SUBCLINICAL MALARIA PARASITAEMIA AMONG BLOOD DONORS IN MAIDUGURI, NIGERIA

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ABSTRACT

Background: Blood banking in a malaria endemic area could result in transfusion-associated problems such as transfusion malaria. The emergence and wide dissemination of drug resistant malaria parasites underscore the need for prevention of posttransfusion malaria.
Objectives: To determine the prevalence of subclinical malaria parasitaemia among blood donors to ascertain the need for inclusion of malaria testing in pre transfusion procedures.
Methods: Screening for malaria parasites was done in 182 blood samples collected from blood donors (169 males and 13 females) who fulfilled the inclusion criteria out of 246 subjects, who came for donation at the Blood Bank Section of University of Maiduguri Teaching Hospital (UMTH) during the month of April to September, 2009. Blood film examination was done to identify malaria parasites and estimate parasite density assuming leukocyte count of 8000 cells/µl blood. **Results**: The overall prevalence of subclinical malaria was 18.7% (34/182) and was significantly higher in female (53.8%, 7/13) than male (16.0%, 27/169) donors (χ^2 = 11.4, df = 1, p = 0.00074). The prevalence was significantly higher during the rainy season than dry season (18.7% *vs* 4.3%; p < 0.0001). Parasite density was generally low with < 1000 parasites/µl blood accounting for the highest proportion (58.8%) (χ^2 = 15.18; df = 2; p = 0.000).
Conclusion: There is a high prevalence of subclinical malaria in this locality as reflected by the high malaria parasitaemia among donors and this could impact negatively on the health of blood recipients in Maiduguri. We advocate that the routine malaria screening should form part of the pre-transfusion testing procedure.

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Keywords: Subclinical, Malaria, Blood, Donors

INTRODUCTION

Malaria is both a modern and ancient plague. Over 2000 million people, 41% of the world population still remain exposed to this disease. About 300-500 million cases occur each year worldwide affecting 90 countries or territories[1]. Around 1.5 to 2.7 million deaths occur each year due to malaria[2,3]. The reduced susceptibility in immune active individuals has been attributed to pre-immunity resulting from previous malaria episodes. When they do infections are mostly subclinical due to malaria pre- immunity. This group of people constitute the largest pool of voluntary blood donors in Nigeria. Maiduguri as an endemic area has not been able to completely adopt the global malaria control strategy, especially to carry out early diagnosis and prompt treatment of clinical malaria cases to use protection and feasible bioenvironmental methods, and to implement strategy for prevention and control of epidemic outbreaks. Also, lack of drug sensitivity situation of various species of malaria is the major constraints of malaria control in endemic area[4].

Blood transfusion is necessary to correct or reduce severe anemia and a host of hematological disorders: blood transfusion serves as a replacement for blood loss; therefore, providing safe blood is mandatory[5]. The transmission of infection through transfusion of infected blood and blood products can be easily prevented through malaria screening[6,7].

Okacha et al[1] reported that transfusion associated malaria is highly prevalent among blood donors and that some risk factors and clinical manifestation are frequently observed. The disease is mostly subclinical and signs are mild which significantly reduces efficient selection of blood donors during the pre-donation interview . However, the destruction of blood bags and antimalarial prophylaxis have been described as measures to reduce transmission. The argument as further stressed by Talib and others[8] which stated that in blood banking the risk of introducing an unsafe potentially dangerous-transmitted circuit is not completely covered. However, Garraud and others suggested the use of serological tests to avoid the risk of infected donation[9].

There is paucity of data on transfusion associated malaria in Maiduguri since malaria is not yet included as a mandatory test for pre-transfusion screening of donors in UMTH,

Nigeria. To bridge this gap, the present study was designed to assess the prevalence of subclinical malaria parasitaemia among blood donors in UMTH.

METHODS

Two hundred and forty six (246) subjects were selected randomly from the population of blood donors between April and September, 2009 after passing the blood banking inclusion criteria. Five (5) mls of blood sample was collected into an EDTA bottle and small portion used to prepare blood smear stained with Giemsa stain for malaria parasites identification and parasitaemia quantification. They were taken from apparently healthy donors after an oral informed consent was sought and through the use of structured questionnaire. Volunteered donors (subjects) who had not taken any anti-malaria drugs within three weeks pre-donation were included into the study. Exclusion criteria included presence of other transmissible infections such as syphilis, hepatitis and HIV. The data obtained were analyzed using SPSS version 16**.**

Laboratory procedures

Staining of Thick and Thin Smears

Two drops of blood was placed on a 76mm x 25mm microscope slide and thick smears were made. The smears were air dried and stained with 10% Giemsa stain solution for 15 minutes. It was washed and viewed under the microscope using oil immersion magnification. Thin smears were made, fixed in methanol before staining in the same concentration of Giemsa stain. A positive smear was included with each new batch of working Giemsa stain.

Examination of thick and thin smears

The stained smears were firstly examined at low magnification (10× and 40×) objectives lens to detect large parasites such as microfilaria and also examined using 100x oil immersion. The parasite densities obtained were reported as a ratio of parasite against WBCs from thick smears assuming the leukocyte count of 8000 cells/µl. For positive smears, parasites were counted against 500 WBCs according to Greenwood and Armstrong[11].

The parasite densities were calculated as follows:

$$\frac{\text{Number of parasite}}{\text{Number of WBC}} \times 8000$$

RESULTS

The subjects enrolled were within the age of 19-58 years with age group 24-28 which has the highest mode (22.0%, 40/182) and age group 54-58 years with the least (0.6%,1/182) (Table1). Of the 182 enrolled subjects, 169 (92.9%) were males and 13 (7.1%) were females. In all, 34 of the 182 samples analyzed had parasitaemia giving subclinical malaria prevalence of 18.7% (34/182) in the studied subjects. The prevalence of parasitaemia was significantly higher in female subjects (53.8%, 7/13) than their male counterparts (16.0%, 27/169) ($\chi^2 = 11.4$, df = 2, p = 0.00074) (Table 2). The proportion of subjects with parasite density below 1000 parasites /µl blood was significantly higher than 1000 - 5000 parasites /µl blood ($\chi^2 = 8.74$; df = 1; p = 0.003) and > 5000 parasites /µl blood ($\chi^2 = 12.21$; df = 1; p = 0.005). All the malaria infections observed were due to *P. Falciparium*.

DISCUSSION

Blood transfusion remains a common integral part of medical practice especially in developing countries

Table 1. Age and sex distribution of the enrolled donors indicating the proportion accepted and excluded.

Age group (years)	Accepted donors		Excluded donors		Number
	Male (%)	Female (%)	Male (%)	Female (%)	
19-23	32 (17.6)	2 (1.0)	8 (12.5)	12 (18.8)	54
24-28	40 (22.0)	-	8 (12.5)	1 (1.6)	49
29-33	24 (13.2)	5 (2.7)	3 (4.69)	2 (3.1)	34
34-38	28 (15.4)	2 (1.01)	4 (6.3)	-	34
39-43	28 (15.4)	1 (0.6)	-	2 (3.1)	31
44-48	8 (4.4)	-	2 (3.1)	1 (1.6)	11
49-53	8 (4.4)	1 (.0.6)	4 (6.3)	3 (4.7)	16
54-58	1 (0.6)	2 (1.0)	8 (12.5)	6 (9.4)	17
Total Number (%)	169 (92.9)	13 (7.1)	37 (57.8)	27 (42.2)	246
Grand Total	**182**		**64**		

Table 2. Prevalence of malaria parasitaemia based on age groups and sex

Age group (years)	Male		Female	
	Positive (%)	Negative (%)	Positive (%)	Negative (%)
19-23	3 (1.8)	29 (17.2)	1 (7.7)	1 (7.7)
24-28	8 (4.7)	32 (18.9)	-	-
29-33	8 (4.7)	16 (11.3)	3 (23.1)	2 (15.4)
34-38	2 (1.2)	26 (18.3)	1 (7.7)	1 (7.7)
39-43	3 (1.8)	25 (14.8)	-	1 (7.7)
44-48	2 (1.2)	6 (3.6)	-	-
49-53	1 (0.6)	7 (4.1)	1 (7.7)	-
54-58	-	1 (0.6)	1 (7.7)	1 (7.7)
TOTAL	**27**	**142**	**7**	**6**

All parasite observed were P. Falciparium

Table 3. Level of parasite densities

	Parasite density (/ µl blood)			
Sex	**< 1000**	**1000 5000**	**> 5000**	**Total**
Male	15 (44.1)	7 (20.6)	5 (14.7)	27 (79.4)
Female	5 (14.7)	1 (2.9)	1 (2.9)	7 (20.6)
Total	**20 (58.8)**	**8 (23.5)**	**6 (17.6)**	**34 (100)**

Values in parenthesis indicate percentage

including Nigeria[8]. Blood serves as a good vehicle for transfer of infectious agents from infected to susceptible individuals[10,12]. Thus, screening of blood is mandatory for many infectious diseases and is undertaken routinely in Blood Banks. Many studies have demonstrated the effectiveness of such screening in prevention of transfusion-transmissible infections[9]. Malaria parasites are one of the common infectious agents that could be transmitted via blood transfusion[13]. Such risk is higher in immunocompetent adults who commonly have asymptomatic malaria due to pre-immunity and infections may go unnoticed[14].

The prevalence rate of 18.7% of subclinical malaria in our cohort of subjects is in accordance with previous report by Falade and others[15]. The absence of symptoms could be associated with pre-immunity that might have developed due to previous exposure to malaria parasites[14]. In addition, relatively low parasitaemia reported in these subjects could also have contributed to the subclinical nature of the infection. Level of parasitaemia has been previously associated with symptoms development in malaria[16]. Meanwhile, we do not have immediate explanation to why the prevalence of subclinical malaria was higher in female than male subjects. This finding may not be conclusive owing to the relatively small number of female (13) enrolled in the study. The prevalence rate of subclinical malaria parasitaemia among donors is lower in this study compared to result obtained (30.2%)[1] in similar work conducted in the southern part of the country and also by Epidi and others' report[17]. This difference could be attributed to regional variation of rainfall which in turn could influence transmission intensity. The result obtained from this study will therefore raise an alarm of the existence of significant risk of transfusion transmitted malaria. Thus, the concerned authorities should take this issue seriously and adopt measures to minimize this risk. It is therefore suggested that all blood be screened for malaria parasite and marked positive or negative as the case may be before storage. Patients transfused with positive blood should be given curative regimen of antimalarial drugs as suggested by Adewuyi[12].

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