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High Prevalence of Transfusion-Transmissible Infections among Volunteer Blood Donors in Rural Area of Eastern Democratic Republic of the Congo (D.R.C)

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Authors' contributions

This work was carried out in collaboration between all authors. Authors MKI and JKK designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors VKT, MMV, TKK, SV, AAM and FKS managed the analyses of the study and the literature searches. Author GKB critically revised the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Background: Transfusion safety investigations in sub-Saharan Africa are sparse, often limited to local initiatives. The provision of transfusion products must comply with the rules of good transfusion practice. This study aimed to evaluate transfusion practices in a rural area in the Eastern Democratic Republic of the Congo and identifying the main Infectious Transfusion Infections.
Methodology: This was a retrospective study carried out from January to December 2017 and including 961 volunteer blood donors in the haematology department of the laboratory of the Referral Health Centre of Eringeti, in the Eastern Democratic Republic of the Congo.
Results: Among the 961 volunteer blood donors, 139 (14.46%) donors were found with infections transmissible by transfusion. The sex ration of 1.6 in favour of males was observed and the group age below 20 years was the most affected. The majorities of donors were single, farmers, without any level of education and reside in the village of Eringeti. Syphilis, Hepatitis B virus, Human Immunodeficiency Virus, as well as Hepatitis C Virus, were more represented respectively with 38.1%, 30.2%, 20.1% and 11.5% followed by HIV-Syphilis, syphilis-hepatitis B and syphilis-hepatitis B and C co-infection in the same proportion (0.7%). Ancient donors were more affected by transmissible transfusion infections with 55.4%.
Conclusion: Blood safety is an essential health goal. But it is by far to be accomplished in the rural areas of the Eastern Democratic Republic of the Congo. Thus, improving the selection of donors on one hand, and the progress made in the development of more sensitive screening tools and the introduction of innovative screening measures on the other side, enhanced with a modern bank of blood with qualified staff at the Eringeti Referral Health Centre may improve the quality and safety of the blood products administered to the needy population and could thus reduce the risks ITTs in this rural area.

Keywords: Sero-epidemiology; transfusion; transmitted; infections; Eringeti; D.R.C.

1. INTRODUCTION

Blood transfusion is a lifesaving intervention and plays a vital role in the care of patients in healthcare systems, and carries risks, particularly the transmission of blood infections [1]. Blood transfusion is one of the most sensitive activities in a health system, because of the nature of the products used which are human-made products - blood and blood derivatives - and the quality of the recipient, the patient [2]. It, therefore, concerns all stages of the transfusion chain, from the collection of labile blood products to the post-transfusion monitoring of the recipients. It also includes the epidemiological monitoring of donors [3,4,5].

In the early 1990s, it was estimated that up to 10% of Human Immunodeficiency Virus (HIV) infections might have been due to transfusions of contaminated blood [6]. Currently, HIV-infected blood is responsible for about 5% of HIV infections in Africa [6].

However, globally there are significant variations in the extent of screening tests, the strategies adopted for screening, and the overall quality and effectiveness of the screening process. Therefore, in many countries, recipients of blood and blood products remain at an unacceptable risk of contracting life-threatening infections that could be easily prevented [7]. Blood transfusion presents a risk of acute or delayed complication and transmission of infections [8].

According to figures for transfusion safety indicators transmitted in 2007 by ministries of health to the World Health Organization (WHO) Global Database on Transfusion Safety (GDBS), among the 155 countries reporting they perform HIV testing on 100% of blood donations, only 71 perform guaranteed quality screening [9]. According to the WHO, 5 to 10% of HIV infections worldwide are transmitted through the transfusion of contaminated blood or blood products. An even more significant number of recipients of labile blood product (LBP) are infected with hepatitis B and C viruses, Treponema of syphilis and other infectious agents [10].

More than 3 million donations of blood are done each year in France. Permanent contraindications to blood donation are active infections known to be transmissible by blood: viral hepatitis, syphilis, HIV infection or the

human lymphotropic Virus-T (HTLV), Chagas disease, malaria [11].

Research works on transfusion safety in sub-Saharan Africa are sparse, often limited to local initiatives. In recent years, local scientific data, generally remaining fragmented, have revealed an insufficient supply of blood products and even more blood-derived drugs, a high prevalence of transfusion-transmissible agents, a predominance of family donors, and inadequate efficacy screening techniques for blood-borne agents, a still high residual risk and often inappropriate clinical use of blood and blood products [12,13].

In Morocco, transfusion safety is ensured by controlling all the stages of the transfusion chain from blood collection, preparation and biological qualification, to the completion of the transfusion act, and even the follow-up of the recipients; to collect and evaluate information on unexpected or undesirable effects resulting from the therapeutic use of labile blood products and to prevent their occurrence [2].

At the National Blood Transfusion Centre in Bamako, all units of blood have been tested for HIV, hepatitis B, hepatitis C and syphilis since 2004, with respective prevalences in 2007 at 2.6%, 13.9%, 3.3% and 0.3% [14].

In the Democratic Republic of the Congo (DRC), the transfusion system is a colonial legacy, such as a hospital blood transfusion system. Nevertheless, the political and socio-economic crisis that the country has experienced for some decades has led to a profound disruption of its socio-economic development, particularly its sanitary apparatus [15]. The transfusion system in the DRC is in the implantation phase. In twelve years, from 2001 to 2012, there were 112,882 volunteer donors of blood mobilised, more than 80% of safe blood products and more than 80% of the needs covered. Besides, 89,688 HIV infections were prevented. During the same period, 8,461 people were trained in blood transfusion. With transfusion safety practice, there has been a regression of viral markers. For example, HIV prevalence decreased from 4.7% to 2.1% between 2001 and 2012 while hepatitis B declined from 7.1% to 3.5% during the same period. For hepatitis C, this rate decreased from 11.8% to 2.3% between 2004 and 2012 [16].

A study conducted at the Kisangani Blood Transfusion Centre showed that of the 3,390 blood donors, 159 (4.7%) were at risk of transmitting HIV, 182 (5.4%) hepatitis B, and 126 (3.7%) syphilis in 2007 [17].

In addition, a recent study of blood donors in Kalemie showed that out of 13,500 donors from January to December 2013, 293 (2.2%), 198 (1.5%) and 140 (1%) had the risk of to transmit HIV, hepatitis B virus (HBV) and hepatitis C virus (HCV) respectively [18].

From the foregoing, it turns out that despite the means implemented to improve blood transfusion safety, blood transfusion remains a risky therapy and remains a major public health problem in our communities, where we do not yet benefit from all technological advances made to ensure better blood safety.

In Eringeti, a rural area in Eastern DRC, no study has been done on the infectious markers found in the blood product of blood donors. Also, there is no protocol or procedure for the administration of blood products. The haemovigilance program is also non-existent. This exposes the population to a risk of acquiring transfusion-transmissible infections. Thus, this study aimed to evaluate transfusion practices at the Eringeti Referral Health Centre by identifying transfusion-transmissible infections found among volunteer blood donors to contribute to the reduction of morbidity and mortality related to blood-borne diseases.

2. MATERIALS AND METHODS

2.1 Study Framework

This study took place in the laboratory department of the Eringeti Referral Health Centre (RHC) located in the village of Eringeti. This last is located in the territory of Beni, North-Kivu, Eastern DRC. It is in the health zone of Oicha, in about 60 Kilometres at the North-East of Beni City, on the border with the province of Ituri. The Eringeti RHC laboratory service works in poor setting conditions and consists of a single room, with the haematology and parasitology departments. It has two electric microscopes, a centrifuge and a freezer.

2.2 Methods

This was a retrospective study carried out from January to December 2017 and including 961 volunteer blood donors in the haematology

department of the laboratory of the Referral Health Centre of Eringeti, in the Eastern Democratic Republic of the Congo.

During the study period, the prevalence of blood donor with pre-existing transfusion transmissible infections were determined among the 961 voluntary blood donors in the laboratory service of Health Center of Reference Eringeti and the type of these prior exiting infections were identified.

Thus, 139 cases with at least one of the infectious markers positive were included in this study.

Information for each respondent was collected from the laboratory records. The data collection was carried out using a collection grid with the following variables: sex, age, address (Eringeti or outside Eringeti), marital status, employment, level of study, type of donation and Transfusion Transmissible Infections among found in volunteer blood donors.

The blood was screened for Anti-HIV 1/2 antibodies, hepatitis B surface antigens (HBsAg) and anti-HCV and Treponema Pallidum Haemagglutination Assay (TPHA) for syphilis. Every reactive result was tested twice and if both replicates are nonreactive, then the initial reactive was interpreted as false positive. Syphilis was tested using manual (TPHA) and VDRL test procedure.

Data entry and analysis was performed using the EPI-INFO software version 3.5.4. Data were presented as tables and chart. The standards of ethics were respected in carrying out this work. Confidentiality was guaranteed for voluntary blood donors. We had obtained ethical clearance from the local ethics review committee of the Faculty of Medicine at the Université Catholique du Graben, Butembo, DRC No 002/TEN/2018, even the Oicha Health Zone District Office and the Eringeti Referral Health Center was also approved with this study. No individual consent was required as archived patient records were collected and no patient identification was used.

3. RESULTS

Among the 961 volunteer blood donors, 139 had transfusion transmissible infections - a prevalence of 14.46%. Males were more predominant with 61.1% and 54% of donors are less than 20 years old. Eighty-tree (59.7%) volunteer blood donors are farmers, 46.7% of them do not have any education and 68.4% are singles. The majority of donors (74.1%) live in Eringeti and 55.4% of them are ancient donors (Table 1).

The Transfusion Transmissible Infections find in this study are syphilis (53 cases, 38.1%), hepatitis B (42 cases, 30.2%), HIV (28 cases, 20.1%), hepatitis C (16 cases, 11.5%). Thee co-infections HIV-Syphilis, Syphilis-Hepatitis B-Hepatitis C and Syphilis-Hepatitis represent each 0.7% (1 case) (Fig. 1).

4. DISCUSSION

The prevalence of Transfusion Transmissible Infections (TTIs) found in voluntary blood donors was 14,1% in the laboratory service of Eringeti Referral Health Centre during the study period.

This value is higher than that found in a study done in Kisangani on voluntary blood donors in 2007 [19]. However, it is less than that found in a study done in Kinshasa on three infectious markers: HIV, HBV and HCV in 2013 [20].

It follows from several studies carried out that the characteristics of the blood donor throughout Francophone sub-Saharan Africa; the provision of blood donations to low-risk individuals remains insufficient and the prevalence of infectious transmissible agents through transfusion remains relatively high in the donor population [21]. A study conducted by Josiane Pillonel between 1992 and 2002, out of the 31 million volunteer blood donations taken, 23,876 donors carried transfusion-transmissible infections at a prevalence of 0.08% [22]. The observed decrease in the number of donors compared to this study is likely multifactorial. A first factor is undoubtedly the reduction in the need for blood products following changes in transfusion practices. The revision of transfusion indications, the evolution of surgical techniques within the particular development of endoscopic interventions as well as the development of autologous transfusion are all factors explaining the decrease in the need for blood products [23].

With regard to the socio-demographic characteristics of the respondents, it appears from this work that males were the most represented with the TTIs with a sex ratio of 1.6 in favour of the male and especially the very young population aged less than 20 years old. The majority were single, farmers, without any

Table 1. Socio-demographic characteristics of volunteer blood donors

Variables	n (with N=139)	%
Sex		
Female	54	38.9
Male	85	61.1
Age in years		
< 20	75	54
21-30	27	19.5
31-40	24	17.2
41-50	13	9.3
Employment		
Farmer	83	59.7
Student	34	24.5
Military	18	13
Teachers	4	2.8
Study level		
None	65	46.7
Primary	44	31.6
Secondary	30	17.7
Tertiary	0	0
Marital status		
Married	27	19.4
Single	95	68.4
Divorced	17	12.2
Address		
Eringeti	103	74.1
Outside Eringeti	36	25.9
Type of donor		
Ancient	77	55.4
New	62	44.6

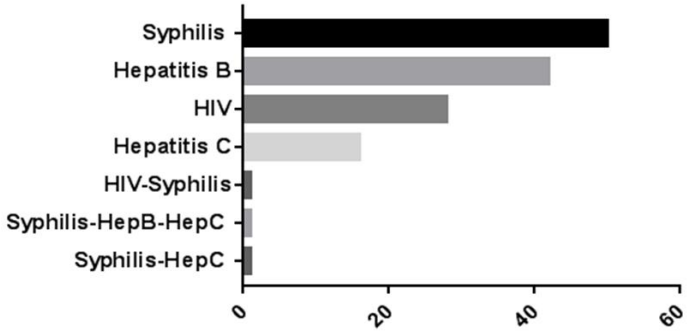

Fig. 1. Transfusion transmissible infection among volunteer blood donors

level of education and reside in the village of Eringeti. These results can be explained by the fact that this population layer is actively sexual, practising unsafe and unprotected sex. The population of Eringeti is largely rural and ignorant of the practice of responsible sexuality. With the sale of agricultural products from their culture to the population from neighbouring regions, this can be the basis of sexual promiscuity and increase of TTIs in this segment of the population.

Researches were done on this theme in 2008 and including seven countries [24] and in 2011 with 15 countries [25] demonstrated that in transfusion centres in sub-Saharan Africa, the blood donor with TTIs is usually young, with a mean age of 26 years (17-60 years). He is more often a male, with a sex ratio ranging from 3 to 5 men for a woman. In America, Murphy and his colleagues have found a higher prevalence of TTIs in males than in females with the mean age of 30-39 years [26].

It is clear from this work that syphilis, Hepatitis B virus, Human Immunodeficiency Virus and the Hepatitis C virus were over-represented with respectively 36%, 30.2%, 20, 1% and 11.5% followed by co-infection HIV- syphilis, hepatitis B, C and syphilis and hepatitis C-syphilis in the same proportion is 0.7%. Tagny and colleagues, in their study doing in francophone African countries, found that the average sero-prevalence of TTIs of 1.84% for the HIV antibody (HIV), 7.21% for the antibodies of hepatitis B virus (HBV), 1.99% for the antibodies of the hepatitis C virus (HCV) and 1.60% for antibodies Treponema pallidum [25].

In France, the incidence rates of hepatitis B virus, Human Immunodeficiency Virus, hepatitis C virus decreased significantly between 1992 and 2000 except for hepatitis C virus for which the incidence continues to decline over the last period so that the Human Immunodeficiency Virus incidence was equal to or lower than that of hepatitis C virus until 1997-1999, it is now higher than that of hepatitis C virus [22]. This decrease in the number of donors and in parallel the number of donations in the last decade, the evolution of geo-demographic characteristics of the donor, the low prevalence and incidence of hepatitis B virus, hepatitis C virus and Human Immunodeficiency Virus compared to those observed in the population in general and decrease between 1992 and 2002 are all indicators of the selection of donors and its improvement during the study period.

In the DRC, a study done from 2001 to 2012 found that out of 112,882 volunteer blood donors mobilized, 89,688 HIV infections have been avoided by the systematic improvement of blood products. During the same period, 8461 people have been trained in blood transfusion and there was a decline in viral markers. Thus, HIV prevalence decreased from 4.7% to 2.1% between 2001 and 2012 while hepatitis B experienced a decline of 7.1% to 3.5% during the same period. For hepatitis C, the rate decreased from 11.8% to 2.3% between 2004 and 2012 [16].

Several studies have proven that the prevalence among new volunteer blood donors is consistent with those found in other populations. Moreover, comparisons of prevalence and impact with countries with similar criteria to those of France (England, Canada, and the USA) show that the differences between the rates of the population of volunteer blood donors of these four countries are also found at the general population in these countries. Finally, if the improvement of donor selection over time has undoubtedly played a key role in decreasing the prevalence and impact, this change resulted probably also the preventive measures taken in the general population to avoid including new infections [22]. With the constant improvement of donor selection firstly, and secondly, to progress in the development of more sensitive screening tools and in the development of innovative screening measures blood components today present a very low viral risk [22].

The volunteer donation by subjects from the low-risk group is associated with a lower prevalence of transfusion-transmissible agents, and even more so that they are regular donors (they constitute 24% of all donors).

5. CONCLUSION

Transfusion-transmissible infections have a significant public health problem in the village of Eringeti that deserves to be resolved in time. Safe blood is a key objective of health, and all stages of the transfusion chain must be secured to prevent the chain of disease transmission and infection from blood products.

The establishment of a blood bank, with full equipment, recommended, equipment and personnel are essential to qualify the Eringeti Referral Health Centre to improve and reduce the risk of transfusion at least in the correct sequence of the transfusion chain, from the selection of volunteer blood donors and product transfusion in the patient.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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