Pilot Study Underscoring The Risk Of Transfusion Transmitted Malaria From Asymptomatic Malaria Blood Donors To Pregnant Women And Children At The Yaounde Gynaecological-Osbstetrical And Pediatric Hospital Cameroon

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Background

Although international policies recommend that blood meant for transfusion should be screened for transfusion transmitted infections (TTI), malaria screening is not performed in most malaria-endemic countries in developing countries like Cameroon. The risk of transfusion transmitted malaria remains high due to the increased demand for blood transfusion (Ebongue et al., 2017) in the Yaoundé Gynaecological And Paediatric Hospitals in malaria endemic communities with limited resources. This study was therefore carried out to determine the risk of Transfusion-transmitted malaria from asymptomatic malaria blood donors to possible transmission to pregnant women and children. We also aimed at assessing the use of rapid inexpensive Ag-RDT technique for low income countries.

Method

malaria diagnosis amongst asymptomatic malaria blood donors was done with CareStart™ Malaria *P falciparum* (HRP2) Ag RDT, which detects the *P. falciparum* Histidine Rich Protein 2 (PfHRP-2). For patients positive to the HRP-2 protein (histidine rich protein -2) the confirmation was done by doing a thick film then geimsa staining. The attending lab technician read all the slides.

Results

145 eligible blood donors were enrolled, The highest numbers of participants were in the age group 18-27 (40.67%). About 62% of our participants had given blood at least once before. The overall prevalence of asymptomatic malaria in blood donor was 20% (29/145), the age group 18-27 years had the highest frequency of testing positive. Sensitivity of RDT was 100% though ther was 12 cases of false positive.

CONCLUSION

The risk of Transfusion-transmitted malaria is particularly important in Yaoundé Gynaecological And Paediatric Hospitals as the blood donated is meant for intervention for the most susceptible population to malaria; pregnant women and children. The study demonstrates the usefulness of rapid pre-screening of blood donors with a cheap and less labour intensive diagnostic tool to avert the risk Transfusion-transmitted malaria in pregnant women and children.

We recommend that at blood banks, testing for Plasmodium falciparum by RDT be performed, especially at blood banks units that will be attending to pregnant women and children.

Keywords—asymptomatic malaria, blood donor, Transfusion-transmitted malaria, pregnant women and children

I. INTRODUCTION

Although international policies recommend that blood meant for transfusion should be screened for transfusion transmitted infections (TTI), malaria screening is not performed in most malaria-endemic countries in developing countries like Cameroon (). the risk of TTI remains high due to the increased demand for blood transfusion (Ebongue et al., 2017) with limited resources to effectively screen for viral, bacteria and protozoan blood borne pathogens amongst blood donors.

In Cameroon, focus is particularly laid on the diagnosis of viral and bacterial infections; including human immunodeficiency virus (HIV), hepatitis B virus (HBV), hepatitis C virus (HCV), and *Treponema pallidum* (*T. pallidum*)(Ebongue et al., 2017). This however makes recipients at risk of having other infections including hemoflagelates and protozoans.

Ensuring that, in endemic countries, the blood supply is free from malaria is problematic and the examination of blood films is still the frequently used method for the diagnosis of both symptomatic and asymptomatic malaria, in most situations it is not sufficiently sensitive for blood bank screening (Kitchen and Chiodini, 2006).

The most effective preventive measure for malaria is the active testing and treatment of infected individuals especially asymptomatic carriers, thus preventing onward transmission of the parasite (Kemleu et al., 2021). Testing

for the diagnosis of malaria is established by the microscopic detection of parasites on Giemsa-stained thick or thin blood smears, or using one of several antigen-based immunochromatographic methods otherwise known as rapid diagnostic tests (RDTs)(L et al., 2019). Although considered the "gold standard" for malaria diagnosis, microscopy-based methods are highly unreliable, particularly in patients with low density parasitemia (<50 parasites/ µl of blood)(Kwenti et al., 2017) and are time-consuming and labour-intensive.

This study was therefore carried out to determine the risk of Transfusion-transmitted malaria from asymptomatic malaria blood donors to possible transmission to pregnant women and children. We also aimed at assessing the use of rapid inexpensive Ag-RDT technique for low income countries.

A. MATERIALS AND METHODS

B. Ethical considerations

Prior to the start of the study, ethical clearance No. 754/CIERSH/DM/2018 was obtained from the Committe Institutionelle d'Ethique De La Recherché Pour La Santé Humaine (CIERSH). Written and verbal consent was obtained from the participants and they were assured of the anonymity and confidentiality of their information. participation was on a voluntary basis

C. Study procedure

This was a cross-sectional and prospective study from January to June 2019 at the Yaoundé Gynaecological And Paediatric Hospitals. A convinient non-probability sampling method was used to enrol study participants.

Blood donors who tested negative for routine transmissible infections were enrolled as study participants . Blood collected at the blood bank is used to serve pregnant women, with obstetrical intervention and children of the hospital

A questionnaire was administered to obtain demographics and information on the last month of blood donation. 2ml of Blood was collected in EDTA (Ethylene - Diamine - Tetra - Acetic - Acid) tubes.

P. falciparum infection was diagnosed by rapid diagnosis tests (RDTs) and confirmed with microscopic examination of thick film. CareStart™ Malaria *P falciparum* (HRP2) Ag RDT, which detects the *P. falciparum* Histidine Rich Protein 2 (PfHRP-2) was performed according to the manufacturer's instructions using whole blood. The parasitological results were interpreted as positive or negative according to kit instructions. Thick film were performed according to the local diagnostic laboratory standards by the lab technician to confirm positive results by microscopy. The procedure was a modified version from WHO standards for the diagnosis of malaria ("WHO | Basic laboratory methods in medical parasitology (archived)," n.d.). Slides were considered negative when parasites were not detected following examination of microscopy fields containing at least a total of 1000 white blood cells.

D. Statistical analysis

Microsoft® Excel was used to enter the data and checked for errors. Data was grouped, and descriptive statistics done with Epi info version 7.0.

E. Results

145 participants were enrolled, 27 (18.62%) were women while 118 (81.38%) were men. The age of the participants ranged from 18 to 57 years. The highest numbers of participants were in the age group 18-27 (40.67%). About 62% of our participants had given blood in at least once before

Table 1: demographics

Variable	Category	Frequency (%)
Age	18-27	59(40.67)
	28-37	45(31.03)
	38-47	30(20.68)
	48-57	11(7.58)
Gender	Male	118(81.38)
	Female	27(18.62)
Number of Months since last blood donation	First time donors	54 (37.24)
	3-6 months	18(12.41)
	>6	73(50.34)

Prevalence of plasmodium (RDT)

The overall prevalence of asymptomatic malaria amongst the blood donor was 20% (29/145), the age group 18-27 years and males had the highest frequency of testing positive (62.07%) and 82.76% respectively.

Variable	Category	Positive (%) N=29
Age	18-27	18 (62.07)
	28-37	6(20.69)
	38-47	4(13.79)
	48-57	1(3.45)
Gender	Male	24 (82.76)
	Female	5(17.24)

Sensitivity of RDT

Using microscopy as a gold standard, the sensitivity of RDT was 100% though, 12 cases of false positive.

		RDT	
		Positive	Negative
microscopy	Positive	17	-
	Negative	12	-
	Total	29	116

F. DISCUSSIONS

The use of blood and blood products is an indispensable aspect of therapeutic medicine and blood donation should be encouraged. However the blood given to an already vulnerable recipient should be free of any organism or product that will increase the disease burden of the patient.

Malaria is an overwhelming, unrestrained and most prevalent parasitic infection in Cameroon and other tropical/subtropical underdeveloped countries. The high prevalence of 37-47% of asymptomatic cases of malaria in the community("The DHS Program - Cameroon: Standard DHS, 2018," n.d.) Increases the risk of blood donors donating blood infected plasmodium. Our study had a malaria prevalence of 20% amongst blood donor when tested with the rapid diagnostic test. 8.1% - 30.5% asymptomatic malaria prevalence has been recorded by other studies in Cameroon amongst blood donors (Kemleu et al., 2021; Kwenti et al., 2017). This prevalence underscores the importance of testing for malaria amongst blood donors especially if the blood is meant for the most vulnerable population.

On the other hand microscopy of the positive results indicated that 17/29 blood samples tested positive for microscopy. This could be explained by the fact that the blood donor might have had a discrete infection of 1–2 parasites/ml that could not be detected by microscopy. Besides, microscopy depends on the expertise of the technician. Though we did not quantify malaria parasitemia, a mean parasitemia of 447.8 parasites/µL and range of 63–11 000 parasites/µL have been reported in blood donors in Cameroon (Kemleu et al., 2021). Nonetheless, a recipient of one unit of this blood with 1–2 parasites/ml would be at risk of receiving approximately half a million parasites (Contreras et al., 1999). Mindless of the test used for the diagnosis, the burden of Transfusion-transmitted malaria is particularly important in these patients in this hospital and similar setting as the blood collected at the blood bank is used for interventions in pregnant women and children of the hospital. This group of inndivual have an increased mobility and motality due to malaria.

The sensitivity of RDT and microscopy was 100% with 12 false positive (microscopy as gold standard). 83.9% concordance of RDT and light microscopy been reported (Kemleu et al., 2021). The availability of rapid diagnostic test for parasitological diagnosis has already produced important improvements in the detection of malaria parasites and is likely to have a major role in curbing Transfusion-transmitted malaria in malaria endemic communities. The use of the RDT kit for the diagnosis of asymptomatic malaria is not routinely performed and should be encouraged especially in our setting where there is the lack of human and material resources for other advanced techniques for the diagnoses of malaria.

The age of the participants ranged from 18 to 57 years. The highest numbers of participants were in the age group 18-27 (40.67%) and had the highest frequency of testing positive for malaria (30%). This is disturbing given that there will be an increased risk of transfusion transmitted malaria amongst the most vulnerable population.

About 62 % of our participants had given blood at least once before, while 37% were first time donor. This is quite an encouraging trend and many more sensitization should be done to increase the numbers.

G. CONCLUSION

The overall prevalence of asymptomatic malaria blood donors was 20% (29/145), the age group 18-27 years was the highest donors and had the highest frequency of testing positive (30%). The risk of Transfusion-transmitted malaria is particularly important in the Yaoundé Gynaecological And Paediatric Hospitals as the blood donated is meant for intervention for the most susceptible population to malaria, pregnant women and children. The study demonstrates the usefulness

of rapid pre-screening of blood donors with a cheap and less labour intensive diagnostic tool to avert the risk Transfusion-transmitted malaria in pregnant women and children.

We recommend that at blood banks, testing for Plasmodium falciparum by RDT be performed, especially at blood banks units that will be attending to pregnant women and children.

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