Prevalence and incidence of the risk of transfusion-transmitted malaria in the Dschang Health District, Include country name; since this is a prevalence study that could vary by place, population and time

Abstract

This study aims to determine the prevalence and distribution of transfusion-transmitted malaria in the Dschang Health District. It will contribute to improving transfusion safety, particularly regarding the transmission of malaria through blood transfusions.Blood transfusion is a vital and indispensable therapy in the management of patients within healthcare systems.Prophylactic antimalarial treatment is not always administered to recipients. Consequently, children and pregnant women are at risk of severe malaria.This was a descriptive cross-sectional study with a longitudinal component conducted on transfused blood units/donors and blood recipients in the healthcare facilities of the Dschang Health District. The cross-sectional component focused on blood units/donors and recipients, as well as transfusion procedures.Whole blood is the most commonly transfused product, administered to 95.45% of the recipients. Additionally, the majority of recipients (86.36%) do not use insecticide-treated nets (ITNs). The recruitment services show a predominance of the medicine service (38.64%), followed by intensive care (18.18%) and traumatology (15.91%). This distribution highlights a high prevalence of transfusions among women, young and middle-aged adults, with common blood types and a predominant indication for severe anemia.

Keywords: insecticide-treated nets, Blood transfusion, hepatitis viruses, pediatric infections

1. Introduction

Blood transfusion is a vital and indispensable therapy in the management of patients within healthcare systems [1-3]. It is a very common procedure. In fact, approximately 118.5 million

Comment [b1]: Our study, titled "Prevalence and Incidence of Transfusion-Transmitted Malaria Risk in the Dschang Health District

Comment [b2]: Generally, needs substantial improvement. Clearly indicate important sections of an abstract (introduction/background, objective, method, result & conclusion). Where is the major outcome variable indicated in the title (i.e. malaria in the method & result section). Not in line with the title and the general objective of the study.

Formatted: Highlight

Comment [b3]: Inconsistency of word use among title, abstract, objective, and conclusion sections. Better to make them consistent by revising in all pertinent sections.

Comment [b4]: Better to put this in introduction/background section.

Comment [b5]: Not in line with the title and the general objective of the study.

Comment [b6]: Better to include the major outcome variable here. Example : Malaria, Transfusion transmissible infections. Plasmodium, Dschang, Cameroon,

Formatted: Highlight

units of blood are collected worldwide each year, with 40% coming from high-income countries, which account for 16% of the global population. Of these blood units, around 1.6 million are discarded due to the presence of infectious agents[4]. In Africa, blood transfusion is most often used to treat complications related to pregnancy and severe childhood anemia (symptoms of various pediatric infections)[3, 5]. It saves lives and improves health but can also be a pathway for the transmission of dangerous pathogens such as the Human Immunodeficiency Virus (HIV), hepatitis viruses, and *Treponema pallidum*[3, 5],but also the transmission of malaria from a donor infected with *Plasmodium* to a healthy recipient[4, 6]. These pathogens pose a threat to the safety and availability of the blood supply, highlighting the importance of an effective hemovigilance system[5].

Malaria is a parasitic disease caused by *Plasmodium*, primarily transmitted to humans through the bite of an *Anopheles* mosquito[7, 8].The most common species of *Plasmodium* are *Plasmodium vivax, P. ovale, P. knowlesi, P. malariae,* and *P. falciparum*[9].Malaria is one of the most significant infectious diseases in Africa in general and in Cameroon in particular, in terms of mortality and morbidity[10, 11].It kills nearly 600,000 people worldwide each year [12], Children and pregnant women are the most vulnerable [12, 13].In Cameroon, where malaria is endemic, blood donors are not systematically screened for malaria, although it is recommended by the WHO[14]. Prophylactic antimalarial treatment is not always administered to recipients. Consequently, children and pregnant women are at risk of severe malaria[15].Few studies have been conducted to measure the actual significance of transfusion-transmitted malaria in Cameroon and in the Dschang Health District, where it remains neglected[16].

This study aims to determine the prevalence and distribution of transfusion-transmitted malaria in the Dschang Health District. It will contribute to improving transfusion safety, particularly regarding the transmission of malaria through blood transfusions.

2. Objectives

- **General Objective:** To determine the prevalence and incidence of the risk of transfusion-transmitted malaria in the healthcare facilities of the Dschang Health District during the study period.
- **Specific Objectives:**

(i) To determine the distribution of procedures for preventing transfusion-transmitted malaria in the healthcare facilities of the Dschang Health District;

Comment [b7]: Clearly indicate the full version before using the shortened (abbrevated form) of the parasite scientific name.

Comment [b8]: Better to show the status of tranfusion-transmitted malaria from globale to SSA, Cameroon and Dschang district to show the context and severity of the problem by including data from previous studies.

Comment [b9]: Make it SMART and aligned to the title.

Comment [b10]: When was the study period ?

(ii) To determine the prevalence of asymptomatic Plasmodium carriage in transfused blood units in the Dschang Health District during the study period;

(iii) To determine the incidence of malaria among blood recipients in the Dschang Health District.

3. Method

Comment [b11]: Study period, sample size for recipients, laboratory tests (RDT, microscopy & PCR) were not described.

3.1 Study design

This was a descriptive cross-sectional study with a longitudinal component conducted on transfused blood units/donors and blood recipients in the healthcare facilities of the Dschang Health District. The cross-sectional component focused on blood units/donors and recipients, as well as transfusion procedures. The longitudinal component involved tracking recipients for 14 days after blood transfusion to determine if they developed malaria. Data collection was carried out using two face-to-face questionnaires administered to donors and recipients, respectively, and a checklist to evaluate transfusion procedures. Rapid diagnostic tests (RDTs) and thick blood smears were performed, and the results were recorded in the questionnaire.

3.2 Sampling

Type: The sampling method used was exhaustive.

Plan: We systematically selected all individuals who met the inclusion criteria and provided informed consent. All 09 healthcare facilities that performed blood transfusions in the Dschang Health District were included.

3.3 Sample Size Calculation

Comment [b12]: If this sample size calculation was for blood donors, how did you determine the sample size for recipients ?

Taille : la formule de Lorentz :

Comment [b13]: What is this ?

$$n = \frac{\left(z_{\frac{\alpha}{2}}\right)^2 \times p(q)}{d^2}$$

Where n is the required sample size, Zα/2 is 1.96 for a 95% confidence interval, p is the proportion of malaria infection, q = 1 - p, and d is the margin of error (5%). The prevalence p of transfusion-transmitted malaria reported by a study conducted in Benin is 15.78% [15].

$NA: n = \frac{(1.96)^2 \times 0.1578(1-0.1578)}{0.05^2}$ = 205 donors/blood units.

Formatted: Highlight

3.3 Study Population

- **Target:**All healthcare facilities that perform blood transfusions in Dschang Health District, whether they have a blood bank or not, were our target. The facilities

included in our study were: Dschang Regional Annex Hospital, St. Vincent de Paul Hospital in Batsingla, Ad Lucem Hospital in Foto, Notre Dame de la Santé Health Center, the CMA of Baleveng, Fongo Tongo, Ndoh Djuittitsa, St. Constant Health Center, and Fiangep Clinic.

- **Source:** Blood donors and recipients in the Dschang Health District.
- **Sample:** Transfused blood units and blood recipients during the data collection period.
- **Inclusion Criteria:**
  - **Healthcare Facilities (FOSA):** Any healthcare facility in the Dschang Health District authorized to perform blood transfusions;
  - **Donors:** All consenting blood donors/blood units who met the blood bank's selection criteria;
  - **Recipients:** Consenting blood recipients who had a negative rapid diagnostic test (RDT) before transfusion and had not received a transfusion two weeks prior to enrollment in the study.
- **Exclusion Criteria:**Donors and recipients with incomplete or inconsistent information.

3.3 Materials and Procedures for Data Collection

Sociodemographic and clinical information from donors and recipients was collected using a questionnaire administered face-to-face by the principal investigator. The questionnaire was designed using KoboCollect and pre-tested in the Dschang Health District a few days before data collection began. A results sheet was used to record the results of tests performed on donors and recipients.

Donors with a positive rapid diagnostic test (RDT) for Plasmodium falciparum/pan (Bioline brand) were subsequently tested using a blood smear and a quantitative polymerase chain reaction (PCR) to determine the species and parasitic load, respectively.

Recipients were tested for Plasmodium with an RDT for Plasmodium falciparum/pan (Bioline brand) just before their blood transfusion and were then followed for 14 days after the transfusion. A new RDT was performed on donors 14 days later. Samples with a positive RDT were tested using a blood smear and PCR to determine the parasitic load and species, respectively. Codes were used to trace the origin of the blood received by each recipient.

3.4 Donor Selection Procedure

Comment [b14]: Whta is this acronym stands for ?

Comment [b15]: When exactly was the study conducted ?

Comment [b16]: Why did you conduct the pre-test in the study area itself? It is advisable to conduct it in area out of the study area, but with relatively comparable area.

Comment [b17]: Make the scientific name of the parasite italic.

Formatted: Highlight

Comment [b18]: Is there any reason for alternatively using microscopy and PCR to detect and qualtify the parasitemia ? Or is it just typos ?

Formatted: Highlight

Comment [b19]: Italic, and you can use the short version for genus name after indicating it earlier.

Comment [b20]: Donors or recipients ?

Formatted: Highlight

Comment [b21]: How did you control the malaria due to mosquitoe-bite during the 14 days follow-up period ? If no any measure was taken, how do you confidently conclude that the infection found after transfusion is just due to transfusion of *Plasmodium* infected blood ? Besides, considering the issue of recurrence (relapse, re-infection & recrudescence) and the limitation of the diagnostic tool you used (RDT sensitivity & species range owing to its brand that you did not mention)to screen the recipients, is it possible to generalize as transufusion-transmitted malaria ?

In accordance with blood transfusion procedures, all donors were tested for blood type (ABO system), Rh factor, and viral infections transmissible by transfusion using ELISA kits and molecular NAT (Nucleic Acid Testing) as per the manufacturer's recommendations. Once the results of these tests were available, a questionnaire was administered to the donor if they were accepted for donation. This questionnaire allowed us to collect information on the serological profile, blood type, Rh factor, and sociodemographic data.

Comment [b22]: Is this a standard donor selection used by the health facilities or a criteria for donor selection for inclusion into this study ? I think it is better to focus your writing particularly to your study .

3.5 Estimation of Parasitic Density

Transfused blood, whether from a donor or the blood bank, was obtained and tested for malaria using a blood smear (GE), from which the parasitic load was determined. The prepared slides were read twice independently by two qualified and experienced personnel to verify consistency. Any discrepancies in the results were resolved by a third microscopist. Parasitic densities were estimated by counting the number of asexual parasites per 200 white blood cells and converting this to parasites/µL, assuming a total white blood cell count of 8,000/µL of blood.

Comment [b23]: What is this abbreviation stands for ?

3.6 Data Processing

Data were collected using KoboCollect and then analyzed with Statistical Package for the Social Sciences (SPSS, Version 20.0). Excel was used to model our tables and charts. Descriptive statistics, percentages, frequencies, tables, and charts were used to describe the qualitative data collected from donors and recipients. Quantitative data were expressed as means and confidence intervals, with a significance level set at 5%.

4 Results

4.1 Sociodemographic Characteristics of Participants

a. Donors

Table 1: Sociodemographic Characteristics of Donors

Comment [b24]: Caption for table and figure should be self-explanatory by briefly putting answers for, but to limited to, **what ? where ? who ? when ?**

Variables	Number of DonationsN (%)		Total N = 252 (%)	P value
	1st donation	2nd donationand more		
Age (years)				
[17-27[	23 (9.13)	90 (35.71)	113 (44.84)	0,17
[27-37[	15 (5.95)	74 (29.36)	89 (35.32)	
[37-47[	1 (0.40)	42 (16.67)	43 (17.07)	
≥ 47	0 (0)	7 (2.78)	7 (2.78)	
Sex				
Male	24 (9.52)	163 (64.68)	187 (74.21)	**0,042**

Female	15 (5.95)	50 (19.84)	65 (25.79)	
Type of donor				
Family	29 (11.51)	156 (61.90)	185 (73.41)	0,94
Voluntary	8 (3.17)	43 (17.06)	51 (20.24)	
Paid	2 (0.79)	14 (5.55)	16 (6.35)	
Blood Type and Rh Factor				
O+	24 (9.52)	132 (52.38)	156 (61.90)	0,90
A+	9 (3.57)	53 (21.03)	62 (24.60)	
B+	3 (1.19)	18 (7.14)	21(8.33)	
O-	3 (1.19)	9 (3.57)	12 (4.76)	
A-	0 (0)	1 (0.4)	1 (0.4)	
Level of Education				
University	24 (9.52)	109 (43.25)	133 (52.78)	0,33
Secondary	11 (4.36)	87 (34.52)	98 (38.89)	
Primary	4 (1.59)	17 (6.74)	21 (8.33)	
Residence Area				
Urban	24 (9.52)	104 (41.27)	128 (50.79)	0,09
Rural	15 (5.95)	109 (43.25)	124 (49.21)	
Use of Insecticide-Treated Nets (ITNs)				
Never	23(9.13)	140 (55.55)	163 (64.68)	0,68
Sometimes	11 (4.36)	47 (18.65)	58 (23.01)	
Always	5 (1.98)	26 (10.32)	31 (12.30)	

Table 1 provides a description of the sociodemographic characteristics of the donors. Notably: Among the 252 donors, the most represented age group was [17-27[years, with 113 (44.84%) donors, followed by the [27-37[years group with 89 donors. Donors' ages ranged from 17 to 54 years, with a mean age of 30 years ± 8 years.Men significantly outnumber women, with 187 (74.21%) male donors compared to 65 (25.79%) female donors.Education levels show that most donors have a university education, 133 (52.78%), followed by those with secondary education, 98 (38.89%).

The majority of donations came from family donors, with 185 (73.41%) participants, while voluntary and paid donors were much fewer.In terms of blood groups, group O+ was the most common, with 156 (61.90%) donors, followed by group A+ with 62 (24.60%) donors.

Donors were almost evenly distributed between rural (124) and urban areas (128, 50.79%), and a majority of donors never use insecticide-treated nets (ITNs), with 163 (64.68%) reporting never using them.

A p-value of 0.042 indicates a significant difference between sexes, with men being more likely to make multiple donations. Other sociodemographic characteristics (age, donor type, blood group, education level, residence area, and ITN use) do not show a statistically significant link with donation frequency. Thus, sex appears to be the only factor influencing donation frequency in this study.

Comment [b25]: This paragraph should be presented before the table it described.

b. Recipients

Table 2: Sociodemographic Characteristics of Recipients

Comment [b26]: Make it self-explanatory.

Variables	Modalités	Frequency (N = 44)	Percentage (%)
Sex	Female	31	70.45
	Male	13	29.55
Age Groups (years)	[0-15[	4	9.09
• Min-Max : 0.5 – 83	[15-30[	12	27.27
• Mean : 38.56	[30-45[	12	27.27
• Standard deviation : 22.46	[45-65[	8	18.18
	> 65	8	18.18
Blood Type	0+	21	47.73
	A+	13	29.55
	B+	8	18.18
	0-	1	2.27
	AB+	1	2.27
Indication for Transfusion	Severe Anemia	32	72.73
	Moderate Anemia	9	20.45
	Postoperative Anemia	2	4.55
	Decompensated Anemia	1	2.27
Type of Transfused Product	Whole Blood	42	95.45
	Red Blood Cells (RBC)	1	2.27
	Plasma	1	2.27
Use of Insecticide-Treated Nets (ITNs)	No	38	86.36
	Yes	6	13.64
Recruitment Service	Medicine	17	38.64
	Intensive Care	8	18.18
	Traumatology	7	15.91
	Postpartum	3	6.82
	Surgery	3	6.82
	Neonatology	2	4.54
	Gynecology	1	2.27
	Maternity	1	2.27
	Pediatrics	1	2.27
	Emergency	1	2.27

Table 2 presents the sociodemographic characteristics of the recipients. Among the 44 recipients, the majority are women (70.45%). The recipients span a wide age range, with a mean age of 38.56 years and a standard deviation of 22.46 years. The most represented age groups are 15 to 30 years and 30 to 45 years, each comprising 27.3% of the recipients.

Regarding blood type, group O+ is the most common, accounting for nearly half of the recipients (47.73%), followed by group A+ (29.55%). In terms of transfusion indications, the vast majority of recipients (72.73%) were transfused for severe anemia, while 20.45% were transfused for moderate anemia.

Whole blood is the most commonly transfused product, administered to 95.45% of the recipients. Additionally, the majority of recipients (86.36%) do not use insecticide-treated nets (ITNs). The recruitment services show a predominance of the medicine service (38.64%), followed by intensive care (18.18%) and traumatology (15.91%). This distribution highlights a high prevalence of transfusions among women, young and middle-aged adults, with common blood types and a predominant indication for severe anemia.

4.2 Distribution of Procedures for Preventing Transfusion-Transmitted Malaria in the Dschang Health District

Table 3: Distribution of Procedures for Preventing Transfusion-Transmitted Malaria in the Dschang Health District

Healthcare Facility (FOSA)N = 9	Category	Total Transfusions	TDR of Donor Performed	Prevention Procedure	
				Exclusion of Blood from Infected Donors	Prophylactic Malaria Treatment
I	3rd Category	22	0 (0%)	0 (0%)	3 (6,8%)
II	4th Category	13	13 (29,54%)	13 (29,54%)	0 (0%)
III	4th Category	5	0%	0%	1 (2,3%)
IV	4th Category	1	0%	0%	0 (0%)
V	5th Category	2	0%	0%	0 (0%)
VI	6th Category	1	0%	0%	0 (0%)
Total		44	**13 (29,54%)**	**13 (29,54%)**	**4 (9,1%)**

The table shows significant variation in the practices for preventing transfusion-transmitted malaria within the healthcare facilities (FOSA) of the Dschang Health District. Preventive measures were implemented in 17 cases out of 44, across 3 out of 6 FOSA, representing a preventive coverage of 38.64%. Only one FOSA performed donor testing (29.54%), where infected donor blood was systematically excluded. In contrast, prophylactic treatment was applied in only 9.09% of cases, across 2 FOSA (I and III). This disparity and the low coverage of preventive measures highlight an urgent need to standardize and strengthen practices across all FOSA to enhance transfusion safety and reduce the risk of malaria transmission.

Comment [b27]: You are supposed to present just the result without any interpretation or implication. Interpretation and implication are expected to appear in the discussion and conclusion section.

4.3 Prevalence of Asymptomatic Plasmodium Carriage among Donors in the Dschang Health District

Comment [b28]: How did you determine the status (symptomatic Vs asymptomatic). I did not see any sentences describing the measurement of temprature or assessing history of fever or any other work to estblish the asmptomatic or symptomatic status ?

Table 4: Prevalence of Asymptomatic Plasmodium Carriage among Donors in the Dschang Health District

Species Count (N = 252)	Effective	Specific Percentage* (%)	Prevalence (%) (N = 252)
Positive RDT (14 cases)			
Plasmodium falciparum	10	71,43	3,97
*Plasmodium falciparum*and other	3	21,43	1.19
Other	1	7,14	0,40
Positive blood smear (12 cases)			
Plasmodium falciparum	9	75	3.57
*Plasmodium falciparum*and *Plasmodium ovale*	2	16,67	0.79
*Plasmodium falciparum*and*Plasmodium vivax*	1	8,33	0.40

**Specific percentage: percentage of each parasitic species in the total number of positives.*

- Parasitic load

Table 5: Description of the parasitic load in donors

Parasitic load	Min – Max (Parasites/µl of blood)	Mean ± Standard deviation
	150 - 600	349,23 ± 134,56

Comment [b29]: Position of the comma ?

Table 4 presents the prevalences of donors with a positive malaria test based on the results of RDTs and confirmation by blood smear.

The prevalence of asymptomatic *Plasmodium* carriage was 5.56% (RDT) and 4.76% (blood smear). Among the 252 donors, 14 cases were identified as positive by RDT, indicating an asymptomatic *Plasmodium* carriage prevalence of 5.56%. Of the 14 *Plasmodium* cases detected by RDT, 10 were *Plasmodium falciparum* (71.43%); *Plasmodium falciparum*

associated with another species was found in 21.43% of cases, and 7.14% had another species revealed by the blood smear.

Blood smears confirmed 12 cases, with *Plasmodium falciparum* alone representing 75% of the cases, followed by 16.67% with a *Plasmodium falciparum* and *Plasmodium ovale* association, and 8.33% with a *Plasmodium falciparum* and *Plasmodium vivax* association.

These results show a predominance of *Plasmodium falciparum* in the detected infections.

4.4 Incidence of Malaria in Recipients

Among the 44 recipients, 6 had received Plasmodium-infected blood, and 4 tested positives for malaria 14 days after transfusion, with an average parasitic load of 275 parasites/µl of blood. The incidence of malaria in blood recipients was 9.09% (4/44). All these cases came from the 6 recipients who had initially received infected blood. The incidence of malaria in recipients who initially received infected blood was 66.67% (4/6). The incidence of malaria in recipients who did not initially receive infected blood was 0% (0/38). The species involved in the four cases was Plasmodium falciparum.

		Incidence of malaria after 14 days		
		Malaria Positive	Malaria Negative	Total
Blood received	Malaria positive	4	2	6
	Malaria negative	0	38	38
	Total	4	40	44

- Incidence of malaria among recipients of malaria positive blood pints = 4/6 (66.67%)
- Incidence of malaria among recipients of malaria negative blood pints = 0/38 (0.00%); P-value <0.001
- Relative Risk of malaria among recipients of malaria positive blood pints = 66.67/0 = infinity
- Attributable risk of malaria among recipients of malaria positive blood pints =66.67 – 0 = 66.67%.

Comment [b30]: What statistical test was used to determine relative risk ?

Formatted: Highlight

Formatted: Highlight

5 Discussion

This study aimed to determine the prevalence of asymptomatic Plasmodium carriage in transfused blood units and the incidence of malaria occurrence in recipients at health facilities

in the Dschang Health District during the study period. It covered 252 blood bags and 44 recipients. Donors' ages ranged from 17 to 54 years, with an average of 30 years +/- 8 years, predominantly male (74.21%) and with a university education (52.78%). The dominant blood group was O+ (61.90%). The average age of recipients was 38.56 years +/- 22.46, with a predominance of females (70.45%). Very few recipients frequently used MILDA (13.64%). Regarding malaria transfusion risk prevention measures, two were used: prophylactic treatment of recipients (9.1%) and donor TDR followed by the exclusion of Plasmodium-infected blood (29.54%). Therefore, prevention of transfusion-transmitted malaria risk was effective in only 38.64% of cases (17/44) and in 3 out of 6 health facilities. This is inconsistent with the findings of the study by Owusu-Ofori et *al.*, 2016 in Ghana, which reported no prevention (0%) [17].This could be explained by the increase in studies on the subject and the exploration of prevention methods over the years. Holtzclaw et *al.*, 2016 in the United States found a 100% prevention rate, particularly through screening of donor blood[18].

This difference is likely due to the fact that prevention methods in the United States are more regulated compared to Cameroon, due to the non-endemicity of malaria in that region and the seriousness that a single case of malaria could entail.Out of a total of 252 transfused units, 4.76% were infected, specifically by *Plasmodium falciparum* (3.57%), a combination of *Plasmodium falciparum* and *Plasmodium vivax*; *Plasmodium falciparum* and *Plasmodium ovale* at 0.40% and 0.79% respectively, with an average parasitic load of 349.23±134.56 parasites/µl of blood. A review of publications from the sub-region (West, Central, and East Africa) published by Owusu-Ofori et *al.*, 2016 reports a higher average prevalence of 10.2% from a sample of 33,029 donors [19]. This prevalence is also different from that observed by Anani et *al.*, 2014 in Benin, who found a prevalence among donors of 13.47% during a study conducted during the rainy season[15] ;different from that found by Aminata et *al.*, 2019 in Niger, which shows a prevalence of 11.6%[1].Kristin et *al.*, 2020 found a prevalence of 15.4% in Uganda for their study conducted during the rainy season over a period of 5 months[20]. Noubouossie et *al.*, 2012 in Cameroon observed a prevalence of 18.1% of gametocytes among 493 donors from October to November in Yaoundé during the rainy season[21]. The low prevalence we observed compared to these studies could be explained by the fact that our collection was conducted during a season of very low rainfall, unlike most of the aforementioned studies conducted during the rainy season, which is a period of high malaria transmission. Additionally, a study by Koanga et *al.*, 2016 in Douala, Cameroon,

found an asymptomatic carriage prevalence of 27.4% among blood donors in their study on "the risk of malaria transmission among blood donors in Douala"[22]. The observed difference between this prevalence and ours could be explained by the different study locations in the two cases, with Douala being a high-transmission area compared to the Dschang Health District where we conducted our study. Seblewongel et *al*., 2020 in Ethiopia found an asymptomatic Plasmodium carriage prevalence of 5.6% among blood donors in their study conducted during the dry season[23]. A study conducted in Saudi Arabia by Atayar et *al*., 2022 during a high transmission season shows a lower prevalence of 4%. This could be explained by the fact that Saudi Arabia is a low-transmission area for malaria compared to Cameroon[24]. In all these studies, the most prevalent parasitic species was Plasmodium falciparum.Home follow-up of recipients 14 days after transfusion revealed that 9.09% of recipients tested positive for malaria using the RDT, thick smear, and blood smear, with an average parasitic load of 275 parasites/µl of blood. Among the 44 recipients, 6 had received Plasmodium-infected blood, and 4 tested positive for malaria 14 days after transfusion. The appearance of clinical signs 14 days after receiving infected blood, positive test results, and the satisfaction achieved following antimalarial treatment strongly suggest post-transfusion clinical malaria. This incidence is relatively low compared to the 15.78% found by Anani et *al*., 2014 in Benin[15]. This could be explained by the different collection periods in the two studies, or by the larger sample size of recipients or the longer home follow-up time compared to this study. It is close to the 9.7% incidence found by Lieby et *al*., 2019 in Bamako, Mali, for their study on the "frequency of transfusion-transmitted malaria," conducted on 250 blood recipients during a high malaria transmission season[25].

Comment [b31]: What is the possible explanation for the two recipients found negative after reportedly received a positive blood unit ? Spontaneous clearance or prophylaxis or diagnostic limitation (due to RDT inherent problem) or what ? since you used PCR ?

Comment [b32]: What does this mean in this context ?

6 Conclusion

Our study, titled "Prevalence and Incidence of Transfusion-Transmitted Malaria Risk in the Dschang Health District, from February to May 2023," revealed that:

- Malaria prevention is not yet optimal in the Dschang Health District. Preventive measures were effective in only 38.64% of cases.
- The asymptomatic carriage of Plasmodium among blood donors in the Dschang Health District was 4.76%, a prevalence that could be higher during the heavy rainfall season. This poses a risk to blood recipients, who are already weakened by an underlying illness.
- Incidence of malaria among recipients of malaria positive blood pints = 4/6 (66.67%)

- Incidence of malaria among recipients of malaria negative blood pints = 0/38 (0.00%); P-value <0.001
- Relative Risk of malaria among recipients of malaria positive blood pints = 66.67/0 = infinity
- Attributable risk of malaria among recipients of malaria positive blood pints =66.67–0 = 66.67%.

Comment [b33]: Better to write conclusion in sentences that indicates the implication, but not overtly using numbers. It is better to include recommendation based on you particular finding in this section.

REFERENCES

1. Iro, A., et al., *Transfusional Malaria and Associated Factors at the National Blood Transfusion Center of Niamey-Niger*. J Trop Med, 2019. **2019**: p. 7290852.
2. Organization, W.H., *Screening Donated Blood for TransfusionTransmissible Infections*. 2009.
3. Okalla Ebongue, C., et al., *Residual risk of transfusion-transmitted malaria infection in a malaria endemic sub-Saharan African setting*. Translational Medicine Communications, 2017. **2**(1): p. 4.
4. Alharazi, T., et al., *Prevalence of Transfusion-Transmitted Infections (HCV, HIV, Syphilis and Malaria) in Blood Donors: A Large-Scale Cross-Sectional Study*. Pathogens, 2022. **11**(7).
5. Organization, W.H., *Global status report on blood safety and availability 2016. Geneva: World*

Health Organization; 2017. Licence: CC BY-NC-SA 3.0 IGO. 2016.
6. Mangano, V.D., et al., *Risk of transfusion-transmitted malaria: evaluation of commercial ELISA kits for the detection of anti-Plasmodium antibodies in candidate blood donors.* Malar J, 2019. **18**(1): p. 17.
7. Gimenez, A.M., et al., *Diagnostic Methods for Non-Falciparum Malaria*. Front Cell Infect Microbiol, 2021. **11**: p. 681063.
8. Brilhante-da-Silva, N., et al., *Innovations in Plasmodium spp. diagnosis on diverse detection platforms*. 3 Biotech, 2021. **11**(12): p. 505.
9. Abdullah, S. and K. Karunamoorthi, *Malaria and blood transfusion: major issues of blood safety in malaria-endemic countries and strategies for mitigating the risk of Plasmodium parasites*. Parasitol Res, 2016. **115**(1): p. 35-47.
10. Antwi-Baffour, S., et al., *The Incidence of Malaria Parasites in Screened Donor Blood for Transfusion*. Malar Res Treat, 2019. **2019**: p. 1457406.
11. Candolfi, E., *Le paludisme transfusionnel, les mesures de prévention.* Transfusion Clinique et Biologique, 2005. **12**(2): p. 107-113.
12. Organization, W.H., *World malaria report 2021. Geneva: World Health Organization; 2021. Licence: CC BY-NC-SA 3.0 IGO*. 2021, Geneva: World Health Organization; 2021
13. Adusei, K.A. and A. Owusu-Ofori, *Prevalence of Plasmodium parasitaemia in blood donors and a survey of the knowledge, attitude and practices of transfusion malaria among health workers in a hospital in Kumasi, Ghana*. PLoS One, 2018. **13**(11): p. e0206303.
14. Kouriba, B., et al., *P. falciparum malaria prevalence among blood donors in Bamako, Mali.* Transfus Clin Biol, 2017. **24**(2): p. 62-67.
15. Anani, L.Y., et al., *[Reality and importance of transfusion-transmitted malaria in a stable endemic context: Cotonou case in Benin]*. Transfus Clin Biol, 2014. **21**(1): p. 23-30.
16. Rattanapan, Y., et al., *Association between Rhesus Blood Groups and Malaria Infection: A Systematic Review and Meta-Analysis.* Trop Med Infect Dis, 2023. **8**(4).
17. Owusu-Ofori, A., D. Gadzo, and I. Bates, *Transfusion-transmitted malaria: donor prevalence of parasitaemia and a survey of healthcare workers knowledge and practices in a district hospital in Ghana.* Malar J, 2016. **15**: p. 234.
18. Holtzclaw, A., et al., *Transfusion-transmitted malaria not preventable by current blood donor screening guidelines: a case report.* Transfusion, 2016. **56**(9): p. 2221-4.

Comment [b34]: Needs revision. Example use of et al. After a single author without mentioning at least six authors, referencing the name of organizations as author, exaple World Health Organization

Formatted: English (United States), Do not check spelling or grammar, Highlight

Formatted: English (United States), Do not check spelling or grammar, Highlight

Formatted: English (United States), Do not check spelling or grammar, Highlight

19. Owusu-Ofori, A.K., C. Parry, and I. Bates, *Transfusion-Transmitted Malaria in Countries Where Malaria Is Endemic: A Review of the Literature from Sub-Saharan Africa*. Clinical Infectious Diseases, 2010. **51**(10): p. 1192-1198.
20. Murphy, K.J., et al., *Malaria parasitemia among blood donors in Uganda*. Transfusion, 2020. **60**(5): p. 955-964.
21. Noubouossie D, T.C., Same-Ekobo A, Mbanya D. Asymptomatic carriage of malaria parasites in blood donors. Transfus Med 2012;22:63–7.
22. Mogtomo, M.K., et al., *High risk of transfusion-transmitted malaria (TTM) from student blood donors living in the town of Douala, Cameroon*. J Clin Infect Dis Pract, 2016. **1**(108): p. 2.
23. Tsehay, S., et al., *Blood transfusion-transmissible malaria and its cost analysis in Hawassa regional blood bank, Southern Ethiopia*. SAGE Open Med, 2020. **8**: p. 2050312120936930.
24. Altayar, M.A., et al., *Prevalence and Association of Transfusion Transmitted Infections with ABO and Rh Blood Groups among Blood Donors in the Western Region of Saudi Arabia: A 7-Year Retrospective Analysis*. Medicina (Kaunas), 2022. **58**(7).
25. Leiby, D.A., et al., *International survey on the impact of parasitic infections: frequency of transmission and current mitigation strategies*. Vox Sang, 2019. **114**(1): p. 17-27.