

Blood collection to cover national needs in sub-Saharan Africa: the reality of the Ivory Coast

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Dear Sir,

Millions of lives are saved each year through blood transfusions. The availability of safe blood is a critical component in improving health care and in preventing the transmission of infections. If its provision and safety are often taken for granted in the industrialized world, the quality and safety of blood transfusion remain continuing concerns in developing countries in which 82% of the world's population lives¹. Blood supplies in Africa have never been able to meet the demand. This is reflected in the high maternal and child mortality rates in the continent.

In 2008, the most recent year for which global data are available, approximately 92 million blood units were donated worldwide. An estimated 4 million (4.3%) of those units were donated in sub-Saharan Africa, which has approximately 12% of the global population.

The World Health Organisation (WHO) estimates that resource-limited countries will begin to meet clinical demand if at least 10 whole blood units per 1,000 inhabitants are collected annually².

In the Ivory Coast, a sub-Saharan country our blood transfusion system is composed of three blood transfusion centres, 11 blood transfusion satellites and five blood collection sites which all are under the supervision of the National Blood Transfusion Service (NBTS). Most previous activity reports showed an increase of blood donation in NBTS each year in general and sole reliance on volunteer non-remunerated donors, but do not address the adequacy of blood supply issue.

We aimed to analyse the evolution of blood collections in order to assess the coverage of hospital blood demands according to the WHO estimate.

We conducted a retrospective study covering the period 1992 to 2012. All blood donors and blood units recorded in our medical database (Progesa, Mak-System Services, Tremblay, France) were included. We also used data from the NBTS annual reports. The number of inhabitants per year was obtained from the website of the National Institute of Statistics of the Ivory Coast. We evaluated coverage of blood needs through the donor index, calculated as the number of donors in 1 year divided by the population in that year, with the quotient multiplied by 1,000 and expressed as donors per 1,000 inhabitants. We also determined the donation index, which reflects the general availability of blood in a country/region/area according to the WHO and is calculated as the number of

donations during 1 year, divided by the population in that year, with the quotient multiplied by 1,000 and expressed as donations/1,000 inhabitants.

Table I shows that during the 21 years of our study, the population of the Ivory Coast grew and doubled from 12,622,000 in 1992 to 23,261,000 in 2012. Concurrently, the population of blood donors rose from 4,596 in 1992 to 78,170 in 2012 driving an increase in the collection of blood from 4,532 bags in 1992 to 122,112 bags in 2012. According to quantitative performance indicators from 1992 to 2012, we observed a significant growth in the donation index, which increased from 0.4 to 5.2 units collected per 1,000 inhabitants. Nevertheless, the donation index does not reach the threshold to cover the needs for blood products which, according to the WHO recommendation, is 10 blood bags collected per 1,000 inhabitants by year. The donor index has passed from 0.4 to 3.4 blood donors per 1,000 inhabitants. The donation/donor ratio remained almost static, going from 0.8 to 1.6 donations per blood donor.

According to the WHO, data on the number of whole blood donations per 1,000 population by year is an indicator of the general availability of blood in a country. Our study showed that during the last two decades with volunteer and non-remunerated blood donation, the NBTS of Ivory Coast has not achieved coverage of the needs for labile blood products. Indeed, our findings revealed that the donor index and the number of bags of blood collected from donors were too low. The maintenance of a safe and adequate blood supply requires the recruitment, retention, and renewal of an active volunteer and non-remunerated donor pool³, educational strategies and other approaches to encourage blood donors to continue donating may be improved.

The donation index in Ivory Coast is lower than the average donation rate in developed countries which is 38.1 donations per 1,000 inhabitants and under the target recommended by WHO for developing countries. Our donation index is, however, similar to those of other sub-Saharan Africa countries⁴. Some studies have reported that it is questionable whether blood donation based on family replacement blood banks will ever be able to maintain adequate blood supplies to meet needs. There is also clear evidence that a strictly volunteer donor system does not provide sufficient blood, estimated to range between 15 and 20 units/1,000 inhabitants. In sub-Saharan Africa, neither centralised national systems

Table I - Evolution of blood collection and donors at the National Blood Transfusion Service of the Ivory Coast in the two decades from 1992-2012.

Year	Total population (1,000 inhabitants)	Blood donors	Blood units collected	Donation index	Donor index	Donation /donor ratio
1992	12,622	5,496	4,532	0.4	0,4	0.8
1993	13,043	17,393	23,375	1.8	1.3	1.3
1994	13,477	20,463	26,621	2.0	1.5	1.3
1995	13,927	18,430	26,160	1.9	1.3	1.4
1996	14,391	19,155	28,042	1.9	1.3	1.5
1997	14,871	25,144	34,858	2.3	1.7	1.4
1998	15,367	27,457	35,356	2.3	1.8	1.3
1999	15,881	27,714	37,687	2.4	1.7	1.4
2000	16,402	29,311	39,743	2.4	1.8	1.4
2001	16,928	34,804	47,589	2.8	2.1	1.4
2002	17,461	46,912	57,624	3.3	2.7	1.2
2003	18,000	41,213	54,515	3.0	2.3	1.3
2004	18,546	52,264	65,224	3.5	2.8	1.2
2005	19,096	60,433	73,977	3.9	3.2	1.2
2006	19,658	56,131	71,684	3.6	2.9	1.3
2007	20,228	68,196	79,079	3.9	3.4	1.2
2008	20,807	89,614	83,410	4.0	4.3	0.9
2009	21,395	73,817	95,981	4.5	3.5	1.3
2010	21,991	58,956	97,433	4.4	2.7	1.7
2011	22,594	62,978	97,664	4.3	2.8	1.6
2012	23,261	78,170	122,112	5.2	3.4	1.6

nor hospital-based systems even reach 10 units/1,000 inhabitants⁵. Given the difficulties of these two strategies for collecting blood for national needs some authors have tried to suggest that, at least for some years to come, both systems should coexist in order to provide patients with the blood they critically need¹.

The inability of the NBTS of Ivory Coast to meet national requirements for labile blood products is not due to the fact that the potential donors and infrastructure do not exist but rather to the lack of material for blood collection and motivation of blood donors, in other words logistical difficulties.

Despite financial support from the U.S. President's Emergency Plan for AIDS Relief, (PEPFAR) since 2005, in our NBTS we do not always meet the demand for blood products. The number of consumables for blood collection is not always adequate for coverage of national needs for blood products per year. The question is often raised as how such blood services will be sustained when external funding is no longer available¹. Coverage of labile blood product needs in the Ivory Coast is inadequate and remains a real challenge in the pathway to blood safety. This study also highlights that, in sub-Saharan Africa countries, dogmatically applying the volunteer, non-remunerated donor policy could only prolong or worsen the chronic blood shortages experienced in blood systems that previously relied on family-replacement donors. Improving the donor and donation indices through a pragmatic approach could ensure that patients' needs

are met and that labile blood products are used suitably to ensure sustainability.

Acknowledgements

We gratefully acknowledge all the staff at the blood collection sites of the National Blood Transfusion Service for their assistance in data collection.

The Authors declare no conflicts of interest.

References

- 1) Field SP, Allain J-P. Transfusion in sub-Saharan Africa: does a Western model fit? *J Clin Pathol* 2007; **60**: 1073-5.
- 2) World Health Organisation (WHO). Blood safety and availability: facts and figures from the 2007 Blood Safety Survey. Geneva, Switzerland: World Health Organisation (WHO); 2007. Available at: <http://www.who.int/mediacentre/factsheets/fs279/en/index.html>. Accessed on 08/03/2014.
- 3) Godin G, Sheeran P, Conner M, et al. Factors explaining the intention to give blood among the general population. *Vox Sang* 2005; **89**: 140-9.
- 4) Centers for Disease Control and Prevention (CDC). Progress toward strengthening national blood transfusion services--14 countries, 2008-2010. *MMWR Morb Mortal Wkly Rep* 2011; **60**: 1577-82.
- 5) Allain J-P. Volunteer safer than replacement donor blood: a myth revealed by evidence. *ISBT Sci Ser.* 2010; **5**: 169-75.

Arrived: 09 April 2014 - Revision accepted: 23 June 2014

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