

## The prevalence of malaria parasitaemia in blood donors in a Nigerian teaching hospital

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*Background & objectives:* The present study was undertaken to assess the prevalence of malaria parasitaemia among blood donors and to determine the possible risk of transmission of malaria parasite to recipients of blood in Nnamdi Azikiwe University Teaching Hospital, Nnewi, Anambra State.

*Methods:* Four hundred and forty-four subjects were selected randomly and EDTA added blood was collected for screening malaria parasites using Giemsa stain. The data were subjected to  $\chi^2$  analysis.

*Results:* Prevalence of malaria was 30.2% among blood donors and showed bimodal distribution with significant variation in different months.

*Interpretation & conclusion:* Due to high prevalence of asymptomatic malaria parasitaemia in this region, all blood samples should be screened for malaria parasites (post-donor screening) and administered with a curative dose of antimalarials prophylactically to all patients transfused with malaria parasite positive blood.

**Key words** Blood donors – malaria parasitaemia – Nigeria – post-donor screening

Malaria is the most widespread and most important single disease entity of the tropics with its morbidity and mortality at unacceptably high levels in the region<sup>1</sup>. It is estimated that the population at risk is about 2.6 billion with 100 million clinical cases<sup>2</sup> and about one million fatalities per year<sup>3</sup>. Most of the malaria cases in the world (about 90%) occur in Africa<sup>4</sup>. This has serious implications as it leads to loss of man-hours and decrease in national productivity.

Malaria in endemic regions exerts its effects mostly on people with low immune status like pregnant mothers, children, foreigners<sup>5</sup> and now, possibly HIV/AIDS patients<sup>6,7</sup>. In the case of sickle cell disease, it is thought to help in maintaining the sickle cell gene in the population<sup>8</sup>.

Transfusion therapy is a form of treatment based on the use of blood and its products of humans. Although this therapy helps to save human lives, blood can nonetheless be a dreadful vehicle for the transmission of some infectious and parasitic diseases; among them is a malaria fever, caused by plasmodium species.

Malaria is endemic in tropical Africa and there has been some debate among transfusion practitioners in the region as to whether donor blood for transfusion to indigenous people should be screened for malaria. The consensus so far has not been to do so<sup>9</sup>. This situation poses a particular risk to vulnerable blood recipients, which include visitors to the region, little children who have not acquired partial immunity, preg-

nant women who are not on routine malaria prophylaxis, probably HIV/AIDS patients<sup>6,7</sup>, and other people with low immune status. Incidentally, a large proportion of blood recipients in the region fall among the malaria vulnerable groups mentioned above. The present study was carried out to assess the prevalence of malaria parasitaemia among blood donors and therefore determine the possible risk of transmission of malaria parasite to recipients of blood.

### Material & Methods

The study was carried out in Nnamdi Azikiwe University Teaching Hospital (NAUTH), Nnewi, Anambra state in southeast Nigeria. A cross-sectional study was carried out among blood donors presenting at the hospital's blood bank. Using systematic random sampling, 444 subjects were selected out of a total of 3,456 blood donors who reported at the NAUTH blood bank between January 2000 and December 2002 (representing a sampling interval of eight).

Venous blood containing ethylenediamine tetra acetic acid (EDTA) routinely collected for haematological analysis was used. Thick blood films were made by spreading a fixed volume of blood over a fixed area resulting in a thickness of 0.05 mm before drying<sup>10</sup>.

The films were stained in a 5% solution of Giemsa stain for 20–30 min, and examined with a standard light microscope. The films were examined at 1000× magnification and scored as negative if no parasite was seen after examining 200 microscopic fields<sup>11</sup>. An experienced technician did the examination.

Data on the age, sex and packed cell volume (PCV) of each donor were documented. The data were analysed statistically and monthly variations were subjected to chi-square analysis for significance.

### Results

The mean age of the donors was  $32.50 \pm 8.75$  (Table 1). Most of the donors 82.2% (365) were males,

**Table 1. Age distribution of the blood donors**

Age (yrs)	Frequency	Percentage
15–19	34	7.7
20–24	32	7.2
25–29	141	31.7
30–34	75	16.9
35–39	79	17.8
40–44	46	10.4
45–49	17	3.8
50–54	16	3.6
55–59	3	0.7
60–64	1	0.2
Total	444	100

Mean age =  $32.50 \pm 8.75$ .

**Table 2. PCV distribution among blood donors**

PCV	Frequency	Percentage
< 0.30	1	0.2
0.30–0.35	37	8.3
0.36–0.40	226	50.9
0.41–0.45	152	34.2
0.46–0.50	26	5.9
0.51–0.55	2	0.5
Total	444	100

Mean PCV =  $0.394 \pm 0.0375$ .

while 17.8% (79) were females. The mean PCV of the subjects was  $0.394 \pm 0.0375$  (Table 2).

The parasite species found were *Plasmodium falciparum* (76.6%) and *P. malariae* (23.4%). The prevalence of malaria parasites in the study population showed a bi-modal distribution with two peaks at the onset and late parts of the rainy season (Fig. 1). The rainy season (from April–October) had an average prevalence of 55%, while the dry season (November–March) had an average prevalence of 26.92%.

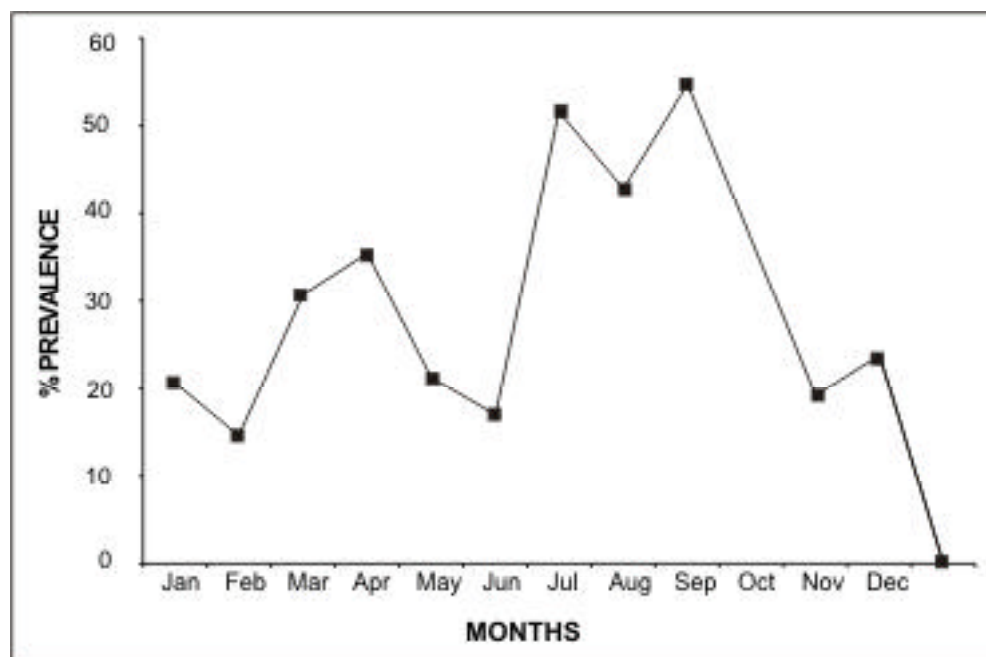


Fig. 1: Monthly distribution of malaria parasitaemia among blood donors

Expectedly, the prevalence of the parasite showed a significant variation with the months ( $\chi^2 = 34.47386$ ,  $df = 11$ ,  $p < 0.05$ ) and seasons—rainy and dry ( $\chi^2 = 10.01$ ,  $df = 1$ ,  $p < 0.05$ ) of the year.

The prevalence shows a sudden rise with the onset of the rains in March and April. As the rains become heavier and more frequent, the flood water probably flush out the vectors in their breeding sites leading to drop in the parasite rate in the population. At the later part of the rainy season in July to September, when the rains become less frequent and with less volume of run off water, and possibly with less disruption of the breeding of the mosquito vectors, a steep rise in parasite rate occurs, before falling steeply thereafter as the dry season sets in.

### Discussion

The high rate of positivity for malaria parasites in blood donors in this study is quite worrisome. This is a reflection of the high rate of asymptomatic malaria parasitaemia in endemic malaria regions. Similar findings have been obtained by other authors in the Afri-

can region in the general population<sup>12</sup>. The implication of this with regard to blood transfusion is enormous. One in three blood transfusions carries the risk of transmitting malaria parasites to the recipients. The majority of the blood recipients — pregnant mothers and children are actually people who are highly vulnerable to malaria<sup>5</sup>. Immigrants from outside malarious regions run a real risk of contracting malaria from blood transfusion<sup>13</sup>.

Majority of blood donors (66.4%) fall within the age range of 25–39 years, and are mostly males (82.2%). This is because of the high rate of commercial donors in the study population<sup>9</sup>. The reason for the low number of females is that females are culturally inhibited as far as commercial blood donation is concerned. Majority of donors (85.1%) had PCVs between 36 and 45%, the lower value is in line with what is generally recommended as lowest PCV values at which patients should be bled<sup>14</sup>.

The prevalence of malaria parasitaemia among blood donors at different times of the year shows two peaks. The lower peak during the month of March (at the on-

set of the rainy season) and the higher during the months from July to September (towards the end of the rainy season). These seasonal peaks are similar to the peaks of mosquito biting density found by other workers in Pakistan and to other authors reporting seasonal peaks of malaria in other regions<sup>11</sup>.

Since there is a paucity of blood donors in Nigeria, donor deferral which is done after careful questioning about travel history and serological testing in the United States and other non-malarial endemic regions cannot be practiced here<sup>15</sup>. We, therefore, recommend that all blood pints be screened for malaria parasites (post-donor screening) and marked negative or positive as the case may be, in case a patient is transfused with malaria parasite positive blood, he or she can be given a curative regimen of antimalarials, especially when they fall into the malaria vulnerable group mentioned above.

Alternatively, it might be considered desirable to give a curative dose of antimalarials prophylactically to all patients transfused with blood as have been suggested by some authors<sup>16</sup>. This is without prejudice to the normal prophylactic intermittent treatment (PIT) given to pregnant women. The latter view may lead to excessive use of antimalarial drugs and possibly increase the risk of emergence of resistant strains of the parasites.

We also note that needing more investigation, is the degree of malaria parasitaemia among blood donors throughout the year and how it correlates with the donors' haemoglobin genotype and blood group.

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