



Original Article

## Prevalence of Haemoparasites among Blood Donors in Calabar, Nigeria

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### ABSTRACT

**Background and objectives:** Voluntary blood donation is the main source of blood and its components globally. Blood transfusion is essential for management of various diseases but remains as one of the most important causes of disease transmission. In this study, we screened donated blood samples for haemoparasites in the University of Calabar Teaching Hospital, Nigeria.

**Methods:** This cross-sectional study was performed on 200 blood samples taken from donors who had been asymptomatic for haemoparasite infections. The blood samples were analyzed microscopically for the presence of malaria parasites using Giemsa stained thin smears and thick smears. The Knott concentration technique was used to detect microfilaria. To evaluate presence of trypanosomes, triple centrifugation was carried out and the resulting sediment was used to prepare wet and smears stained with 10% Giemsa solution.

**Results:** The prevalence of malaria parasites, microfilaria, and trypanosome was 38% (76/200), 5% (10/200), and nil (0/200), respectively. The prevalence of malaria infection was highest among females, individuals aged 18–25 years and those with O+ blood type. Most donors had malaria parasite density of 200–4000/μl. Microfilaria was only found in males and more common among subjects between 26 and 33 years of age as well as those with O+ blood type.

**Conclusion:** The findings revealed the presence of malaria and microfilaria infections and the absence of trypanosomes among blood donors in Calabar, Nigeria. This accentuates the need to screen all blood donors for haemoparasites in order to reduce the spread of the parasites and minimize its effects on the recipients.

**Keywords** [Blood donors](#), Nigeria, [Malaria](#), [Microfilariae](#), [Trypanosoma](#).

## INTRODUCTION

As the main source of blood and its components, blood donation is essential for management of several diseases, particularly in individuals with massive blood loss caused by accidents, hemorrhage or surgery (1,2). However, blood recipients are at high risk of haemoparasites transmission and are deprived of safe blood components from the blood bank (3-6). This is because many of the prospective donors with infectious haemoparasites are asymptomatic, while symptomatic individuals may still harbor the haemoparasites but feel healthy either after antimicrobial treatment or after the disease had run its course (3). Haemoparasites are blood-borne parasites including species of *Apicomplexa*, haemoflagellates, and microfilaria (8,9). Numerous studies around the globe have reported the transmission of haemoparasites during blood transfusion (5,10,11), which could result in life-threatening diseases including trypanosomiasis, filariasis, malaria, babesiosis, and leishmaniasis (4,8).

Although transfusion-transmissible haemoparasite infections have been widely studied in Nigeria, little attention has been given to the transmission of haemoparasitic infections. Therefore, the present study was performed to screen donated blood for haemoparasites in the University of Calabar Teaching Hospital, Nigeria.

## MATERIALS AND METHODS

This cross-sectional study was performed on 200 blood samples taken from apparently healthy blood donors who visited the Hematology and Blood Unit of the University of Calabar Teaching Hospital (UCTH) in Calabar, Nigeria. The study included non-clotted blood samples from donors with

hemoglobin level of  $\geq 12.5$ g/dl. The samples were free from human immunodeficiency virus infection, hepatitis, and syphilis. The ABO and rhesus blood groups were determined. Ethical approval was obtained from the UCTH Research Ethics Committee. A written consent was also taken from all participants. Sociodemographic characteristics of the subjects were recorded using a questionnaire.

Three ml of venous blood were collected into tubes containing ethylene diamine tetraacetic acid and transferred to the laboratory for analysis. Thin and thick blood smears were prepared and stained with 10% Giemsa. The thin blood smear was fixed with absolute methanol. The smears were examined with a microscope under X40 and X100 magnifications. Parasite count was determined by counting the number of parasites per 200 leucocytes/ $\mu$ l assuming mean leucocyte count of 8000 per  $\mu$ l as the standard (12-14).

$$\text{Number of parasites}/\mu\text{l} = \frac{\text{Number of parasites counted} \times 8000 \text{ leucocytes}/\mu\text{l}}{200 \text{ leucocytes}}$$

The presence of microfilaria was examined microscopically as wet and stained preparations using the Knott's method as described by Arora & Arora (15).

The blood samples were screened for trypanosomes using the triple centrifugation technique at speeds of 100g, 250g and 700g for 10 minutes. The resulting sediment was examined both as wet preparation and smear stained with 10% Giemsa and then examined with a microscope under X10 and X40 magnifications (16).

The collected data were grouped based on the categorical variables.

Table 1- Prevalence of haemoparasites among donors according to age

Age (years)	Number of subjects	No. (%) infected with Mp	No. (%) infected with Mf	No. (%) Infected with Tp
18-25	42	22 (52.4)	2 (4.8)	0 (0.0)
26-33	70	36 (51.4)	6 (8.6)	0 (0.0)
34-41	58	14 (24.1)	2 (3.4)	0 (0.0)
42-49	30	4 (13.3)	0 (0.0)	0 (0.0)
Total	200	76 (38.0)	10 (5.0)	0 (0.0)

Mp = Malaria parasite; Mf = Microfilaria; Tp = Trypanosome

## RESULTS

The prevalence of malaria parasites, microfilaria, and trypanosomes among 200 blood samples was 38% (76/200), 5% (10/200), and nil, respectively. The prevalence

of malaria parasites was highest (52.4%) among blood samples taken from donors between the age of 18 and 25 years and lowest (13.3%) among those taken from subjects aged

26–33 years. Moreover, microfilaria were most frequent (8.6%) among samples taken from subjects aged 26–33 years but not detected in samples taken from subjects aged 42–49 years (Table 1). Based on the results,

50% of samples taken from females and 37.2% of samples taken from males were infected with malaria parasites. Moreover, microfilaria were only detected in samples taken from males (Table 2).

Table 2- Prevalence of haemoparasites among donors according to gender

Age group	Number of subjects	No.(%) infected with Mp	No.(%) infected with Mf	No.(%) infected with Tp
Male	188	70 (37.2)	10 (5.3)	0 (0.0)
Female	12	6 (50.0)	0 (0.0)	0 (0.0)
Total	200	76 (38.0)	10 (5.0)	0 (0.0)

Mp = Malaria parasite; Mf = Microfilaria; Tp = Trypanosome

The frequency of malaria parasites was highest (46.7%) in individuals with blood type AB+ and lowest (20%) in those with blood type O-. In addition, malaria parasites were not detected in samples from donors with blood types A- and AB-. Microfilaria were only detected in samples from individuals with O+ blood type (Table 3).

Of the 38% (76/200) malaria infected donors, 13.2% (10/76) had a malaria parasite density of  $\leq 200/\mu\text{l}$  blood (+), 78.9% (60/76) had malaria parasite density of 201–40000/ $\mu\text{l}$  blood (++), and 7.9% (6/76) had malaria parasite density of less than 40000/ $\mu\text{l}$  blood (+++) (Figure 1).

Table 3- Prevalence of haemoparasites among donors by according to blood group

Blood group	Number of subjects	No.(%) infected with Mp	No.(%) infected with Mf	No.(%) infected with Tp
O+	132	53 (40.2)	10 (7.6)	0 (0)
O-	10	2 (20.0)	0 (0)	0 (0)
A+	4	1 (25.0)	0 (0)	0 (0)
A-	0	0 (0.0)	0 (0)	0 (0)
B+	18	4 (36.4)	0 (0)	0 (0)
B-	6	2 (33.3)	0 (0)	0 (0)
AB+	30	14 (46.7)	0 (0)	0 (0)
AB-	0	0 (0)	0 (0)	0 (0)
Total	200	76 (38.0)	10 (5.0)	0 (0)

Mp = Malaria parasite; Mf = Microfilaria; Tp = Trypanosome

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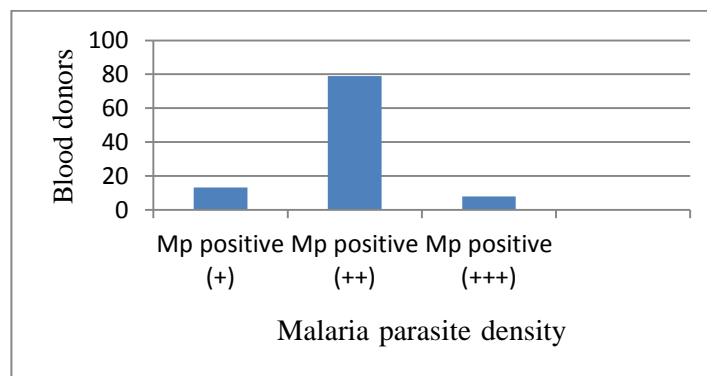


Figure 1- Distribution of malaria parasite density among donors. Mp positive (+) represents  $\leq 200/\mu\text{l}$ ; Mp positive (++) represents 201–4000/ $\mu\text{l}$ ; Mp positive (+++) represents  $>4000/\mu\text{l}$

## DISCUSSION

In order to ensure biosafety in blood transfusion, it is imperative to investigate the presence of haemoparasites in apparently healthy donors since they can be asymptomatic carriers of haemoparasites (16). The prevalence of malaria parasites was 38% among blood donors. This rate is different from the rates reported by studies in Mwanza, Tanzania (5.3%) (17), and Ghana (3%) (18). Studies in other parts of Nigeria including Lagos (19), Kwara (20), and Kaduna (21) reported prevalence rates of 57.5%, 27.3%, and 29.4%, respectively. The prevalence of microfilaria among blood donors was 5%, which is higher than the rates reported in other parts of Nigeria including Ekiti State (2.5%) (22), Osun State (1.01%) (23), Oyo State (1%) (24), and Plateau State (1%) (25). In our study, no sample was positive for trypanosoma. The low prevalence of trypanosome infection has been reported in a study on North-Central Nigeria (26). The difference in the prevalence of haemoparasites among blood donors could be due to the impact of geographical variations on the transmission of the haemoparasites.

Malaria parasites with a density of 201–4000/ $\mu$ l were the most commonly found haemoparasites among blood donors. This may be due to the fact that malaria is endemic in Nigeria. The rate of malaria infection was higher among samples collected from donors aged 18–25 years. Contrary to this finding, Ekwunife et al. reported that the highest rate of infection was among donors aged 25–29 years (27). Malaria parasites were also more common in females, which is in line with findings of Kalu et al. (28) and Otajevwo (29). However, Esan et al. (30) and Ukpai & Ajoku (31) reported that malaria parasites were more prevalent among males.

The prevalence of malaria parasites was highest (46.7%) in A+ blood samples. Studies on the relationship of ABO blood types and malaria susceptibility have reported contradictory results (29,32–34).

The prevalence of microfilaria was highest (8.6%) among samples taken from subjects aged 26–33 years. Similarly, Ojo-Bola et al. demonstrated that the rate of microfilaria infection in blood donors was highest among individuals over the age of 20 years (35). In our study, only males were infected with microfilaria, which is in line with results of two previous studies (24,36). However, Ojo-

Bola et al. reported that microfilaria infection was more prevalent among females (35). Microfilaria were only detected in subjects with blood type O+. This is in line with results of Ojo-bola et al. (35) but different from results of Alli et al. (24).

## CONCLUSION

Our findings revealed the presence of malaria and microfilaria infections among blood donors in Calabar, Nigeria. The most prevalent haemoparasites were malaria parasites, followed by microfilaria. We did not detect trypanosoma infection in the blood samples. The results also indicate that incidence of haemoparasitemia is not associated with age, gender, and blood type. Overall, the findings accentuate the need to screen all blood donors for haemoparasites in order to reduce the spread of parasites and minimize its effects on the recipients.

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## DECLARATIONS

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### *Ethics approvals and consent to participate*

Ethical approval was obtained from the UCTH Research Ethics Committee. A written consent was also taken from all participants.

### *Conflict of interest*

The authors declare that there is no conflict of interest regarding publication of this article.

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