

Evaluation of Flagship Transfusion Safety Indicators from 2010 to 2020 in the Democratic Republic of Congo

Alain K. Ilunga^{1*}, Pacifique Misingi², Paul Kabamba², Christine M. Katuanda¹, Botha Greta¹, Berry I. Bongenia³ and Erick N. Kamangu^{3,4}

¹Institute for Research in Health Sciences, Kinshasa, Democratic Republic of Congo.

²Centre National de Transfusion Sanguine, Kinshasa, Democratic Republic of Congo.

³Research Group "Focus HIV/AIDS", Kinshasa, Democratic Republic of Congo.

⁴Service of Molecular Biology, Faculty of Medicine, University of Kinshasa, Kinshasa, Democratic Republic of Congo.

*Correspondence:

Alain K. Ilunga, Institute for Research in Health Sciences, Kinshasa, Democratic Republic of Congo.

Received: 29 Nov 2021; Accepted: 01 Jan 2022; Published: 05 Jan 2022

Citation: Ilunga AK, Misingi P, Kabamba P, et al. Evaluation of Flagship Transfusion Safety Indicators from 2010 to 2020 in the Democratic Republic of Congo. *Insights Blood Disord.* 2022; 1(1): 1-6.

ABSTRACT

Context: Blood transfusion is an act that saves lives and puts recipients at risk of infection, immunology, metabolism and hemodynamics. Transfusion safety consists of reducing and or eliminating these risks. The National Blood Transfusion Center (NBTC) coordinates national blood transfusion safety activities and defines key indicators.

Objective: Evaluate the flagship indicators of blood safety through data from 2010 to 2020 collected at the National Blood Transfusion Center.

Methods: This is a retrospective study based on the documentary review of NBTC annual reports from 2010 to 2020. Statistical analyzes are made on the basis of calculation of proportions.

Results: The proportion of blood mobilization carried out is less than 0.5% and that of voluntary donors at 34%. The risk of infection is 1.78% for HIV, 2.42% for HBV, 1.48% for HCV and 1.21% for syphilis. The pediatric service is the major user of this blood. Mobilization is below the targets of WHO 1% of the total population and NBTC 0.75%.

Conclusion: Replacement donors remain in the majority and require the NBTC to change its strategy for a major mobilization of voluntary donors. The risk of infection has remained within the African proportion range and has decreased compared to the period from 2001 to 2012.

Keywords

Transfusion Safety, Voluntary donations, Replacement donations, Infectious risks, Donations tested in accordance with the standards.

Introduction

Blood transfusion is an act that saves lives and improves health every second across the world. It puts recipients at risk of infection,

immunology, metabolism and hemodynamics [1]. Transfusion safety therefore consists of reducing and or eliminating these risks.

To ensure the mastery of all stages of the transfusion chain, from donor to recipient, the World Health Organization (WHO) recommends that all activities relating to blood collection, screening, treatment, storage and its distribution are coordinated

at national level through an efficient organization and integrated supply networks [2]. The National Blood Transfusion Safety System should be governed by the national blood transfusion policy and legislative framework to promote uniformity in both the application of quality and safety standards for blood and blood products [3].

Responding to WHO resolutions and supported by its partners, in 1994 the Democratic Republic of Congo (DRC) began the process of drawing up its first national blood transfusion policy, which in 1995 culminated in the presentation of the draft national blood transfusion policy. The promulgation of the transfusion policy and the creation of the technical body to implement this policy took place in 1999. The effective implementation of this policy was carried out around 2002, by the establishment of provincial focal points which were transformed, after their rehabilitation, into provincial coordination and centers [4].

National coordination of blood safety is ensured by the National Blood Transfusion Center (NBTC). The latter considers the proportions of blood donation from voluntary and paid donors, the proportions of units of blood tested for the four markers (HIV, hepatitis B and C virus [HBV, HCV], syphilis) and the prevalence of these markers according to the categories of blood donors as flagship indicators [4] that can enable it to monitor and assess transfusion safety.

The objective of this study was to assess the flagship indicators of blood safety through data from 2010 to 2020 collected by the National Blood Transfusion Center.

Methods

This work is a retrospective study based on the documentary review of the annual reports from 2010 to 2020 of the Center National de Transfusion Sanguine (NBTC). The NBTC reports come from Provincial Blood Transfusion Centers. All reports have been used without any discrimination.

The parameters of interest are: the mobilization of blood donations (donations made, voluntary donations, paid donations, donations at risk, donations tested in the standards,) biological qualification (number of lives saved compared to HIV, HBV, HCV, syphilis) and the use of this blood.

Statistical analyzes are made on the basis of calculation of proportions.

Some operational definitions

Donations made (DM): This is the quantity of blood donations collected by the various Provincial Blood Transfusion Centers and transfusion structures.

Secure Volunteer Donations (SVD): These are blood donations from voluntary donors, not replacements tested negative for the 4 markers according to national standards.

Replacement donations (RD): These are non-voluntary blood donations from family members or paid donors.

Donations at Risk (DR): These are donations that have not been tested or tested positive for one of the biological markers.

Number of lives saved: This is the number of people who received blood units that tested negative for 4 markers according to national standards.

Donations tested in accordance with the standards: This is the donation tested with the 4 markers of HIV, HBV, HCV and syphilis

Results

The results are presented in terms of mobilization, contribution and use of blood.

Blood mobilization

The NBTC in the DRC mobilized 4,743,941 blood donations between 2010 and 2020. Of this total blood mobilized, 1,597,218 came from voluntary secure blood donors, or an average of 34% of secure voluntary donations between 2010 and 2020.

The mobilization trend for secure voluntary blood donations stagnated at around 34% between 2010 and 2020.

Contribution

The NBTC in the DRC has contributed to tested 3,014,094 blood donations in accordance with the standards out of the 4,743,941 donated blood mobilized (64%) of blood tested within standards and 1,729,347 donations at risk (36%).

It should also be noted that between 2013 and 2018 donations tested with standards were greater than 80% except in 2015 and that from 2019 to 2020 donations tested with standards were less than or equal to 55%.

The NBTC in the DRC, which mobilized 4,743,941 blood donations between 2010 and 2020, recorded 1.78% of donations infected with HIV, 2.42% donations infected with HBV, 1.48% of donations infected with HCV and 1.21% donations infected with syphilis.

Use of blood

3,064,508 blood transfusions (BT) were reported between 2010 and 2017 to the NBTC and of this total reported 1,808,057 blood transfusions were used in Pediatrics (59%) between 2010 and 2017. 297,559 blood transfusions were used in the Gynecology department (10%) and 31% in all other departments.

Discussion

The objective of this study was to assess the flagship indicators of blood safety through data from 2010 to 2020 collected by the National Blood Transfusion Center (NBTC).

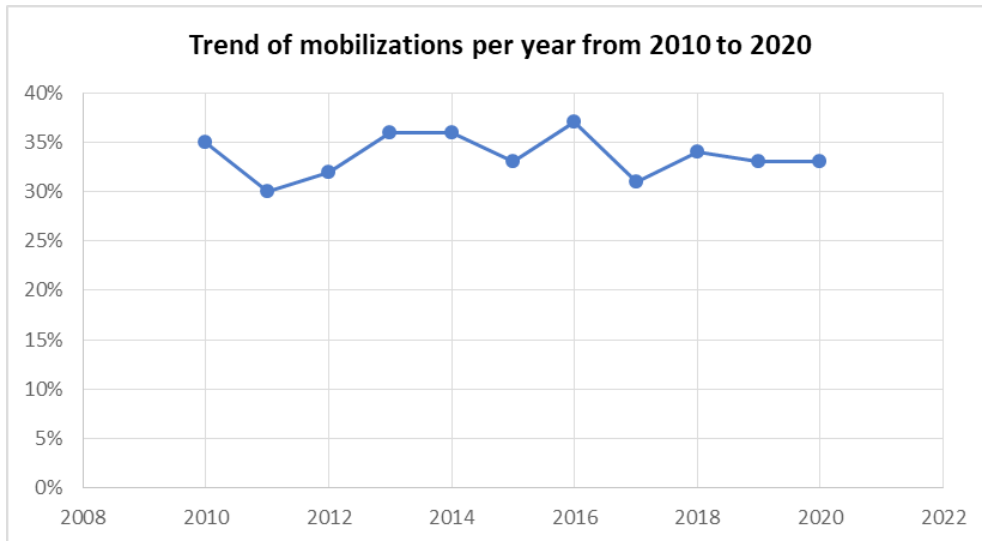


Figure 1: Trend of mobilizations per year.

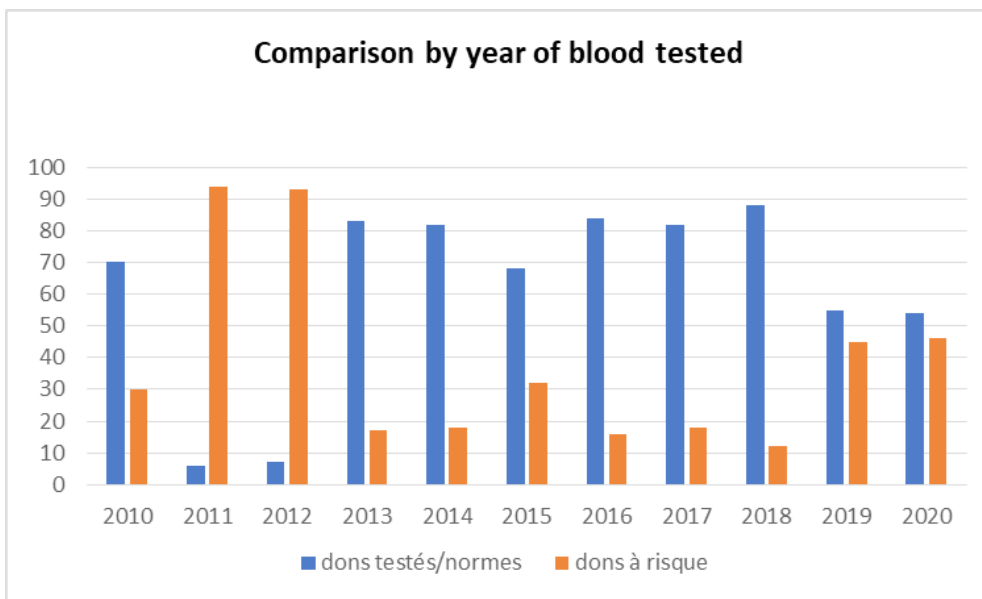


Figure 2: Comparison by year of blood tested.

Table 1: Annual breakdown of donations made and donations from voluntary donors.

Years	Donation made	SVD	% SVD
2010	322 295	112 882	35%
2011	394 898	120 034	30%
2012	377 071	119 250	32%
2013	435 275	155 401	36%
2014	571 205	205 831	36%
2015	465 267	154 234	33%
2016	442 141	162 847	37%
2017	453 856	140 757	31%
2018	420 147	141 603	34%
2019	440 367	145 321	33%
2020	421 419	139 068	33%
Total	4 743 941	1597218	34%

Table 2: Annual distribution of donations tested in the standards and donations at risk.

Years	Donation made	Tested accordingly	%	Donation at Risk	%
2010	322 295	224 309	70	97986	30
2011	394 898	240 379	62	154519	38
2012	377 071	260 182	69	116889	31
2013	435 275	362 426	83	72849	17
2014	571 205	470 518	82	100687	18
2015	465 267	317 853	68	147414	32
2016	442 141	373 473	84	68668	16
2017	453 856	373 130	82	80726	18
2018	420 147	370 370	88	49777	12
2019	440 367	242 202	55	198165	45
2020	421 419	229 252	54	192167	46
Total	4 743 941	3 014 094	64	1 729 347	36

Table 3: Annual prevalence of HIV, HBV, HCV and syphilis infections.

Years	Donation made	HIV (%)	HBV (%)	HCV (%)	SYPHILIS (%)
2010	322 295	9 024 (2.79)	12 247 (3.79)	5 157 (1.60)	3 543 (1.09)
2011	394 898	6 832 (1.73)	8 016 (2.02)	4 620 (1.16)	5 529 (1.40)
2012	377 071	7 918 (2.09)	13 197 (3.49)	8 673 (2.30)	4 525 (1.20)
2013	435 275	4 527 (1.04)	9 750 (2.23)	4 527 (1.04)	2 916 (0.66)
2014	571 205	7 997 (1.40)	10 282 (1.80)	4 570 (0.80)	2 856 (0.49)
2015	465 267	6 049 (1.30)	7 444 (1.59)	5 118 (1.10)	4 187 (0.89)
2016	442 141	7 074 (1.59)	7 959 (1.80)	5 306 (1.20)	3 979 (0.89)
2017	453 856	10 893 (2.40)	14 070 (3.10)	10 893 (2.40)	9 077 (1.99)
2018	420 147	9 243 (2.19)	10 924 (2.60)	9 663 (2.29)	6 722 (1.59)
2019	440 367	9 248 (2.10)	11 450 (2.60)	7 486 (1.69)	7 927 (1.80)
2020	421 419	5 900 (1.40)	9 693 (2.30)	4 214 (0.99)	6 321 (1.49)
Total	4 743 941	84 704 (1.78)	115 031(2.42)	70 227(1.48)	57 584 (1.21)
Means	431 267	7700 (1.78)	10457(2.42)	6384(1.48)	5234 (1.21)

Table 4: Average prevalence of the proportions of infectious markers between 2010 and 2020

Biological markers	Frequencies	%
HIV	7700	1.78
HBV	10457	2.42
HVC	6384	1.48
SYPHILIS	5234	1.21

Table 5: Breakdown of proportions of reported blood transfusions and consumption services

Years	Reported data	Number of lives saved in Gynecology (%)	Number of lives saved in Pediatrics (%)
2010	309 295	28 300 (9.14)	178 953 (57.85)
2011	344 327	30 607 (8.88)	224 840 (65.29)
2012	343 809	33 076 (9.62)	211 210 (61.43)
2013	387 019	40 482 (10.45)	228 084 (58.93)
2014	510 074	51 809 (10.15)	301 416 (59.09)
2015	410 708	39 353 (9.58)	227 590 (55.41)
2016	411 396	39 312 (9.55)	236 089 (57.38)
2017	350 880	34 620 (9.86)	199 875 (56.96)
TOTAL	3 067 508	297 559 (9.70)	1 808 057 (58.94)

Transfusion safety is based on controlling the immunological risk and reducing infections transmitted through the blood [5].

The strategies to be implemented to achieve this are a well-organized and nationally coordinated blood transfusion service, blood collection from regular, voluntary and unpaid donors from low-risk populations, screening for infectious agents transmissible

by transfusion, determination of blood grouping and an appropriate strategy for clinical use of blood [5].

The flagship indicators make it possible to assess blood safety activities in terms of blood mobilization, contributions to avoid contamination and the use of this blood [4].

Blood mobilization

The NBTC made 4,743,951 blood donations between 2010 and 2020 with an annual average of over 400,000 donations. This is much higher than the mobilization from 2001 to 2012 or the annual achievement was less than 300,000 donations [4]. Although high, this achievement does not meet WHO's targets in terms of the need for 1-2% of the total population, nor its own targets of 0.75% [4] for an estimated population of 80 million.

The main objective of the World Health Organization was to obtain 100% of blood donations from voluntary donors by 2020 [6]. The results report that the vast majority of donations were made by replacement donors (66%) and that 34% of donations were voluntary. These results are similar to those obtained by Noubiap in Cameroon [7]. This shows that many awareness campaigns on the importance of voluntary blood donation are necessary to hope to meet the objectives that the WHO has set itself.

In this achievement, the proportion of voluntary donors remained low as between 2001 to 2012 [4] around 34% while the WHO recommends having at least 80% of voluntary donors because replacement donations (family and paid) carry a greater risk of infection [8]. Residual risks exist for all donors as most organizations use rapid tests for biological qualification [9] instead of enzyme-linked immunosorbent assays (ELISA) or molecular biology tests (PCR).

Contributions

The proportion of blood tested within standards is 3,014,094 (64%) of donations made and 36% of donations at risk, while the proportions between 2001 and 2012 were 71% of donations tested within standards and 29% of blood at risk [4].

These results would be influenced by the proportion of volunteer donors which is low, out of stock and the impact of the Covid-19 pandemic on several sectors.

During the same period, blood safety activities helped prevent 84,704 (1.78%) of donations contaminated with Human Immunodeficiency Virus (HIV). These cases are lower than the infections averted between 2001 and 2012 (2.1%) [4]. They were able to avoid 89,688 HIV-infected blood donations. This prevalence is in the range of low-income countries which is between 1% and 12% for HIV infection. However, it is lower than those obtained by other authors in Cameroon (2.9%), Ghana (3.8%) and Nigeria (6.2%) [10-12].

The rate of bags infected with HBV is 115031 (2.42%) between 2010 and 2020. This rate is lower than the range of low-income African countries between 3% and 22%, also lower than that reported by the NBTC between 2001 and 2012 (3.5%) [4] and finally lower than the rates found in certain countries such as Nigeria (18.6%), Guinea Bissau (16.2%) and Burkina Faso (14.96%) [13-15].

The seroprevalence of HBV infection could be explained by the absence of a vaccination policy against HBV in our country apart from the reasons mentioned above.

The rate of HCV infected bags is 70,227 (1.48%) and remains in the low-income range of 0.5% and 12%. This is higher than that observed in Nigeria (0.6%) [16] but less important than that obtained by Nagalo [15]. And by Kabinda in DR Congo between 2000 and 2012 (2.3%) [4].

The rate of bags infected with the syphilis germ between 2010 and 2020 is 57,584 (1.21%). This is slightly higher than that reported by Kabinda between 2001 and 2012 [4] but much lower than that encountered in Ethiopia and Tanzania which are respectively 12.8% and 12.7% [17,18].

The blood bags collected are qualified on the basis of rapid diagnostic tests (RDTs) detecting certain viral antibodies in the majority of health structures organizing transfusion except in a few Provincial Blood Transfusion Centers where there are devices for Elisa tests. A residual risk of transfusion persists for several infectious agents [19].

Use of donations made

The donations made between 2010 and 2020 were intended for 59% for the Pediatric service, 10% for the obstetrics and gynecology service and 31% for all other services. The pediatric service remains the major user of these services but has lower proportions. Before 2012, pediatrics consumed 75% of donations made followed by gyneco-obstetrics services [4]. The latter begins to consume fewer donations probably due to the use of an insecticide-treated mosquito net which would limit the prevalence of severe anemic malaria (PNLP report 2014) for pediatrics and the use of utero tonics, misoprostol during childbirth, cesarean section and myomectomy which would prevent severe bleeding.

Conclusion

Blood donation mobilization has increased but remains below WHO and NBTC targets and also remains dominated by risky replacement donor donations. The infectious risk for all markers is less than 2.5% and remains in the range of low-income countries. D or the need for a major awareness campaign for secure voluntary donations. Pediatrics remains the major user of mobilized donations

Acknowledgments

All the authors thank the National Center for Transfusion Safety.

References

1. Criss Koba Mjumbe, Kykputa Mwanto, Isabelle Kasongo Omba, et al. Analyse Opérationnelle des Activités de la Sécurité Transfusionnelle dans les Zones de Santé de Katuba et Kenya en RDC. IOSR Journal of Dental and Medical Sciences. 2020; 19: 10-14.
2. Organisation Mondiale Santé. Disponibilité, nocuité et qualité des produits sanguins. Genève 2009, EB126/19. Médecine et Santé Tropicales, Vol. 25, N8 4- octobre-novembre-décembre 2015 349 Transfusion sanguine en RDC. 2012.

3. Organisation Mondiale Santé. Sécurité transfusionnelle, Aide-mémoire pour les programmes nationaux de transfusion sanguine. Genève 1999.
4. Kabinda Maotela J, Ramazani S Y, Misingi P, et al. [Blood Transfusion in the Democratic Republic of Congo: Efforts and Challenges]. *Medecine et sante tropicales*. 2015; 25: 342-349.
5. Jean-Paul Chirambiza Lushamba, Willy Basimike Bukombe, Bonhomme Kalimira Kachelewa, Titi Bahemuyiki Maheshe, Célestin Kyambikwa Bisangamo B., Nkrumah, Owusu Frempong H., and Acquah P.A. 2010. 'The Prevalence of Hepatitis B and C Viral Infections among Blood Donors. A Retrospective Study from Rural Ghana'. *Clinical Chemistry* 56(6 SUPPL. 1): A52.
6. Who Health Organisation. Blood safety: Fact Sheet n°279. 2011.
7. Noubiap JJ, Joko WY, Nansseu JR, et al. Sero-epidemiology of human immunodeficiency virus, hepatitis B and C viruses, and syphilis infections among first-time blood donors in Edéa, Cameroon. *International Journal of Infectious diseases*. 2013; 17: 832-837.
8. Batina A, Kabemba S, Malengela R. Marqueurs infectieux chez les donneurs de sang en République Démocratique du Congo(RDC). *Rev Med Brux*. 2007; 28: 145-149.
9. Namululi B, Guerrieri C, Dramaix-Wilmet M. Prévalence et incidence du VIH et de l'hépatite B chez les donneurs de sang et estimation du risque résiduel de transmission du virus VIH et du virus VHB par la transfusion sanguine; une étude à l'hôpital provincial général de référence de Bukavu, République démocratique du Congo. *Revue d'épidémiologie et de santé publique*. 2013; 61: 139-144.
10. Ampofo W, Nii-Trebi N, Ansah J, et al. Prevalence of blood-borne infectious diseases in blood donors in Ghana. *J Clin Microbiol*. 2002; 40: 3523-3525.
11. Mbanya DN, Tayou C. Blood safety begins with safe donations update among blood donors in Yaounde, Cameroon. *Transfus Med*. 2005; 15: 395-399.
12. Motayo OB, Faneye OA, Udo AU, et al. Seroprevalence of transfusion transmissible infections (TTIs), in first time blood donors in Abeokuta, Nigeria. *African Health Sciences*. 2015; 15: 19-24.
13. Buseri FI, Muhibi MA, Jeremiah ZA. Sero-epidemiology of transfusion-transmissible infectious diseases among blood donors in Osgbo, south-west Nigeria. *Blood Transfus*. 2009; 7: 293-299.
14. Tapko JB, Mainuka P, Diarra-Nama AJ. Status of blood safety in the WHO African Region: report of the 2006 survey. Brazzaville: WHO Regional Office for Africa: 2009.
15. Nagalo BM, Sanou M, Bisseye C, et al. Seroprevalence of human immunodeficiency virus, hepatitis B and C viruses and syphilis among blood donors in koudougou (Burkina Faso) in 2009. *Blood Transfus*. 2011; 9: 419-424.
16. Durro V, Koraqi A, Saliasi S. Trends in the prevalence of transfusion-transmissible infections among blood donors in Albania. *Clin Lab*. 2010; 56: 591-595.
17. World Health Organization Status of blood safety in the WHO African region report of the 2004 survey WHO Regional Office for Africa. Brazzaville. 2007; 1-25.
18. Matee MI, Magesa PM, Lyamuya EF. Seroprevalence of human immunodeficiency virus, hepatitis B and C viruses and syphilis infections among blood donors at Muhumbili National Hospital in Dar-es-Salaam, Tanzania. *BMC Public Health*. 2006; 6: 21.
19. Hannachi N, Boughammoura L, Marzouk M, et al. Le risque infectieux viral chez le polytransfusé: séroprévalence de sept agents viraux dans le centre tunisien. *Bulletin de la Société de pathologie exotique*. 2011; 104: 220-225.