Transfusion Transmitable Infections and Reasons for Release of Total Blood to the Blood Bank of the Yaounde Centrall Hospital

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Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

Original Research Article

ABSTRACT

Blood banks in sub-Saharan Africa regularly face shortages of blood products (PS). Several factors are responsible for this, including transfusion-transmissible infections (ITT) and deficiencies in the transfusion system. This study aims to determine the prevalence and the various reasons for rejection at the blood bank of the Central Hospital of Yaoundé. We first conducted a retrospective study at the blood bank of the Central Hospital of Yaoundé for 12 months between January 01, 2014 and December 31, 2014.Secondly, we carried out a prospective study in October 2015. Five milliliters (05 ml) of venous blood were taken from each participant in a tube without anticoagulant; patient samples were stored at -24°C. A rapid screening test and ELISA were used to test for HIV, HCV, HBs and syphilis on the samples taken. Approximately 15,028 bags of whole blood were drawn in 2014, of which 3,688 bags were rejected. This equates to a rejection rate of 24.54%. Discards for non-infectious reasons represented 3.51% and rejections for infectious reasons 21.03%. During the prospective study, among those selected, there were 95.74% men and 4.26% women. The average age of the participants was 30 years. Among the 705 people in this investigation, 185 blood bags were rejected. Infectious causes represented 22.55% (Hepatitis B and C, HIV and syphilis with a respective prevalence of 9.08%, 0.71% 6.95% and 5.82%) and non-

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infectious causes represented 3.68 % (clots, insufficient volume of PST, hemolysis and expiration with a respective prevalence of: 1.84%, 0.71 0.14% and 0.99%).The association between rejection of blood bags and qualitative variables was assessed. There emerged a significant association between the risk of rejection of a blood bag and the type of donor; condom use, number of partners, history of STIs. At the Yaoundé Central Hospital blood bank, the reasons for rejecting blood bags are divided into two categories: Mainly infectious and non-infectious. Also, certain risk variables such as not using a condom, multiple sexual partners and a history of STIs are risk factors that can encourage rejection of blood bags.

Keywords: Blood bank; Yaounde Central Hospital; infections; blood bags; blood transfusion.

1. INTRODUCTION

Blood transfusion is an act of injecting blood or blood products from one subject to another subject, intravenously [1]. However, the problem of the shortage of blood and its derivatives has led to many studies on the crucial issue of blood donation worldwide [2]. This is why the system put in place to ensure health security in the area of blood transfusion has never ceased to strengthen, especially in wealthy countries. On the other hand, in developing countries like Cameroon, this device is not well applied. Chronic shortages are common [3], due in large part to the high rate of rejection of blood transfusion products, the latter mainly resulting from infections transmissible by transfusion (ITT). In addition, the prevailing transfusion context and the organizational problems encountered by blood transfusion services may be the basis for the emergence of new reasons for rejection [4]. The present study consists in determining the prevalence of rejection and all the reasons for rejection of PST in the blood bank of the Central Hospital of Yaoundé.

2. METHODOLOGY

We conducted a retrospective and prospective study (transversal and descriptive) at the blood bank of the Central Hospital of Yaoundé (BSHCY). The retrospective study concerned the data contained in the BSHCY PST rejection register during 2014 while for the prospective study, we carried out an exhaustive consecutive sampling over 5 months, going from August 2015

to December 2015. All persons selected as candidates for blood donation to the BSHSY were included. Excluded were people who did not complete their forms in full. Donor samples were collected during blood donation by correctly puncturing a peripheral vein in dry tubes. The blood collected was transported directly using the appropriate racks in the various units for biological analyzes. The various biological tests were carried out: rapid tests on strips (HIV; hepatitis B; hepatitis C; syphilis) and tests on the ELISA chain (ELISA HIV 1 + 2 + 0 Fortress diagnostic BXE091a; ELISAHBSAG (HS) fortress diagnostic; ELISA (4th generation) ANTI-HCV FORTRESS DIAGNOSIS); the results were interpreted and recorded after quality control.

Data collection was carried out using a pre-established data collection questionnaire. The variables studied were socio-demographic, clinical and biological. The data were encoded and processed using Epi-Info 7 and Excel 2007 software. They were analyzed using SPSS 20 software.

3. RESULTS

We recorded a total of 15,028 whole blood bags (PST) collected in 2014 at the BSHCY, including 13,746 collected in fixed collection and 1,282 collected in mobile collection. 3688 PST or 24.54% had been rejected for various reasons divided into infectious causes (3160 cases or 85.66%) and non-infectious causes (528 cases or 3.51%). 228 rejected PSTs came from mobile collections.

Table 1. Collection and rejection of PSTs in 2014 at the BSHCY depending on the collection site

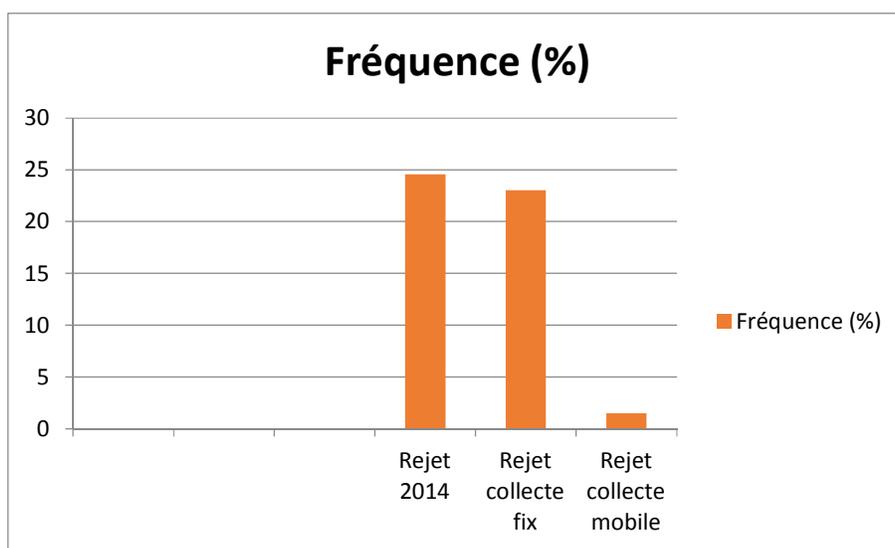|	Workforce (n)	Frequency (%)
Direct debit 2014	15028	100
Fixed collection	13746	91,47
Mobile collection	1282	8,53
Rejection 2014	3688	24,54
Fixed collection reject	3460	23,03
Rejection mobile collection	228	1,51

Fréquence (%)

Fig. 1. Frequency of PST rejection in 2014 depending on the level of collection

From our study, there were 7 non-infectious causes of rejection of whole blood bags (PST) at the BSHCY: Clots, hemolysis, insufficient volume of PST, polycythemia, expiration, bacterial contamination and the reactivity of the whole blood bag. Insufficient volume was the most common cause in our population (Table 2).

In addition, infectious causes of rejection have been recorded. There were 4 of them: HIV infection, Viral Hepatitis B and C and syphilis. Viral hepatitis B was the main cause of infectious rejection of PSTs (Table 3).

3.1 Cross-Descriptive Study

At the end of our prospective study, 705 blood donors were selected. The age of the patients was between 18 and 58 years with an average age of 30 years. Over 80% of the population was under the age of 39.

The sex ratio was 22.5 with a male prevalence of 95.74%.

Family replacement donors were the most represented with a percentage of 99.46%; the great majority were single (81.62%) and secondary school students 47.28% (Table 4).

The 705 samples recruited were analyzed using rapid diagnostic tests and the ELISA analyzer. 159 cases of infections (ITT) were recorded (22.55%). It was hepatitis B and C, HIV and syphilis with a respective prevalence of 9.08%; 0.71%; 6.95% and 5.82% (Table 5).

In addition, releases from non-infectious causes were also recorded. 4 in number, they corresponded to 26 PST or 3.68% of the sample. It was the insufficient volume of the blood bag, hemolysis, expiration and clots that were mainly represented (Table 6).

**Table 2. Summary of frequencies of non-infectious reasons for rejection of PST**

Causes of rejection	Clots	Hemolysis	Insufficient volume	Poly	Expiration	Bacteriology	Réaction	Total
Workforce	66	45	341	5	51	6	14	528
Fréquencies	0,43	0,30	2,26	0,03	0,34	0,04	0,09	3,51

Table 3. Summary of frequencies of infectious reasons for rejection of PST

Infectious causes	AcVIH	AcHVC	AgHBS	AcTP	Total
Workforce (n)	518	621	1725	451	3315
Fréquencies %	3,45	4,13	11,47	3	22,26

Table 4. Representation of other socio-demographic characteristics

Variables	Numbers	Fréquencies
Marital status		
Married	578	81,99%
Single	126	17,87%
Widower	1	0,14%
Level of study		
Primary		
Secondary	290	41,19%
University	222	31,53%
None	2	0,28%
Type of donation		
Volunter	9	1,28%
Family	696	98,72%
Use of condoms		
Yes	132	18,72%
No	573	81,28%
Multiple partners		
Yes	481	68,23%
No	224	31,77%
History of STI treatment		
Yes	242	34,33%
No	463	65,67%
Affection		
Yes	60	8,51%
No	645	91,49%
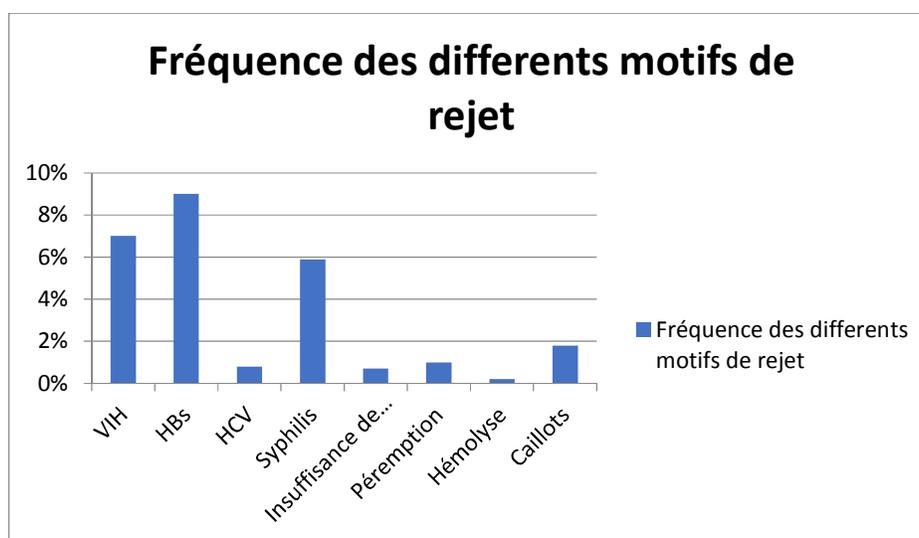
Fig. 2. Frequency distribution of all reasons for rejecting PSTs

Co-infections have also been reported in 9 bags of whole blood. There were also cases where there are infectious and non-infectious causes responsible for the same rejection of PST, especially for the association of insufficient volume of PST and ITT. The rejection of PST for non-infectious causes concerned: the clot, insufficient volume of PST, hemolysis and expiration with a respective prevalence of: 1.84%, 0.71%, 0.14% and 0.99% (Fig. 2).

There was an association between the type of donor and the risk of rejection of a blood bag taken. Indeed, family replacement donors had a higher percentage of PST rejection than voluntary donors (Table 7). Men were the main

blood donors, but there was no association between sex and the risk of rejection of PST (p = 0.99); variables such as marital status and educational level had no association with the rate of rejection of STPs. On the other hand, variables such as: No condom use seemed to have an association with the risk of rejection of PST, as well as the variable multiple partners, STI treatments and conditions (Table 7).

Table 5. Summary of serological tests for ITT screening

ITT	Workforce	Fréquencies
HIV		
P	49	6,95%
N	656	93,05%
HBs		
P	64	9,08%
N	641	90,92%
HCV		
P	5	0,71%
N	700	99,29%
Syphilis		
P	41	5,82%
N	664	94,18%

Table 6. Summary of the results of the non-infectious causes of rejection occurring on the collected PST

Causes of non-infectious rejection	Numbers	Fréquencies
Insufficient PST volume		
P	5	0,71%
N	700	99,29%
Clots		
P	13	1,84%
N	692	98,16%
Hémolysis		
P	1	0,14%
N	704	
Expiration		
P	7	0,99%
N	698	99,01%

4. DISCUSSION

Our study shows that ITTs are the main reasons for rejection at the BSHCY. We agree with Batima et al. who reported in 2007 that: in addition to malaria, ITTs such as HIV / AIDS viruses, those of hepatitis B (HBV) and C as well as syphilis are very widespread in the general population of sub-Saharan Africa [5]. In addition, Hepatitis B represents the ITT responsible for the highest rate of rejection of PST, which can be justified by the high prevalence of markers of the hepatitis B virus in Cameroon, found in approximately 10% of the population according to reports by Biwole et al. in 2015 [6]. However, the persistence of other non-infectious reasons for rejection was also observed (clots, hemolysis, expiration, insufficient volume, bacterial contamination, hyper-reactivity and polycythemia) which are signs of deterioration of a PST as designated I 'WHO in 2008 [7].

In a prospective study, the prevalence of ITT: Hepatitis B and C, HIV and syphilis were respectively: 9.08%; 0.71%; 6.95% and 5.82%. Here hepatitis B is the ITT with the highest rejection percentage. This result does not corroborate that of Eboumbou et al. who reported in 2012 among blood donors of the Laquintinie hospital in Douala a respective prevalence of 1.3%. 1.8% 3.5% and 8.1% for HCV, HIV, HBV and T. pallidum infection [8]. This difference may be due to the growth over time in the prevalence of hepatitis B infection in the general population.

Family replacement blood donors were at greater risk of having a positive serological result. This fact therefore demonstrates a significant association between the type of donor and the risk of rejection of a PST due to ITT. This result does not agree with the study by Mole et al. in 2011 who reported in the same blood bank after adjustment for the other socio-behavioral characteristics of blood donors in a logistic regression model, that there was no longer a significant difference for HIV serology between family replacement donors and volunteers [9]. For their part, Pereira et al. in agreement with our results reported in 2005 at the end of a study made on more than 2,226 blood donors in Barcelona despite the adjustment with the variables influencing the occurrence of seropositivity, that family donors had 2.5 times more risk of having a positive viral serology result [10]. Several studies done in separate geographic settings where family replacement donations are still accepted have found results similar to ours. This is the case of the study by Loua et al. in 2004 in Guinea Conakry in a context of relatively low HIV seroprevalence in the general population (2.8%) [11]. Naila et al. in 2004 reported that in Pakistan the risk of seroprevalence was higher among family replacement donors because in this category are poor people, paid secretly by the family and who hide information during the selection interview [12] Sultan et al., 2007.

Table 7. Relationship between rejection of blood bags and characteristics

Riskfactors		No rejection	Rejection	P- value
Type of donation	Bénévole	9	0	0,031
	Family	520	185	
Sex	Male	501	174	0,099
	Female	19	11	Non significative
Age group	[18-25 ans [	177	66	Variable non liée, chi2 non valide
	[26-38 ans [	267	88	
	[39 – 56 ans [	75	31	
	< ou = 58 ans	1	0	
Marital status	Single	427	151	Variable non liée, chi2 non valide
	Married	93	33	
	Widower	0	1	
Academiclevel	University	166	56	Variable non liée, Chi2 non valide
	Primary	150	40	
	Secondary	203	87	
	None	1	1	
	Use of condoms			
Risk behaviors and medical history	Yes	111	21	0,0010
	No	409	164	
	Multiple partners			
	Yes	304	177	<0,001
	No	216	8	
	STI Treatment			
	Yes	170	139	<0,001
	No	350	46	
	Affection			
	Yes	26	34	<0,001
	No	494	151	

Sex was a non-significant variable in our study and this in accordance with the study by Mole et al. in 2011 in the same blood bank [11]. This could be justified by the fact that male donors represented the majority of donors in our two studies.

In our study there was no association between the school level variable and the rejection of PST. This does not corroborate with the studies of Sharma et al. who reported in 2004, in India, a reduction in the risk of transmission of viral diseases by transfusion only by young and educated voluntary donors [13]. Young school children Indians would be healthier than young school children of Cameroon. This could explain this difference.

However, in our study the variable condom use did not seem to have a significant association with rejection of the whole blood bag; similarly, variables such as: multiple partners and history of STIs also appeared to be associated with rejection of PST. This result agrees with those of Mole et al. who reported that the variables strongly associated with the HIV test result, regardless of the type of donation, were the number of sexual partners, previous HIV testing, history or treatment of STIs, non-use of condoms and reports homosexuals in men [7]. Admittedly, our study did not take into account the variables: homosexual intercourse and previous HIV testing, but it included all ITT including HIV. In addition, all ITTs, as reported by Sarkodie et al. in 2001, have a main transmission mechanism in Africa, which occurs mainly by sexual means [14].

The causes of non-infectious rejection were: clot, insufficient volume of PST, hemolysis and expiration with a respective prevalence of 1.84%, 0.71%, 0.14% and 0.99 %. Insufficient volume was the main cause of non-infectious rejection in 2014. This corroborates with the study by Naila

et al. in 2004 who affirmed that in Pakistan among family replacement donors there are in fact poor people, paid secretly by the family and who hide information during the selection interview [15].

On the other hand, in 2015 clots were the main non-infectious reason for rejection of PST; this could be explained by the fact that these blood bags were not well mixed with the anticoagulant during the collection; indeed the WHO (2008) thus justifies this type of deterioration of the blood product [7].

5. CONCLUSION

In view of this retrospective and prospective work At the Yaoundé Central Hospital blood bank, the reasons for rejecting blood bags are divided into two categories: mainly infectious and non-infectious. Also, certain risk variables such as not using a condom, multiple sexual partners and a history of STIs are risk factors that can encourage rejection of blood bags.

CONSENT

As per international standard or university standard written patient consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

COMPETING INTERESTS

Author has declared that no competing interests exist.

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