



Original Article

Haemovigilance: the Full Count in Blood Donors at the Ziguinchor Peace Hospital

Hémovigilance: l'hémogramme chez les donneurs de sang au sein de l'hôpital de la paix de Ziguinchor

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ABSTRACT

Introduction. Hemovigilance of blood donors requires a set of provisions that contribute to the preservation of the health of donors and recipients. Among these is the pre-donation blood test. **Objectives.** To study the profile of different parameters of the haemogram in blood donors at the Ziguinchor Peace Hospital. **Patients and methods.** Prospective study over a period of three months (September to December 2019). One hundred and seventeen (117) donors: 68 loyal donors, 24 new volunteer donors and 25 new family donors. All analyses were performed with the Mindray BC-5000 automated counting machine. The Chi-square test was used for all data analyzed (significance if p threshold < 0.05). **Results.** Total number of 117 donors: 8 female and 109 male (sex ratio = 13.62) The mean age of the donors was 33.15 years (range 18-57 years). The average age of the donors was 33.15 years (extreme from 18 to 57 years). The abnormalities of the haemogram found were: hypereosinophilia: 12.8%, neutropenia: 21.4%, anaemia: 29.6%, thrombocytopenia: 12.8%, lymphopenia: 1.7%, hyperleukocytosis: 0.9%, microcytosis without anaemia: 1.7%, hypochromic (n=4) and normochromic (n=30) microcytic anaemia. There is a significant difference between anemia and gender (p=0.048) but none between anemia and status (p=0.279). **Conclusion.** The medical consultation should be completed by a pre-donation blood test at Ziguinchor.

RÉSUMÉ

Introduction. L'hémovigilance des donneurs de sang requiert un ensemble de dispositions qui concourent à la préservation de la santé des donneurs et des receveurs. Parmi celle-ci figure l'hémogramme pré don. **Objectifs.** Décrire les différents paramètres de l'hémogramme chez les donneurs de sang au sein de l'hôpital de la paix de Ziguinchor. **Patients et méthodes.** Étude transversale prospective sur une période de trois mois (septembre à décembre 2019). Cent dix-sept (117) donneurs : 68 donneurs fidèles, 24 nouveaux donneurs bénévoles et 25 nouveaux donneurs familiaux. L'ensemble des analyses a été effectué avec l'automate de numération Mindray BC-5000. **Résultats.** Nous avons étudié un total de 117 donneurs : 8 de sexe féminin et 109 de sexe masculin (sex -ratio = 13,62). L'âge moyen des donneurs était de 33,15 ans (extrême de 18 à 57ans). Les anomalies de l'hémogramme retrouvées étaient : l'hyperéosinophilie : 12,8% , la neutropénie : 21,4% , l'anémie :29,6 % , la thrombopénie :12,8 % , la lymphopénie : 1,7% l'hyperleucocytose : 0,9%, la microcytose sans anémie :1,7 % , anémie microcytaire hypochrome(n=4) et normocytaire normochrome(n=30). Il existe une différence significative entre l'anémie et le sexe (p= 0,048) mais aucune entre elle et le statut (p=0,279). **Conclusion:** La consultation médicale doit être complétée par un hémogramme pré don à Ziguinchor.

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Key words: haemogram, pre-donation, haemovigilance, blood donors, Ziguinchor.

Mots-clés : hémogramme, pré don, hémovigilance, donneurs de sang, Ziguinchor.

INTRODUCTION

Haemovigilance of blood donors is an integral part of the safety of the transfusion chain [1] and consists of regular biological monitoring of the donor and all the actions taken to ensure that the donor is healthy after the

donation over the long term [2]. The pre-donation blood test is a rapid test that is recommended prior to any whole blood donation [3] Studies of the pre-donation blood test on donors who have been medically screened for suitability have shown [4-6] a relatively high prevalence of anaemia and other abnormalities in

volunteer donors. In addition, regular donors who are not well managed may develop deficiency anemia [7-9] At the Hôpital de la Paix in Ziguinchor, blood donors who have undergone rigorous medical screening and have been declared fit to donate do not receive pre-donation blood tests. Given the importance and the stakes for the donor and the recipient, we propose to conduct a prospective study on donors.

PATIENTS AND METHODS

1. Time period, setting and study population :

We conducted a prospective study over a three-month period from September to December 2019 at the blood bank of the Ziguinchor Peace Hospital. In order not to create stigma, we did not sort donors by status during the period. All donors received during the period agreed to be included in the study, but the selection was made after a medical consultation to determine their suitability to donate. All donors were provided with an informed consent form.

2. Sampling and analysis :

The collection for the blood count was done on EDTA tube before the blood bag to avoid contamination with the anticoagulant in the blood bags. The analysis was performed on Mindray BC-5000 and smears were made and stained with May Grunnwald Giemsa (MGG) in case of abnormality. Thrombocytopenia was checked by smear and citrated tube sampling.

Principles of BC-5000 :

- Impedance method for counting RBC(red blood cell) and PLT(platelets).
- Cyanide-free reagent for hemoglobin test.

RESULTS

Donors

For a total number of 117 donors included in the study, females represented 6.8% (n=8) and males 93.2% (n=109) for a sex ratio of 13.62. The average age of the donors was 33.15 years with extremes of 18 to 57 years (SD=10.16). Older donors accounted for 58.1% (n=68) compared to 20.5% for newer volunteer donors (n=24) and 21.4% for newer family donors: (n= 25).

Biological parameters:

We detected two cases of microcytosis without anemia in two female donors.

The anemia was microcytic hypochromic in 4 donors and normocytic normochromic in 30 donors.

- Flow Cytometry (FCM) + three-angle laser dispersion + chemical dye for white blood cells.

3. Definition of reference values:

The definition of the reference values was carried out according to international standards. Since we did not have the reference values of the Senegalese and African population in general, we referred to international values.

Erythrocyte lineage:

Anemia: Male: Hb <13g/dl and female: HB <12g/dl.

Microcytosis: Mean globular volume (VgM): <80fl.

Hypochromia: Mean corpuscular Hb concentration (MCHC) < 32%.

Platelet line:

Thrombocytopenia: Platelet count (PLQ) < 150,000/mm³.

Leukocyte lineage:

Hyperleukocytosis: White blood cell count > 10000/mm³.

Lymphopenia: Lymphocyte count < 1000/mm³.

Neutropenia: Neutrophil count < 1500/mm³.

Hyper eosinophilia: Eosinophil count > 400/mm³.

4. Statistical analysis:

All data was analyzed on Epi info 2000 software. Chi-square and exact Fisher's tests were used to determine significant differences between the observed abnormalities and the sex of the donor, between the abnormalities and the status. Any value of p < 0.05 was considered significant.

Table I: Means, standard deviations, minimum and maximum values of the different parameters studied.

	AVERAGE	MIN	MAX	DEVIATION
WBC	4803.22222	2490	10200	5451.79328
RBC	4.309.658	3.050.000	5.580.000	1.788.980
HB	13.5598291	10.6	16.7	4.31335137
HT	37.5051282	28.9	45.2	11.5258405
MCV	87.3470085	67.5	101.4	23.9709199
MCH	34.308547	23.3	336.6	9.75807358
MCHC	36.1982906	30.3	39.5	6.29325035
PLQ	202.965	83.000	388.000	180.312
NEUTRO	2112.34188	810	6750	4200,21428
LYMPHO	2047.02564	148	3700	1903
MONO	359.623932	110	860	530,330086
EOSINO	178.854701	10	1160	815,294119
BASO	43,6410256	10	257	174,655375

AVERAGE: Average, MIN: minimum, MAX: maximum, DEVAITION: Standard deviation, WBC: white blood cells/mm³, RBC: red blood cells in millions/mm³, HB: haemoglobin in g/dl, HT: haematocrit in %, MCV: average blood volume in fl,

MCH: mean hemoglobin content in pg, MCHC: mean corpuscular hemoglobin concentration in %, PLQ: platelets/mm³, NEUTRO: neutrophils /mm³, LYMPHO: lymphocytes /mm³, MONO: monocytes /mm³, EOSINO: eosinophils /mm³, BASO: basophils /mm³.

Table II: Distribution of Donors by Sex and Type of Abnormality

	Anemia:	Hyperleucocytosis:	Hypereosinophilia:	lymphopenia:
SEX:				
male:	29	1	12	2
female:	5	0	3	0
Total	34	1	15	2
percentage :	29.60%	0.90%	12.80%	1.70%
p	0.04	0.93	0.06	0.86

Table III: Distribution of donors by status and type of abnormality.

Abnormalities:	Status :				
	Loyal donor:	New family:	New volunteer:	Total :	p:
Anemia:	16	9	9	34	0.27
Thrombopenia:	13	1	1	15	0.056
Hyperleucocytosis:	0	1	0	1	0.15
Neutropenia:	15	5	5	25	0.97
Hypereosinophilia:	9	2	4	15	0.65
Lymphopenia:	2	0	0	2	0.48

DISCUSSION

Since 2008, the biological monitoring of blood donors has been recommending the periodic performance of blood tests on blood donors to ensure good donor-recipient hemovigilance [10]. Our study is conducted in a context where there is a lack of data on the profile of blood count parameters in blood donors in our region where hemoglobinopathies, risk factors for anemia and other blood count abnormalities are common [11].

1. Characteristics of blood donors.

The average age of blood donors was 33.15 years for a total of 117 blood donors. This result is comparable to that of the study conducted in Cameroon in 2013 by Kourouma. K et al [3] who found an average age of 31.32 years for a total number of 127 donors.

The male sex represented 93.16 % (n= 109) against 6.84% (n= 8) for the female sex (sex ratio = 13.62). Most blood donors in Africa are male [12-14], and the percentages found in our study are different from those found in Kourouma. K et al [3] who found respectively 73.22% and 26.78% (sex ratio = 2.7). Although our sample size is small compared to several studies in Africa, it is true that blood donors are often male [5, 6, 13, 15].

In our study, we have three categories of blood donors. Older donors accounted for 58.1% (n=68) compared to 20.5% for newer volunteer donors (n=24) and 21.4% for newer family donors : (n= 25). It should be noted that recruitment was conducted over the period from September to December 2019 and that all donors who accepted were included in the study regardless of gender and status. These different categories of blood donors

(voluntary and family donors or donors in favour) are most often found in Africa, whereas blood donation must be a voluntary act [13, 16-18]. This could be explained by a lack of real policies to retain blood donors and a demand that exceeds the supply of blood products [13]. Our results are different from those obtained by Kourouma. K et al [3] who found 70% family donors and 30% volunteer donors out of a total number of 127 blood donors. We did not find a study carried out on a number of donors closer than ours for a better comparison of our results but a study carried out by Batina .A et al [19] in the Democratic Republic of Congo in 2003 revealed a participation of 69.17% of family donors and 29.7% of volunteers out of a total number of 3390 donors.

2. Red blood cell parameters.

Anaemia is a real public health problem in Africa (20). Particularly in our region, factor hemoglobinopathies promoting anemia are very frequent [11]. In our study, 29.6% of donors were anemic with a significant difference according to gender (p=0.04) and regardless of donor status (p=0.27). In the study by Kourouma K et al [3], its prevalence was 28.34% with a significant difference in favour of men as in our study. A study carried out in Morocco from 2014 to 2016 by Bakrim.S et al [22] on a total number of 15797 donors revealed a prevalence of 8.6% with a higher number of cases among female donors. The differences could be explained by the very large difference between male (n=109) and female (n=8) donors.

There was no significant difference between anemia and the donor profile in our study (p=0.27) although its prevalence was higher among our new donors (favourites

and volunteers (n=18) compared to old donors (n=16). These results are in line with the study carried out by Bakrim S et al [22] (p=0, 587) in Morocco with a higher prevalence among new donors, leading the authors to conclude that anemia is not caused by blood donation. However, a study conducted in Côte d'Ivoire in 2015 by Dembele. B et al [7] on 137 donors showed an increase in martial deficiency anaemia with the frequency of donation (p < 0, 00051).

The anemia was microcytic hypochromic in 4 donors and normocytic normochromic in 30. Donors with hypochromic microcytic anemia were female. In the Kourouma study. K et al [3] , 20 donors had hypochromic microcytic anemia. The prevalence of normochromic normocytic anemia in our donors was higher as in the study by Bakrim S et al [20]. A study conducted in India between 2007 and 2008 by Bahadur S et al [22] showed that anemia was most often normocytic normochromic in blood donors.

Two cases of microcytosis without anemia were found in our donors and we drew a MGG smear for verification. We did not investigate further because of lack of means.

3. Leukocyte parameters.

All of the abnormalities of the blood count in our study were detected after consultation of the World Health Organization (WHO) database since we were unable to obtain reference values specific to our region(21) The abnormalities found were: hypereosinophilia: 12.8% (n=15), neutropenia: 21.4% (n=25), lymphopenia: 1.7% (n=2) and hyperleukocytosis: 0.9% (n=1). All these abnormalities have also been found in studies conducted in North and sub-Saharan Africa in blood donors [22,25,26]. The most frequent abnormality was neutropenia followed by hypereosinophilia. In the study by Kourouma .K et al [3], neutropenia (PNN < 1500/mm³) had occurred in 24.41% of donors and hyperleukocytosis in 0.79%. With regard to hypereosinophilia, the study by Bakrim S et al [20] conducted a higher number of donors found a prevalence of 4.11% while ours found a prevalence of 12.8% on a much smaller number of donors. A study conducted in Mali in 2008 by Keita. I [23] found abnormalities such as neutropenia 15% and lymphopenia 6.9% in 426 voluntary donors.

The leukocyte abnormalities that occurred in our study were independent of sex (see table II) and status (see table III) since p > 0.005. We did not find any studies reporting a significant difference between sex and abnormalities or status and abnormalities.

4. Platelet parameters.

We had no cases of thrombocytosis but thrombocytopenia (platelet count < 150,000/mm³) did exist in our series with a prevalence of 12.8% (n=15).all thrombocytopenia was checked on MGG stained blood smears and citrated tube if necessary. Of the donors who developed thrombocytopenia, all were male. Thrombocytopenia had occurred in 13 old donors and 2 new donors. There were no significant differences between this thrombocytopenia and gender (p=0.321) or

status (p=0.056), and our results differed from those of Kourouma. K et al [3] and Bakrim S et al [4] who found a rate of 3.15% and 3.97% in 127 and 15797 donors respectively. We did not find any studies evaluating a significant difference between the sex or status of donors and this type of abnormality.

Overall, our study allowed us to detect blood count abnormalities in both old and new donors in our region. It opens another avenue of investigation because given the profile of anemias (normochrome and microcytic) and hypereosinophilia, we considered a study of hemoglobinopathies, exploration of the iron supply and screening for parasitosis in blood donors in our region.

In total, this study allowed us to learn that blood disorders exist in our blood donors despite careful medical screening. We recommend a systematic blood count for blood donors in our region.

Declaration of conflict of interest:

The authors declare that they have no conflict of interest in this article.

CONCLUSION

Biological monitoring of blood donors is an integral part of donor-recipient hemovigilance. Among the monitoring parameters, the pre-donation haemoglobin or haemoglobin measurement remains a recommendation applied in developed countries. Our study has shown that abnormalities exist in our blood donors that cannot be detected during the medical consultation. We recommend a biological follow-up of blood donors at our clinic for better donor-recipient safety.

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