

# The Prevalence of Malaria Infection Among Blood Donors Attending Ahmadu Bello University Teaching Hospital, Shika, Kaduna, Nigeria

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**Abstract:-** The prevalence of malaria infection among blood donors attending Ahmadu Bello University Teaching Hospital, Shika was assessed. Thin blood film using Leishman's staining technique was used to determine the prevalence of malaria. The result showed that the prevalence of infected donor was 24% which is low. Out of the total 100 blood donors, (80 males and 20 females) screened 24 (24.0% CI, 95%, 23.0 – 24.0) were infected. Females were more infected (30.0% CI, 95%, and 25.0 – 34.0) than males 22.5% CI, 95% 21.0 – 23.0. The infection decrease with age with the highest prevalence of 31.2% among those aged 20 – 25 years. The infection did not significantly vary with age or sex ( $P < 0.05$ ). individuals with blood group B were slightly more infected 26.7% CI 95% (4.31 – 49.1%) than those of group O (23.4% CI 95% 12.63 – 34.1%) and A (24.0% CI 95% 7.25 – 40) and there was a significant difference ( $P < 0.05$ ). Highest prevalence was recorded in the month of September corresponding to the later part of rainy season. And overall of existing blood donation policies in Ahmadu Bello University Teaching Hospital to incorporate malaria screening is advocated. Curative antimalarial drug followed by prophylactic drugs should be administered to all recipient of parasitized blood.

## I. INTRODUCTION

The term malaria is Roman in origin, although the disease was not known by its present name until the mid eighteenth century. Before then it was referred to variously as intermittent fever, swamp fever, Roman fever, and death fever. Malaria or evil (Mal) air (aria) was a name derived from the miasma theory of causation. Human are not the only specie infected by malaria parasites. Almost all vertebrates from snake on, are parasitized by specie of plasmodium which have co-evolve with a particular mosquito vector. Yet in the course of human cultural evolution, it seems that malaria became widespread only after the introduction of agriculture which increased human population density and provided breeding place for Anopheles mosquito (Heggenhougen *et al.*, 2003).

Malaria is a potentially fatal disease that is caused by a parasite known as plasmodium. It is spread through a bite of an infected female mosquito. Sporozoite contained in the saliva of the mosquito is inoculated into the blood of a human host when the mosquito takes a blood meal.

Infection can occur by transfusion of infected donor blood, injection through the use of needles and syringes contaminated with infected blood and very occasionally congenitally usually when a mother is non-immune.

Malaria parasite has been with us since the dawn of time. They probably originated in Africa (Along with mankind) and fossil of mosquito's up to 30 million years old show that the vector for malaria was present well before the earliest history (TDR/WHO, 2002).

Malaria is one of the leading causes of death in the world. It is estimated that there are 300 – 500 million new cases every year with 2 – 3 million death world wide (WHO, 2000).

Malaria is caused by four species of plasmodium but their morphology and life cycles are almost alike yet they show some distinguishing characters. Plasmodium as referred to, the parasite in its mature adult condition is called trophozoite. The trophozoite is amoeboid, uninucleated having vacuolated and granular cytoplasm and the ultra structure of the plasmodium has been reviewed and it shows that it possess double membrane.

Several types of infectious organism can be transmitted through blood transfusion. Cases of transfusion or imported malaria are increasing world wide due to frequency of travelling and increase demand in transfusion.

Killer malaria due to *Plasmodium falciparum* can be acquired even with the transfusion of a small number of infected red cells (Achidi *et al.*, 1995).

Laboratory screening for malaria remain a possible option for reducing transfusion malaria.

Screening blood donors for malaria (as recommended by the WHO) is currently not included in the protocols of Nigerian blood banks. This is worsened by the facts that absence of symptoms even for a long period does not necessarily ensure lack of infection and malaria parasite survive well in stored blood.

Infected person may have feverish attacks, influenza like symptoms tiredness, diarrhea or whole range of other symptoms. On the purely practical level, the most malignant (*P. falciparum*) cases develop within three month of leaving the malaria region while the form transmitted by *P. vivax* and *P. ovale* may not appear within 3 years later.

The actual attacks of malaria develop when the red blood corpuscles burst, releasing a mass of parasite into the blood. The attacks do not begin until a sufficient number of blood corpuscles have been infected with parasite other sign and symptoms are fever and shivering temperature rising as high as 40°C and falling again over a period of several hours.

A poor general condition, feeling unwell and having headaches like influenza. Nausea and vomiting often occur as well.

The actual diagnosis is made by detecting the parasite in the blood. This is done using a special product mixed with one of the drops of the patients blood and spread it on a microscopic slide. This is then stained and examined carefully under a microscope.

#### ➤ *Statement Of Research Problem:*

The public health importance of transfusion malaria in this part of the globe necessitated this research.

#### • *Justification:*

- ✓ This is justifiable by the facts that malaria infection has cosmopolitan geographical distribution and occurs in all ages.
- ✓ This incidence is likely to be highest in tropical and subtropical region of the world most especially Africa, possibly reflecting non screening blood donors for malaria infection.

#### • *Hypothesis:*

- ✓ No Transfusional malaria in patient receiving blood in Ahmadu Bello University Teaching Hospital Shika.
- ✓ No malaria infection among blood donors attending Ahmadu Bello University Teaching Hospital Shika.
- ✓ No malaria infection among blood donors in relation to their age, sex, month and blood group.

#### • *Aims And Objectives:*

- ✓ To access the prevalence of transfusional malaria in patient receiving blood in Ahmadu Bello University Teaching Hospital Shika.
- ✓ To access the prevalence of malaria infection among blood donors attending ABUTH Shika.
- ✓ To access the prevalence of malaria infection among blood donors in relations to their age, sex, month and blood group.

## II. MATERIALS AND METHOD

### ➤ *Study Area:*

This research was conducted in the haematology / blood transfusion department of Ahmadu Bello University Teaching Hospital Shika, Zaria.

Visits were made to the hospital twice a week (Tuesdays and Friday between August to November 2009). All patients referred to the hospital laboratory for routine blood analysis on these sampling days constituted the subject for this research. The choice of the hospital was because it serves as referral centre for blood transfusion services in Kaduna state. The study area is defined by longitude 7°44'E and latitude 11°07'N elevated at 675 ft above sea level. The vegetation characteristic is that of the Sudan Savanana with an average annual rainfall of about 1016mm and atmosphere temperature of 22 – 30°. there are two distinct seasons the wet and the dry seasons the former taking place between April and October while the later occurs from November to March.

### ➤ *Ethical Consideration:*

The approval for this study was obtained from the faculty of Clinical Medicine Ahmadu Bello University Teaching Hospital Shika Zaria, Kaduna State. Approval was also obtained from ethical and medical advisory committee of the hospital the approval was on the agreement that patient anonymity must be maintained, good laboratory practiced quality control ensured and that every finding would be treated with utmost confidentiality and for the purpose of this research only.

### ➤ *Research Materials:*

Material use for this research were standard equipment obtained from the haematology / blood transfusion department which constituted items use for routine blood diagnosis of infections. They include:

- Clean slide
- Distilled Water
- Absolute alcohol
- Leishman stain (Romoano sky stain)
- Cotton wool
- Spirit swab
- Microscope
- X 100 oil immersion

### ➤ *Data Collection:*

Patient personal data such as age, sex, blood group and month of collection were obtained by reference to their medical records. About 2ml of blood were obtained from the patient by vein puncture and transferred into anticoagulated bottle containing EDTA anticoagulant to prevent the blood from clotting from these preserved blood samples were other haematological test conducted.

### ➤ *Determination Of Haemoglobin Level Or Packed Cell Volume:*

Blood samples were collected into capillary tube and were sealed using plastercine. The capillary tube were then arranged in a balanced manner in a microhaematocrit

centrifuge machine and spun at 12000 revolution for minute (rpm) for 5 minutes.

The packed cell volume of the blood sample were determine using a haematocrit chart from these the haemoglobin level of the blood samples were determined. The value obtained was use to determined level of anaemia in the patients < 11.0gld (WHO, 1989).

➤ *Determination Of Blood Group:*

The thumb of patient was pricked with a disposable needle after being sterilized with swab. The drops of blood were placed on tiles. Capillary haematocrit tube was placed on the point where the thumb was pricked which was allowed to fill up. three capillary tubes were filled with blood and sealed at both ends, three drops of normal saline solution was dropped at the end of the microscopic slide which has a line drawn across the middle, the slide was labeled A, B and AB. A drop of blood from one of the capillary tube was added to the saline on each. It was then thoroughly mixed using a stirrer. 2 drop of Anti-A serum was added to one part, and Anti-B serum to another part then Anti-AB serum to the last part, each was mixed thoroughly by tilting the slide back and front and observation was made after few minutes agglutination was observed.

- Anti A serum agglutinate A and AB cells
- Anti B serum agglutinate B and AB cells
- Anti AB serum agglutinate group A, B and AB cell
- Group O cell were not agglutinated by any of the serum group.

➤ *Screening Of Patient For Malaria Infection To Determine Disease Prevalence:*

Leishman stained thin blood films were prepared within an hour of collection to determine malaria prevalence.

Two drops of blood, was placed on a microscopic slide and spread to cover an area of about 15mm in diameter and allowed to dry. The film was then stained for 10 minutes using leishman’s stain. The slide was then gently washed with few drop of distilled water dried and examined under the microscope at x 100 oil immersion objective lens to detect infection with plasmodium specie. The film was then considered positive for malaria if the presence of the ring form of trophozoites or any other blood stage of the erythrocytic shigozony was detected. A film was considered negative if no parasite was seen after scanning through at least 100 fields.

➤ *Statistical Analysis:*

Differences in proportion was evaluated using chi-square test statistical significance was achieved if P<0.05.

**III. RESULT**

Out of a total of 100 blood donors (sample examined) 80 males and 20 females screened 24 (24% CI 95% 23.0 – 24.0) were infected with malaria infection. Result showed that 18 (22.5% CI 95% 21.0 – 23.0) of the males and 6 (30.0% CI 95% 25.0 – 34.0) of the females had the malaria infection. The infection decreased with age among the donors, with individual aged 20 – 25 years old recording the highest prevalence of 31.2% no infection was observed among those 36 – 40 and ≥ 41 years old (table 4.1) statistical analysis indicated no significant difference in age (X<sup>2</sup> calculated = 2.32, X<sup>2</sup> tabulated 9.49, df = 4 P>0.05) or the sex (X<sup>2</sup> calculated = 0.485, X<sup>2</sup> tabulated = 3.84, df = 1 P>0.05).

Table 1 Prevalence of Malaria Infection in Blood Donor Abu Teaching Hospital in Relation to Age and Sex

Male				Female				Total			
	NE	NI	% INFECTED		NE	NI	% INFECTED		NE	NI	% INFECTED
20-25	44	14	31.8%	4	1	25.0%	48	15	31.2%	18.1-44.3	
26-30	20	3	15.0%	7	3	42.9%	27	6	22.2%	6.52-37.8	
31-35	10	1	10.0%	5	2	40.0%	15	3	20.0%	0.24-40.2	
36-40	5	0	0	3	0	0	8	0	0	0	
41-above	1	0	0	1	0	0	2	0	0	0	
Total	80	18	22.5%	20	6	30.0%	100	24	24%	23.0-24.0	

NE = Number examined  
NI = Number Infected

With the exception of Blood group AB all other blood group were observed blood group AB was not recorded because donors with this blood are often very rare in this study area. Blood group 0 was the dominant blood group of the 60,25 and 15 individuals that were examined in blood group O, A and B respectively 14 (23.4% CI 95% - 12.69 –

34.11%) of group O individuals 6 (24.0 CI 95% 7.25 – 40.74%) of group A and 4 (26.7 CI 95% 4.31 – 49.1) of group B were infected with the malaria parasite (Table 4.2) chi-square test indicate a significant difference between the blood group of patient and the prevalence of infection (X<sup>2</sup> calculated = 0.331, X<sup>2</sup> tabulated 5.99 df = 2, P<0.05).

Table 2 Prevalence of Malaria Infection in Blood Donor in Abu Teaching Hospital in Relation to the Blood Group and Various Study Months

Parameter ABO blood group	NE	NI	% Infected	95% CI
O	60	14	23.4%	12.69-34.11
A	25	6	24.0%	7.25-40.74
B	15	4	26.7%	4.31-49.1
<b>Total</b>	100	24	24.0%	23.0-24.0
<b>Month</b>				
September	50	15	30.0%	-10.16-70.16
October	35	7	20.0%	6.75-33.62
November	15	2	13.4%	-3.82-30.62
<b>Total</b>	100	24	24.0%	23.0-24.0

CI = Confidence interval.

The infection was also recorded according to the various month of the study where a total of 50, 35 and 15 blood samples were examined for the months of September, October and November their respective prevalence rate were 30.0% (NI = 15) 20.0% (NI = 7) and 13.4% (NI = 2) Table 4.2 statistically using chi-square there is a significant association between the month and the prevalence of infection. ( $X^2$  calculated = 3.73  $X^2$  tabulated = 5.99 df = 2,  $P < 0.05$ ).

#### IV. DISCUSSION

The health problems posed by the transmission of malaria through blood transfusion are immense and will remain a menace especially, if the screening of the donors blood for malaria before donation is not initiated or probably carried out.

Transfusion malaria was described as particularly common in countries where blood donation has become a commercial transaction and where blood donors comes from the less affluent social classes, most of whom are low income earners and live in places where vector transmission of malaria is high (Chigozie and Ogbonnaya, 2006).

In this finding the incidence of malaria parasite (24% seems to be low, this may be due to the months this research work was carried out been the month of September, October and November.

This was similarly recorded by (Stewart and Weir, 1997) when they expressed that the prevalence show sudden rise with the onset of rain in March and April and falling steeply thereafter as the dry season set in that is from October to March.

It may also be due to the introduction of the insecticide treated bed net supplied by federal government might have reduced the incidence of malaria infection also.

It could also be due to the fact that Ahmadu Bello University Teaching Hospital Shika do not allow commercial blood donation, donations are restricted to volunteer and replacement donors alone.

Finding from this study indicate a higher percentage of infection among female compared to male blood donors

(30.0% vs 22.5%) although no significant difference was observed statistically. In a study conducted in Columbia, males were found to be more infected with malaria parasite than female (59% vs 41.%) however, in the Caribbean and Ghana reports more females were infected.

Interestingly, the prevalence of malaria in this study decreased with age, individuals age 20 – 25 years were most infected. The reason for this outcome was not apparently clear. It is however, established that in malaria endemic area of sub-saharan Africa the younger member of the community are more expose to the infection than older individuals, probably due to their greater involvement into nocturnal activities that enhance contact with mosquitoes which may be social or occupational in nature. In addition the use of insecticide treated bed net is a very rare occurrence among young people in their early 20s in northern part of Nigeria and this trend may have influenced the prevalence of infection among this age group. The importance of intensifying malaria control effort among adolescent/young adult cannot be overstated, this is because of the enormous public health implication of Age-related prevalence of malaria in which case these individuals not only constitute the most infected population (31.2%) but also the dominant blood donor population as evidence from this study.

When malaria infection was associated with blood group ABO, it was observed that individual with blood group B were slightly more likely to be infected than those of group O and A. The reason for this outcome was not apparently clear even though a statistical significant difference was obtained. Although recent studies of the pathogenesis of malaria have shown that some strain of *Plasmodium falciparum* preferentially trigger rosette formation depending on the red blood cell blood group, with A and B group cells being more likely to form rosettes and the individuals with this group to be at greater risks of developing severe central nervous system malaria. A number of studies have shown that susceptibility to several infections disease is related to the patient blood group. In a study comparing distribution of blood group in malaria patient conducted in India in the early 1980s it was reported that blood group B showed the highest susceptibility (41.8%). Among the infected cases followed by group A = (29%) group O (22.2%) and group AB (7%).

There was a significant variation of the infection with respect to month ( $P < 0.05$ ) the highest prevalence was recorded in the month of September corresponding to the later part of the rainy season, when the rain becomes less frequent and with less volume of runoff water and possibly with less disruption of the breeding of the mosquito vectors a steep rise in a parasite rate occurs before falling steeply thereafter as the dry season set in. (July to September) 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 it was therefore not surprising that the prevalence of infection was highest in September.

## V. CONCLUSION

In conclusion, this study has provided insight on the potential for induced malaria via blood transfusion. Even though the prevalence of infection in donors is low the screening of donors for malaria prior to blood donation should not be neglected since it is evident that malaria can be transmitted through blood transfusion. There is a need for new donor – screening assay to protect the integrity and purity of the blood supplied. Blood should not be collected from donor with suspected malaria. In malaria endemic area, however, it is not feasible to screen all donors blood for plasmodium species or reject donors who had malaria previously. In such cases curative antimalaria drugs followed by prophylactic drugs should be given to all recipients of blood. Individual suffering from malaria or those within 3 month after treatment for infection with malaria should not donate blood (Vimala, 2005). Furthermore in spite of drug-resistant malaria more systematic care must be directed toward blood screening.

## RECOMMENDATIONS

- Screening blood donors for malaria should be made mandatory infected donors should be treated before being accepted for donation.
- The hospital should encourage the use of insecticide treated nets for people living around Shika, Zaria in particular and the entire state in general.
- Laboratory technicians should be properly trained form microscopic examination of blood donated.
- The hospital through the state (ministry of health) should encourage public participation and funding of safe transmission this may reduced the chances of malaria infection in blood donors.
- More drainage system should be constructed in Zaria locality to avoid breeding sit of the vectors female anopheles mosquitoes.

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