

Short Communication

A study of plasmodium species in blood donors and their demographic parameters to malaria susceptibility

T.T. Epidi^{1*}, C.D. Nwani² and N.P. Ugorji²

¹Department of Crop Production Technology, Niger Delta University, Wilberforce Island, Bayelsa State, Nigeria.

²Department of Applied Biology, Ebonyi State University, Abakaliki, Nigeria.

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In view of the problem of transfusional malaria, the prevalence of *Plasmodium* in transfused blood was assessed. Blood film examination for malaria parasites in donor blood transfused to patients in Abakaliki, Ebonyi State of Nigeria was carried out over a 5-month period. Blood group O was the dominant blood type (74%). A high malaria parasite prevalence rate of 51.5% was noted in transfused donor blood. All blood groups and Rhesus factor types were infected with malaria parasites and there was no significant increase in malaria infection rate in any particular blood group type. Method of blood procurement was observed as a major risk factor of transmission, with commercial blood donor having the highest proportion of parasitic contamination.

Keyword: donor blood, *plasmodium*, prevalence, transfusional malaria.

INTRODUCTION

Amongst vector borne diseases, malaria occupies a pre-dominant position since it is probably the leading cause of death in the world despite intense national and international efforts to control it (Pickett, 1990; Smyth, 1994). It is estimated that there are 300-500 million new cases every year, with 1.5 to 2.7 million deaths world wide particularly in Africa (WHO, 1992).

Malaria parasites, *Plasmodium* species, are generally transmitted by *Anopheles* species of mosquitoes. However, another major source of transmission is blood transfusion. Although blood transfusion is generally believed to save human lives, blood can nonetheless be a dreadful vehicle for the transmission of some infectious and parasitic diseases including malaria fever (MMWR 1999). In view of its new status as a state capital, Abakaliki metropolis is growing rapidly, and medical cases requiring blood transfusion are expected to increase. The quality of donor blood particularly with respect to infectious diseases including malaria would therefore attract great concern.

In this study, we examine the prevalence of plasmodium species in blood donors as well as the contribution of demographic parameters of blood donors to malaria susceptibility.

MATERIAL AND METHOD

Study area

The study was carried out within Abakaliki town in Ebonyi State, Nigeria. Abakaliki has a land mass of 51 km² and a population of 255,752 (1991 population census). The area lies on latitude 6°22'26"N and longitude 8° 6'6" E of the Greenwich meridian. The rainfall pattern is moderate with average atmospheric temperature of 32-35° C. The study was conducted in two major hospitals within Abakaliki – Ebonyi State University Teaching Hospital and the Federal Medical Centre. The choice of these hospitals was based on the fact that blood transfusion cases are always referred to and handled in these hospitals.

Materials

The materials employed in the study included a Leitz light microscope, EDTA (ethylene diamine tetra acetic acid) bottles, methylated spirit (methanol), cotton wool, tourniquet, syringes (5 ml) and needles (21 g).

Study population

A total 200 (182 males and 18 females) blood samples were collected from donors living in Abakaliki town. The donors were of three categories: (1) commercial blood donors who offer units of blood for a fee, (2) replacement blood donors, usually family members, who donate a unit of blood to be used for a specific patient, or (3) volunteer blood donors who donate blood free of charge (Enosolease et al., 2004).

*Corresponding author. E-mail: tepidi@yahoo.com.

Table 1. Prevalence of *Plasmodium* in examined blood samples based on sex and age.

Age group	Male			Female			Total			95% CI
	No. Examined	No. Infected	% Infected	No. Examined	No. Infected	% Infected	No. Examined	No. Infected	% Infected	
25	105	69	65.7	4	1	25.0	109	70	64.2	55.2-71.3
26-30	63	23	36.5	7	3	42.9	70	26	37.1	25.9-48.4
31-35	13	5	38.5	5	2	40.0	18	7	38.9	36.3-41.5
36-40	-	-	-	2	-	-	2	-	-	-
41	1	-	-	-	-	-	1	-	-	-
Total	182	97	53.3	18	6	33.3	200	103	51.5	41.6-55.4

CI = Confidence interval.

Table 2. Prevalence of *Plasmodium* in examined blood samples based on blood group.

Group	No. Examined	No. Infected	% Infected	95% CI
O	148	79	53.4	45.3-61.5
A	32	16	50.0	32.7-67.3
B	20	8	40.0	18.5-61.5
Total	200	103	51.5	41.6-55.4

CI = Confidence interval.

Method of sample collection

The method of sample collection employed was venepuncture technique (Carmel et al., 1993; Ibhanesebhor et al. 1996; Okocha et al. 2005). Soft tubing tourniquet was fastened to the upper arm of the patient to enable the index finger feel a suitable vein. The puncture site was then cleansed with methylated spirit (methanol) and venepuncture made with the aid of a 21 g needle attached to a 5 ml syringe. When sufficient blood had been collected, the tourniquet was released and the needle removed immediately while the blood was transferred into an EDTA bottle.

Laboratory analysis

The collected blood samples were analyzed within 1-2 h of collection. Thick blood films were prepared according to the technique outlined by Cheesebrough (2004). A drop of each blood sample was placed in the center of a grease-free clean glass slide. Thereafter, the reverse side of the slide was cleaned with cotton wool and kept for air-drying and staining with field's stain. The slide was held with the dried thick film side facing downward and dipped in field's stain A (eosin) for 5 s. It was washed off gently in clean water and then dipped in field's stain B (methyl azure) for 5 s and washed again in clean water. The back of the slide was cleaned with cotton wool and kept in the draining rack to air-dry for eventual examination under the microscope.

RESULTS

Out of a total of 200 samples examined (182 males and 18 females), 103 (51.5%) were infected with malaria parasites (Table 1). Amongst the males (182 samples), 97 (53.3%) had malaria parasites, while amongst the females (18 samples) 33.3% were infected. The number

of persons examined for each age group was 105, 63, 13, 0, and 1 for 25, 26-30, 31-35, 36-40 and 41, respectively. The respective infection rate for the first three groups were 65.7% (n=69), 36.5% (n=23), and 38.5% (n=5) while age groups 36-40 and 41 were not infected.

With the exception of blood group AB, all other blood group types were examined. Blood group O was the dominant blood type. A total of 148, 32 and 20 blood samples were examined for blood groups O, A and B, respectively. The respective infection rates for the blood group types were 53.4, 50.0 and 40.0%, respectively (Table2).

The prevalence of infection in five different months viz February, March, April, May and June was also determined. Table 3 shows the infection rates of the different months.

DISCUSSION

The high rate of malaria prevalence in the blood samples examined was quite worrisome. This is a reflection of the high rate of asymptomatic malaria parasitaemia in endemic malaria regions. A similar report was made by Achidi et al. (1995). 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 (Qari, 1993).

In this study, an overall prevalence rate of 51.5% was

Table 3. Prevalence of *Plasmodium* in examined blood samples in five different months.

Month	No. Examined	No. Infected	% Infected	95% CI
Feb	10	6	60.0	30.0-90.0
Mar	15	10	66.7	42.8-90.5
April	60	34	56.7	44.5-69.5
May	65	30	46.2	34.1-57.9
June	50	23	46.0	32.1-59.9
Total	200	103	51.5	41.6-55.4

CI = Confidence interval.

Observed (95% CI = 41.6- 55.4) and it varied according to age but not sex. The most infected age groups were 25 and 26-30 and were mostly males. This is because of the high rate of male commercial donors in the study population. The reason for the much lower number of females is that females are culturally inhibited as far as commercial blood donation is concerned.

While age groups 26-30 and 31-36 had prevalence rate of 36 and 38.5% respectively, no infection was recorded for 36- 40 and 41 possibly because donors in these groups were volunteer and replacement blood donors.

Blood group O was the dominant blood group type (74%) followed by A and B while there was no AB donor. All blood group types were infected and there was no significant infection rate in any particular blood group type. Similarly, there was little variation in infection within months of the study period.

This study has shown that malaria is endemic in Abakaliki Metropolis. Most of the donors carried malaria parasites but were asymptomatic. It is therefore recommended that all blood 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/she could be given a curative regimen of anti-malarial, especially if he/she falls into the malaria vulnerable group. Alternatively, it might be considered desirable to give a curative dose of anti-malarial prophylactically to all patients transfused with blood (Adewuyi, 2001). This could be without prejudice to the normal prophylactic intermittent (PIT) given to pregnant women.

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