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Study of Transfusion Incidents and Accidents at the Central Hospital of Yaounde

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Abstract: Blood transfusion is a medical act consisting of administering blood or one of its derivatives from a donor to a recipient. In order to identify the failures and complications related to blood transfusions in our country, we conducted a study on transfusion incidents and accidents with the aim of contributing to the improvement of transfusion safety in our context. To study transfusion safety at the Central Hospital of Yaounde, we conducted a longitudinal descriptive observational study over a period of four months at the Central Hospital of Yaounde (CHY). Our study population consisted of 77 patients. We excluded from our study all non-consenting patients, those for whom we did not witness the process of delivery of their labile blood products to the blood bank, those who had already taken a first blood bag before our contact, newborns in neonatology, and those whose nursing staff would have refused to witness the process of labile blood products administration. Variables studied were sociodemographic data, transfusion history, pre-transfusion procedural errors, adverse reactions during and after transfusion. Seventy-seven (77) patients with a mean age of 37.92 ± 15.99 were divided into 4 departments where women represented 64.90% and the age group most transfused was 30 to 35 years. The absence of pre-transfusion parameters, the verification of the labile blood products at reception (60.8%), and the final control at the patient's bed (58.8%) were not effective. Minor allergic reactions (46.2%), non-hemolytic febrile reactions (43.6%) and major allergic reactions (7.7%) were the main transfusion complications. Blood transfusion, a source of human solidarity, obeys certain standards which practitioners must improve over time. It is imperative to set up a system of continuous training for blood transfusion personnel, and to set up anonymous transfusion incident and accident reporting forms in each department.

Keywords: Blood Transfusion, Transfusion Incidents, Transfusion Accidents, Transfusion Safety

1. Introduction

Blood transfusion (BT) is a medical procedure in which blood or its derivatives, taken from a human being called "donor", is administered to a patient called "recipient" for therapeutic purposes [1]. Although it is an irreplaceable therapy, it is sometimes the cause of adverse reactions, some of which are due to procedural errors that can subsequently lead to therapeutic consequences.

A transfusion event can be defined as an error or problem that could have led to a transfusion reaction, but was detected before the blood product was transfused. A transfusion-related event is the consequence of an error or reaction detected after the administration of a labile or stable blood product (LBP) has begun [2]. Worldwide, the demand for blood transfusion is dynamic; where 118.5 million blood donations are collected annually, 40% are collected in high-income countries where 16% of the world's population lives

and where the most transfused patient group is the 60-year-olds, accounting for 75% of transfusions. In low-income countries, 54% of blood transfusions are given to children under 5 years of age [3].

In France, for example, each year, 3 million labile blood products (LBP) are transfused to 500 thousand recipients with about 2.5‰ adverse events (i.e., more than 7 thousand per year) of varying severity. The most frequent adverse events are anti-erythrocyte alloimmunization (36%), non-hemolytic febrile reaction (29%) and allergies (18%). They are generally benign and exceptionally cause the death of the recipient [4].

In Africa, in 2017, a study conducted by the World Health Organization (WHO) on blood donations noted that, out of 47 member states that had received the questionnaire, 46 responded to the survey. Thus, 38 countries had already developed and adopted a national blood safety policy; 33 had already developed a strategic plan for the implementation of their national blood transfusion (BT) policy, 19 had already adopted legislation on blood safety, 34 already had national guidelines on the use of blood and labile blood products (LBP). Only 13 countries had already established a hemovigilance system, of which only 3 countries reported cases of serious adverse reactions related to TS [5]. According to the WHO, hemovigilance is the weakest link in transfusion in Africa [6].

In Cameroon, since 2003, with the law n° 2003/014 of December 22, 2003 governing blood transfusion [1] and with the support of the WHO, the country only operated with the National Strategic Plan for Blood Transfusion where, each health facility had its own policy, based on the principle of family and voluntary replacement donations. It is only in 2018 with the decree of the Head of State n°2019/067 of February 12, 2019 on the organization and functioning of the National Blood Transfusion Center [7], with the main objective of making adverse transfusion reactions avoidable, that Cameroon will be equipped with a national TS algorithm. Given this new dynamic, we considered it useful to conduct a situational analysis of transfusion safety, the objective or goal of which was to contribute to the improvement of transfusion safety in Cameroon, based on the prevalence of transfusion-related incidents and accidents in a reference health facility.

2. Methodology

2.1. Nature, Place and Period of the Study

We conducted a descriptive and longitudinal observational study at the Central Hospital of Yaounde for a period of 5 months, from March 30 to August 30, 2021.

2.2. Procedure

Our sample was recruited in three phases:

2.2.1. Blood Bank

At the blood bank, we were set up in the LBP distribution room. When the patient or the patient's caretaker came to this room with their completed blood voucher, we greeted them, then explained the purpose and goal of our study to obtain their written consent. If the patient did not meet the selection criteria, we excluded them from our study. Once consent was obtained, we observed the process for the delivery of the LBP. During this process of delivering the LBP, we observed: the temperature of storage of the LBP in the refrigerator, the cross-match between the patient's blood and that of the donor bag, the labeling of the LBP, and the compliance of the product.

2.2.2. Transportation

After the delivery of the LBP, we began by filling out our data collection sheet and, as soon as the preparation for delivery was complete, the distribution staff gave the delivery file to the patient care worker to be forwarded to the care department, where a care staff member would come to transport the LBP. After the arrival of the transport personnel, we observed the tool and the conditions of the transport of the LBP to the care department.

2.2.3. In the Care Department

In the care department, we observed: the act of receiving the LBP, then we observed the process of the transfusion act itself (verification of the patient's identity, matching of the LBP, cross match at the patient's bed, the transfusion device), the monitoring of the patient with the recording of adverse transfusion reactions occurring; and after the first 15 minutes, we took the patient's parameters (temperature and blood pressure). If the patient's initial temperature was high (> 38°), the staff first took steps to lower it, including the injection of Perfalgan as an emergency measure, and for other patients, they practiced the wet wrap.

1) Taking the patient's temperature: if the temperature after the first 15 minutes after the start of the transfusion was > 38°, we considered that he had a fever, we noted the clinical sign and notified the staff;
2) Taking the patient's blood pressure and arterial pulse: if the blood pressure after the first 15 minutes after the start of the transfusion was >120/80mmhg, we considered that he has arterial hypertension; and if the pulse was > 75 beats/min, we considered that the heart rate was high, and then we noted the nature of the clinical symptom in our data sheets;
3) If there were no clinical symptoms during the first 30 minutes after the start of the administration of the LBP, we left to do something else and we came back every 2 hours before the end of the transfusion, which was estimated to last 4 hours, and then we noted the appointments for the patient's visits in our diary for one month.

After 30 minutes of monitoring the patient, after the administration of the LBP, we consulted the patient's medical and nursing records to note the date and time of the start and end of the transfusion, the rate of administration, the time of administration of the LBP, and the order of passage of all the other products infused into the patient.

For patients discharged from the hospital 8 days earlier, agreement was made for remote evaluation by telephone calls.

2.3. Variables Sought

In our data sheets, we collected sociodemographic data, data before, during and after transfusion.

1) *Sociodemographic data*: patient identification, age and sex;
2) *Pre-transfusion data*: Hospitalization service, transfusion history (previous transfusion, chronic diseases, massive transfusion), date (of request, of administration of the LBP), blood groups of the patients, indications of transfusion, types of LBP to be transfused, transfusion incidents (taking parameters before transfusion, cross match at the blood bank and at the patient's bed, condition of storage of the LBP, labeling of the LBP, confusion of the LBP, verification of the LBP at the reception), ultimate control at the patient's bed, quality of the transfused product;
3) *Data during transfusion*: time of start and end of transfusion, product administration time, product administration techniques, product matching, errors found (confusion of transfused product/expired LBP), patient's clinical symptoms during transfusion: (fatigue, fever, nausea, vomiting, urticaria, chills, pruritus, dyspnea, tachypnea, tachycardia, bradycardia, hypertension, hypotension, erythema, pain, edema, tremor, cough, pallor, dizziness, sweating, faintness);
4) *Post-transfusion data*: cessation of transfusion, patient's clinical symptoms after transfusion: (fatigue, fever, nausea, vomiting, urticaria, chills, pruritus, dyspnea, tachypnea, tachycardia, bradycardia, hypertension, hypotension, erythema, pain, edema, tremor, cough, pallor, dizziness);

Based on the clinical symptoms suggestive of the patients and on the basis of a previously established clinical picture, we subjectively defined the transfusion accidents, where the imputability was according to the indicators: certainly, possibly and probably related to blood transfusion.

2.4. Data Analysis

Les Data were collected on data sheets and then recorded and processed on IBM SPSS statistic version 21 software. The statistical study used Student's t-tests to compare quantitative variables and the Chi-square test to compare qualitative variables. The significance level was $P < 0.05$.

3. Results

3.1. Distribution of the Study Population by Care Unit

Figure 1 shows that of the 77 patients followed, the maternity unit was the one that transfused the most patients (41%) at the CHY.

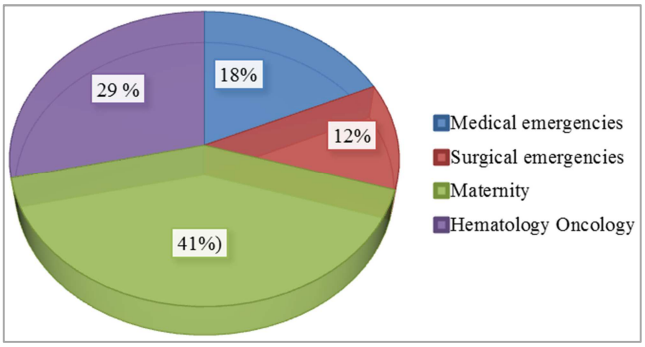

Figure 1. *Frequency of patient recruitment by unit.*

3.2. Distribution of the Population According to Socio-Demographic Data

Table 1 shows us that the mean age of our patients was 37.92 ± 15.99 years with extremes of 16 and 24 years.

Table 1. *Characteristics of the central age trends.*

	Minimum	Maximum	Average	Standard deviation
Age	16	84	37.92	15.992

The age range where the population was most transfused was 30 to 35 years as shown in figure 2.

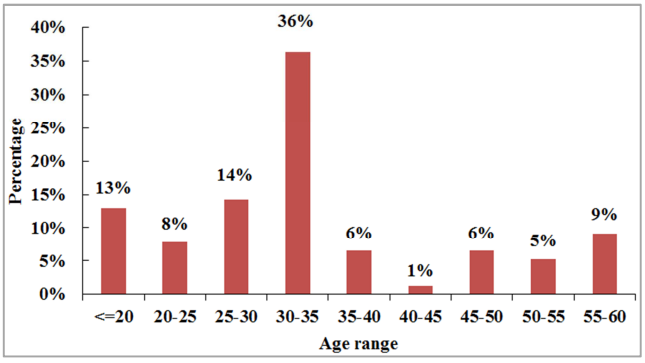

Figure 2. *Distribution of the population by age range.*

3.3. Distribution of Data According to Information Related to Transfusion Risk

Le table 2 shows that, on the whole, the failure to take parameters before transfusion, checks of the LBP on receipt (60.8%), and the final check at the patient's bed (58.8%) were not effective.

Fresh frozen plasma and platelet concentrates were not cross-matched at the blood bank or at the patient's bedside.

The duration of the follow-up of our patients was 01 month from the day of administration of the LBP. Before the start of the transfusion, we assessed the patient (questions about his or her general feeling before the transfusion), then we took his or her vital parameters (temperature, blood pressure). If the patient's initial temperature was high (> 38°), the staff first took steps to lower it, notably with the injection of Perfalgan in emergency, and for other patients, they practiced the wet wrap.

Table 3 shows the different clinical signs. We observed

that sweating (34.2%) was the most common clinical sign, fatigue and fever were observed in 25.3% of the cases; 15.2% of the patients had a faintness.

Table 2. *Registration of transfusion events by department.*

Information sought	Medical emergencies		Surgical emergencies		Maternity		Hematology oncology		Total	
	N	%	N	%	N	%	N	%	N	%
Cross match in the lab not done					4	5.1%	4	5.1%	8	10.1%
Cross match at the patient's bed not done	7	8.9%	4	5.1%	14	17.7%	7	8.9%	32	40.5%
Failure to take parameters before transfusion	12	15.2%	5	6.3%	23	29.1%	8	10.1%	48	60.8%
Quality of transfused fluid (clot)	1	1.3%	2	2.5%	3	3.8%			6	7.6%
Checking LBP on receipt not done	11	13.9%	5	6.3%	25	31.6%	7	8.9%	48	60.8%
Ultimate check at the patient's bed not done	6	7.6%	6	7.6%	25	31.6%	9	11.4%	46	58.2%
Unconfortable pocket transport	3	3.8%	4	5.1%	1	1.3%	2	2.5%	10	12.7%

Table 3. *Recording of clinical symptoms and symptoms observed during transfusion.*

Clinical Signs	Medical emergencies		Surgical emergencies		Maternity		Hematology oncology		Total	
	N	%	N	%	N	%	N	%	N	%
Fatigue	4	5.1%	4	5.1%	2	2.5%	10	12.7%	20	25.3%
Fever	5	6.3%	2	2.5%	2	2.5%	11	13.9%	20	25.3%
Urticaria	1	1.3%					1	1.3%	2	2.5%
Pruritus	1	1.3%							1	1.3%
Dyspnea	3	3.8%					2	2.5%	5	6.3%
Tachypnea	2	2.5%							2	2.5%
Tachycardia	2	2.5%			1	1.3%	2	2.5%	5	6.3%
Hypertension	1	1.3%							1	1.3%
Nausea/vomiting			1	1.3%	2	2.5%			3	3.8%
Œdema					3	3.8%			3	3.8%
Shock	1	1.3%			1	1.3%			2	2.5%
Sweating (perspiration)	6	7.6%	5	6.3%	5	6.3%	11	13.9%	27	34.2%
Faintness	3	3.8%	4	5.1%	1	1.3%	4	5.1%	12	15.2%

The responsibility for these transfusion events was subjective and depended on the symptoms observed in the patients during transfusion monitoring. We therefore had 04 types of transfusion events in our study as presented in Table 4 with high proportions in hematology oncology:

1) Minor allergic reactions or immediate hypersensitivity or type I. With a frequency of 46.2%, we defined them through the following symptoms: fever, sweat, and itching.
2) Major allergic reactions or type II hypersensitivity. With a frequency of 7.7%, we defined them in our study through the following symptoms: fever, sweat, itching, skin rash, chest tightness, faintness, fatigue and edema.
3) Non-hemolytic febrile reactions: with a frequency of 43.6%, this is a diagnosis of exclusion that must be retained after eliminating all other causes of fever [8]. In our study, we defined them with recurrent fever during the surveillance period up to 1 month after transfusion in our patients.
4) High blood pressure: We recorded one patient, a percentage of 2.6% during our study. It was defined as a blood pressure elevation >120/80 during blood transfusion in this patient.

Table 4. *Distribution of transfusion events by department.*

Transfusion accidents	Medical emergencies		Surgical emergencies		Maternity		Hematology oncology		Total	
	N	%	N	%	N	%	N	%	N	%
Minor allergic reaction	4	28%	3	33.3%	2	6.30%	9	40.90%	18	46.2%
Major allergic reaction	2	14%					1	4.50%	3	7.7%
Non-hemolytic febrile reaction	2	14%	3	33.3%	2	6.30%	10	45.50%	17	43.6%
Post-transfusion hypertension	1	7%							1	2.6%

4. Discussion

This study revisited the transfusion complications experienced by patients receiving blood transfusions in a reference facility for transfusion practices in Cameroon. To this end, we conducted a longitudinal descriptive observational study over a period of 6 months at the Central Hospital of Yaounde. It highlighted the search for errors in pre-transfusion procedures, while identifying transfusion complications in a total of 77 patients recruited in 4 departments of the hospital. The size of this sample was similar to that of Françoise Ngo Sack et *al* who, in 2018, conducted a CAP study on the evaluation of transfusion practices by medical and paramedical staff at the Central Hospital of Yaounde and whose number of participants was

79 practitioners [9], despite the difference in the source population. It was high (292 patients) in Sima Zué and Cie who, in 2015 in Côte d'Ivoire, worked on «Anti-erythrocyte alloimmunization in sickle cell patients followed in the transfusion therapy unit of the Blood Transfusion Centre of Côte d'Ivvoire» [10].

The mean age of our patients was 37.92 ± 15.99 years, with extremes of 16 and 84 years. The most transfused age group was 30 to 35 years. The most represented sex was female with 50 (64.90%) female patients. We found that: on the one hand, women were more transfused than men. This means that at this age interval, they are at the maximum threshold of reproductive age, and therefore exposed to postpartum anemia which is related to postpartum hemorrhage and associated pathologies. This observation coincides with that of N. Louati et *al*, who found that: the obstetrical environment predisposes to blood transfusion because of the frequency of hemorrhage and associated pathologies, which remain an important cause of maternal morbidity and mortality in both developed and underdeveloped countries [11] and, on the other hand, as explained by F. Lionnet et *al*, the incidence of complications related to chronic diseases (e.g., sickle cell anemia) increases the need for blood transfusion [12].

The transfusion incidents were varied. Thus, in our study, we listed the following incidents in our observation scale: the end time, the rate of administration of the PSL and the duration of administration of the LBP were absent in 98.7% of cases in the patients' transfusion records. The taking of parameters (temperature and blood pressure) before transfusion and the verification of the LBP on receipt were not effective in 60.8% of cases. Plasma and platelet concentrates were not cross-matched at the blood bank or at the treatment room, and patient monitoring was not part of the transfusion follow-up. These results mean that nurses neglect the procedures applicable to blood transfusion, confuse this care with conventional care and may also be related to the lack of capacity building of the staff and may have more or less significant impacts in the transfusion follow-up. D. Legrand et *al* had made this finding, which in 2013, showed that these errors are favored by systemic causes by poor application of procedures and that the study of incident reports of the transfusion chain shows that the risk of failure is significant [13]; and to the WHO to add: "the safety of the patient in blood transfusion depends both on the safety of blood products and the safety of the clinical process of transfusion" [14]. On the other hand, our results were opposed to those of Françoise Ngo Sack et *al*. who concluded that the level of knowledge and transfusion practices estimated at 83.3% of medical and paramedical staff at the Central Hospital of Yaounde were good [9]. The methodological discrepancy between the studies, and in particular the target population, could explain this discrepancy.

The subjectivity in the imputability of the accidents led to inferences through the adverbs of intensity: certainly, possibly and probably attributable to blood transfusion. Minor allergic reactions (46.2%), non-hemolytic febrile reactions (43.2%) and major allergic reactions (7.7%) were the main transfusion-related complications of patients in our study. This nomenclature is similar to that of E. Peynaud-Debayle in France in 2012 [4]. These accidents were mainly observed in patients with a history of transfusion (sickle cell disease, repeated transfusions, myeloproliferative syndromes) and less in those without a history of transfusion. The meta-analysis of Hirst and Williamson showed, from three identified studies, that simple transfusion decreased the risk of perioperative complications compared to an aggressive strategy (repeated transfusion, exchange transfusion) [14]; not forgetting also the Ag-Ac conflicts resulting from immunization to the various erythrocyte Ag. This was noted by Bernasinski M et *al*, when they discussed the risks incurred during a blood transfusion: «The complications of transfusion are directly related to the terrain, the genetic capital of the transfused patient, the quality of the LBP administered, but also to the lack of practice. Since viral risks have been greatly reduced, non-hemolytic febrile reactions and allergies are now the main complications of transfusion» [15].

The present study, which analyzed transfusion-related incidents and accidents in a reference facility in Cameroon, presents some weaknesses, notably the subjectivity of the attribution of transfusion-related accidents, the relatively short time of the study, and the number of health facilities surveyed (only one). Notwithstanding these limitations, this study was able to highlight the real existence of deficiencies and adverse transfusion reactions in the transfusion chain in our country. It has allowed us to call once again on the authorities and hospital practitioners of our country to the risk incurred by patients and the existing adverse transfusion reactions, in order to make them avoidable. However, there is a need to extend the study to several medical trainings and to continue it for a long period of time to better identify the pitfalls of blood transfusion where there is no such thing as zero risk.

5. Conclusion

Although transfusion safety has already made considerable progress, it is still a major challenge in our transfusion practices at the Central Hospital of Yaounde. The respect of hemovigilance standards and the application of new technologies must be updated. Among the incidents, the failure to take parameters before transfusion and the failure to check the LBP at reception were the major incidents; and the most common adverse reactions encountered during the transfusion episode were minor allergies. Hence the importance of ongoing training and clinical monitoring during transfusion events. Transfusion safety therefore remains a challenge for practitioners, and a challenge for the public authorities to implement adequate controlled guidelines for the practice of this therapy, particularly for the Ministry of Public Health through the National Blood Transfusion Center, whose main objective is to make

transfusion adverse events preventable. Thus, despite the high level of safety achieved throughout the world, particularly in terms of infectious risk and compatibility control, it is important to always ensure the improvement of transfusion safety.

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