

Parasitaemia among patients and blood donors in Ijebu-north, Southwest Nigeria

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Abstract

There is a persistent risk of passive transmission of a number of haemoparasites through blood transfusion in tropical Africa. Parasitaemia was studied among patients and blood donors in Ijebu-Igbo, and Ago-Iwoye, Ijebu-North, Southwest Nigeria. A total of 485 patients studied retrospectively (for the period between July 2006 and July 2007), and 237 other patients (between August 2007 and January 2008) were examined using Giemsa - stained thin blood films, while 100 apparently healthy self-selected blood donors (between February and April 2008) were examined using thin and thick blood films stained with Field stain and buffered Giemsa stain, respectively. 82.9% of the patients studied retrospectively and 89.9% of the other group of patients examined had *Plasmodium* parasitaemia, but the infection was neither gender-dependent nor age-dependent in both groups. 45.0% of the blood donors had *Plasmodium* parasitaemia which was statistically higher in males (51.3 %) than in females (20.0 %) ($P < 0.001$) and statistically highest in 20-30 years age group ($P < 0.001$). 14% and 1% of the blood donors had *Trypanosoma* and microfilariae of *Wuchereria bancrofti*, respectively. A total of 230 out of the patients examined between August 2007 and January 2008 were interviewed. 68.7% (158) of them had mosquito bites in the previous one month and were *Plasmodium* parasitaemia positive. 86.9% (172 / 198) of those that used mosquito nets and/or insecticides were *Plasmodium* parasitaemia positive, which was statistically higher than 13.1% (26 / 198) who were negative ($P < 0.001$). The findings of this study underscore the need for the formulation, effective implementation and monitoring of policies that will ensure safe blood transfusion in the study area.

INTRODUCTION

Plasmodium infection has long been identified as a main public health problem in the tropical and subtropical countries^[1]. Despite the World Health Organisation led roll back malaria initiative, the parasitic disease has consistently exerted its greatest toll on humans, particularly in children who suffer severe morbidity which often end fatally^[2]. Apart from the normal means of transmission of malaria parasite through female *Anopheles* mosquitoes, there remains a persistent risk of passive transmission through blood transfusion in tropical Africa^[3].

In view of the above, there have several studies on epidemiology, immunology and treatment of malaria in endemic regions^[4-6]. Many of such studies have demonstrated that the prevalence of *Plasmodium* infection is generally high in many parts of Nigeria^[7,8]. However, there seems to be no information in literature on the current prevalence of the infection, particularly among blood donors in Ijebu North area of Ogun State, Nigeria.

In addition, human bloodstream is a convenient habitat for many other pathogenic endoparasites^[9] which eventually influence the quality of human blood and general well-being of humans. Although some blood-dwelling filarial parasites have been reported earlier from Ijebu-North area of Ogun State^[10], blood donors were not included and *Trypanosoma* infections were not recorded.

This paper reports the prevalence of *Plasmodium* among patients, and *Plasmodium*, *Trypanosoma* and microfilariae among blood donors in some communities of Ijebu-North, Ogun State, Nigeria. It is hoped that the findings of this study will enhance formulation of meaningful health policies towards

transfusion of safe blood and the general well-being of the inhabitants of Ijebu-North, Ogun State.

MATERIALS AND METHODS

Study area

The study was conducted in Ijebu-Igbo and Ago-Iwoye in Ijebu-North area of Ogun State, in the rain forest belt of southwest Nigeria. Ijebu-Igbo is the headquarter town of Ijebu-North Local Government area of Ogun State. Ago-Iwoye is about 8km from Ijebu-Igbo and is the main seat of the Olabisi Onabanjo University. The populations of the two towns are composed of Yorubas (mainly Ijebus), relatively few Ibos and Hausas. The adult inhabitants engage in occupations such as farming, trading and civil service. Many are artisans while some others are university students.

Blood samples collection and questionnaires administration

The Health Centre of the Olabisi Onabanjo University (O.O.U.), Ago-Iwoye, was chosen for retrospective *Plasmodium* parasitaemia study covering July 2006 to July 2007 and examination of patients for *Plasmodium* parasitaemia from August 2007 to January 2008. The retrospective study included 485 (200 males, 285 females) patients, while the latter aspect of this study included 237 (89 males, 148 females) patients. The age range of the patients in the two categories examined for *Plasmodium* parasitaemia was 15 to 52 years. A total of 230 patients out of those examined between August 2007 and January 2008 had a structured questionnaire administered on them individually to obtain information including use of mosquito nets and insecticides, and when last bitten by mosquitoes.

The only government-owned hospital and two private hospitals in Ijebu-Igbo, and the Health Centre of the Olabisi Onabanjo University, were chosen for blood parasites study in blood donors, which occurred between February and April 2008. Blood samples were collected from 100 (80 males, 20 females) apparently healthy self-selected blood donors between 20 and 60 years of age.

All blood samples were collected by venipuncture using sterile needles and syringes and kept in labeled EDTA anticoagulant bottles, although some few blood donors were screened for malaria parasites using blood samples collected by finger-pricking.

Preparation and examination of blood films

For patients examined for *Plasmodium* parasitaemia thick blood films were made. Each blood film was air-dried, stained with Giemsa stain for about 10 minutes, after which it was rinsed in clean water, and air-dried at room temperature. For each blood

donor, a thick blood film and a thin blood film were made separately of two grease-free glass slides. Each thin film was dried using flame, dipped into Field's stain A for two minutes, rinsed briefly in clean water, dipped into Field's stain B for two minutes, and then rinsed again in water. The thick blood films were fixed for three to five minutes in methyl alcohol and then dried. The fixed thick films were stained using buffered Giemsa stain for 15 minutes. Excess stain was washed off with tap water or distilled water. Each stained thin and thick film was air-dried at room temperature. All thick and thin slides were examined microscopically using oil-immersion objective lens. Estimation of intensity of parasitaemia was not done.

RESULTS

The retrospective study revealed 82.9 % (402 / 485) prevalence of *Plasmodium* parasitaemia in the study area. The prevalence is related to gender and age-group in Table 1. There were no significant differences in the prevalence of *Plasmodium*

Table 1: *Plasmodium* parasitaemia among patients between July 2006 and July 2007 in Ijebu-North, Southwest Nigeria

Age groups (years)	Males		Females		Total	
	No.examined	No. (%) positive	No.examined	No. (%) positive	No.examined	No. (%) positive
15-20	5	5 (100)	10	9 (90.0)	15	14 (93.3)
21-25	26	22 (91.7)	58	48 (82.8)	84	70 (83.3)
26-30	27	21 (77.8)	24	18 (75.0)	51	39 (76.5)
31+	142	121 (85.2)	193	158 (81.9)	335	279 (83.3)
Total	200	169 (84.5)	285	233 (81.8)	485	402 (82.9)

Table 2: *Plasmodium* parasitaemia among patients between August 2007 and January 2008 in Ijebu-North, Southwest Nigeria.

Age groups (years)	Males		Females		Total	
	No.examined	No. (%) positive	No.examined	No. (%) positive	No.examined	No. (%) positive
15-20	2	2 (100)	8	8 (100)	10	10 (100)
21-25	16	15 (93.8)	52	45 (86.5)	68	60 (88.2)
26-30	15	15 (100)	27	24 (88.9)	42	39 (92.9)
31+	56	51 (91.1)	61	53 (86.9)	117	104 (88.9)
Total	89	83 (93.3)	148	130 (87.8)	237	213 (89.9)

Table 3: *Plasmodium* and *Trypanosoma* parasitaemia in relation to age groups of blood donors in Ijebu-North, Southwest Nigeria.

Age groups (years)	No. examined	No. (%) positive	
		<i>Plasmodium</i>	<i>Trypanosoma</i>
20-30	30	18 (60.0)	3 (10.0)
31-40	56	25 (44.6)	10 (17.9)
41+	14	2 (14.3)	1 (7.1)
Total	100	45 (45.0)	14 (14.0)

parasitaemia between the genders ($\chi^2 = 0.04$, $df = 1$, $P > 0.05$), and among the age-groups ($\chi^2 = 1.709$, $df = 3$, $P > 0.05$). Out of the 237 patients examined between August 2007 and January 2008, 213 (89.9 %) were positive for *Plasmodium* parasitaemia, and the prevalence in relation to gender and age-group is shown in Table 2. No statistically significant differences in prevalence were found between the genders ($\chi^2 = 1.17$, $df = 1$, $P > 0.05$), and among the age-groups ($\chi^2 = 0.95$, $df = 3$, $P > 0.05$).

Out of the 100 blood donors examined 45.0 % had *Plasmodium* parasitaemia which was statistically lower than the recorded prevalence in examined patients (89.9%) ($\chi^2 = 14.94$, $df = 1$, $P < 0.001$). Among blood donors, the recorded prevalence of *Plasmodium* in males (51.3 %) was statistically higher than that in females (20.0 %) ($\chi^2 = 13.74$, $df = 1$, $P < 0.001$). A total 14% prevalence of *Trypanosoma* was recorded among blood donors. The prevalences of *Plasmodium* and *Trypanosoma* parasitaemia in relation to age groups of blood donors are summarized in Table 3. *Plasmodium* prevalence was statistically highest in 20-30 years age group ($\chi^2 = 27.28$, $df = 2$, $P < 0.001$), while that of *Trypanosoma* was not age related ($\chi^2 = 5.36$, $df = 2$, $P > 0.05$). *P. falciparum* had the statistically highest prevalence of occurrence (40/45, 88.9%), followed by *P. ovale* (4/45, 8.9%), and *P. malariae* (1/45, 2.2%) ($\chi^2 = 129.76$, $df = 2$, $P < 0.001$). Three (21.4 %) of the *Trypanosoma* infection cases occurred concurrently with *Plasmodium* in male donors, while one (7.1 %) of the cases occurred concurrently with *Plasmodium* and the only microfilarial infection recorded in a female blood donor in 31-40 years age group. The microfilariae were identified to be those of *Wuchereria bancrofti*.

The administered questionnaires showed that 68.7% (158 / 230) of the patients examined between August 2007 and January 2008 had mosquito bites in the previous one month and were *Plasmodium* parasitaemia positive. 86.1% (198 / 230) of the interviewees used mosquito nets (on door and/or window) and / or insecticides to control mosquitoes in their rooms or apartments. 86.9% (172 / 198) of those that used mosquito control measures were *Plasmodium* parasitaemia positive, which was statistically higher than 13.1% (26 / 198) who were negative ($\chi^2 = 54.46$, $df = 1$, $P < 0.001$).

DISCUSSION

The occurrence of high prevalence of *Plasmodium* infection in the study area was the first of its kind, but expected because the rain-forest area of tropical Africa has long been recognized as endemic for malaria^[1]. The recorded prevalence agrees with those

from some other parts of Nigeria^[8]. The similar prevalence recorded in the two study groups examined for *Plasmodium* only is a true reflection of the fact that they were from the same malariogenic environment. However, the relative lower *Plasmodium* prevalence in blood donors in this study may not be indicative of absence of *Plasmodium* infection in some donors since studies have shown that sometimes parasitaemia may be low and thereby undetected in the peripheral blood^[6, 11]. Nevertheless, the malaria parasitaemia in this study was higher than those reported from some parts of Nigeria^[3, 12].

In this study, the *Plasmodium* parasitaemia was neither gender-dependent nor age-dependent among the two groups of patients examined. The reverse seems to be the case among blood donors with males having higher prevalence than females in agreement with some previous reports. Similarly, age group 20-30 years had the highest prevalence among the blood donors. The reason for this discrepancy is unknown to the authors of this paper. It is noteworthy that the presence of *Plasmodium* parasitaemia and the relatively high prevalence of *P. falciparum* among the blood donors are worrisome in view of the severe complications often associated with the species particularly among children^[2, 4]. This suggests the need for caution and proper screening of blood before transfusion in the study area.

The presence of *Trypanosoma* parasitaemia in blood donors in this study is the first from Ijebu-North, Nigeria. *Trypanosoma* parasitaemia had been previously-reported from some other parts of Nigeria^[12]. The presence of *Trypanosoma* in the study area suggests the presence of *Glossina* species in suburbs of the two towns included in this study and some villages visited by some of the examined blood donors. More importantly, since *Trypanosoma* is one of the parasitic infections transmissible via blood^[13], its occurrence in some blood donors in Ijebu-North, southwest Nigeria further strengthens the call for adequate screening and carefulness before blood transfusion in the study area.

This study reveals, for the first time, the occurrence of *W. bancrofti* infection in Ijebu-North, though it had been reported earlier from some other parts of Nigeria^[13-15]. The first author has observed few cases of lymphoedema of the legs and one case of hydrocele in the study area, which are strong indicators of wuchereriosis^[16].

Most of the interviewees in this study are undergraduates and staff of O.O.U., and the use of mosquito nets and insecticides by many of them shows that they were, at least, enlightened on the

evils associated with mosquito bites. However, the high prevalence of *Plasmodium* parasitaemia among such people poses serious public health concern because it suggests inadequacy of the use of mosquito nets and insecticides to prevent malaria transmission. It is common knowledge that the immediate vicinity of many in the sub-Sahara Africa is ignorantly rendered conducive for mosquito breeding^[9,17]. Therefore, mosquitoes still trickle in and out of many residential buildings, in addition to the fact that they are further exposed to mosquito bites in their offices, classrooms, eating houses (canteens), cyber café and commercial vehicles.

In view of the findings of this study, there is urgent need for the formulation, effective implementation and monitoring of policies that will ensure adequate screening of blood prior to transfusion to recipients in the study area. Furthermore, mosquitoes control in the study area should be wholesome and an integral part of health education and parasitic diseases control.

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