markers was statistically higher in the new FRBD group compared to the new VUBD population (11.7% *vs*. 8.3%) ($p=0.003$, OR=1.4). The comparison of HIV, HCV and syphilis marker seroprevalences, only in new donors, showed no statistically significant difference between both categories of new FRBD and new VUBD ($p>0.05$). However, for HBV, the prevalence was higher in new FRBD with a statistically significant difference ($p=0.002$; **Table 3**). Our results showed that FRBD increases the risk of having at least one positive serological result for one of the infectious markers tested ($p < 0.001$; OR = 2.2), in line with different studies in the World.[4] Furthermore, a statistically higher

Table 2. Donor's serology according to type of donation and donor status.

Donation and donor	Positive N (%)	Negative N (%)	*P-value*	OR (CI 95 %)
Type of donation				
Family/Replacement donor	249 (9.2%)	2450 (90.8%)	<0.001	2.2
Voluntary donor	99 (4.3%)	2204 (95.7%)		
Donor status				
Known donor	68 (2.9%)	2301 (97.1%)	<0.001	0.2
New donor	280 (10.6%)	2353 (89.4%)		

Table 3. Spreading of donor's serology according to type of donation.

Parameter	New replacement donor N (%)	New voluntary donor N (%)	*P-value*	OR (CI :95 %)
HBsAg				
Positive	167 (9.3%)	51 (6.1%)	0.002	0.63
Negative	1644 (90.7%)	732 (93.9%)		
HCV			0.28	
Positive	22 (1.2%)	8 (1%)		NA
Negative	1778 (98.8%)	825 (99%)		
HIV				
Positive	12 (0.7%)	9 (1.1%)	0.14	NA
Negative	1788 (99.3%)	824 (98.9%)		
Syphilis				
Positive	15 (0.8%)	3 (0.4%)	0.08	NA
Negative	1785 (99.3%)	830 (99.6%)		

NA: not applicable

seroprevalence of infectious agents in new donors was found compared to regular donors in Africa, notably in Mali and Niger.[5] The comparison of HIV, HCV, and syphilis seroprevalences between new FRBD and new VUBD showed no statistically significant difference in the prevalence for these three markers. However, a statistically higher prevalence among new FRBD for HIV, HCV, and syphilis markers was found in the Democratic Republic of Congo (DRC).[6] Previously, in Cameroon, a study found a statistically higher prevalence of HCV and HIV in first-time FRBD.[7] In our study, the lack of statistically significant difference between voluntary and replacement donors for these three markers could be explained by the effectiveness of medical screening and the low prevalence of these infectious markers, especially HIV, in the general population. However, in our study, the prevalence of HBV is significantly higher in new FRBD (6.4%) than in new VUBD (2.9%; ($p<0.001$). These results are similar to those of the study in the DRC, with higher values in the new FRBD.[6] Nonetheless, in Tanzania, there is no statistical difference in the prevalence of HIV, HCV, and syphilis, but the prevalence of HBV was significantly higher in new FRBD.[8] This higher prevalence of HBsAg in FRBD could be explained by the risk factor of transmission linked to living in a common household with a person infected with HBV. Indeed, previous studies revealed that the HBV virus can be transmitted between people living in the same household.[9,10] Finally, it is obvious that HBV-carried parents increase the risk of virus transmission to their children and relatives. The COVID-19 pandemic impacted the proper supply of blood products by increasing more than 2X the number of FRBD. Thus, replacement donations have played an important role in limiting the damage observed with blood shortages despite the increased risk of TTIs. Our study highlights and strengthens the WHO recommendations for selecting voluntary unpaid donors. Our results will allow to continue collecting family/replacement donors in blood shortage situations while taking into account the prevalence of infectious blood markers in the new donor population.

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