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Prevalence Of Malaria Infection Among ABO Blood Groups In Jama'are, Nigeria

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BACKGROUND: Malaria is a threatening disease that is common in both tropical and subtropical regions of the world. It is caused by an obligate parasite of the genus *Plasmodium* and transmitted mostly by female Anopheles mosquitoes. The treatment of malaria has been a great task causing both economic and social stress on the patients. Susceptibility to malaria infection varies with individuals and location. Identifying genetic indices through anthropometric study would be useful in diagnosis of this disease. **Objectives:** To determine the prevalence of malaria infection among ABO blood groups and establishes association between the gender, blood groups and malaria infection. **Methodology:** The study was retrospective carried out in General hospital Jama'are in between June and September, 2014. A total of one hundred and six patients (106) records comprised of 48 (45.28%) males and 58 (54.72%) females with age 29.01±10.33 years were collected and expressed as percentages distribution of malaria infection by age group. Chi-square test of association between malaria infection and genders was also carried out using Minitab (version 16) statistical software. **Results:** The prevalence of ABO blood groups infection to malaria infection was in the orders of O 57(53.77%), B 23 (21.70%), 15 (14.15%) and AB 11 (10.38%). The incidence of malaria infection was higher in blood group O and age group 26-35 years. There was no statistically significant association (P = 0.293) between gender, blood groups and malaria infection. **Conclusions:** The prevalence of malaria infection was higher in female gender, blood group O and no statistically significant association between gender, blood group and malaria infection.

KEY-WORDS: Malaria, blood groups, Jama'are, Chi-square

INTRODUCTION

Malaria is caused by an obligate, intracellular protozoan parasite of the genus *Plasmodium*. Four species of malaria have been established that infect humans (*Plasmodium falciparum, Plasmodium vivax, Plasmodium ovale and Plasmodium malariae).* The mortality rate following *P. falciparum* is virtually responsible for all deaths (Pathirana *et al.,* 2005). The virulence of *P. falciparum* has been associated with the capacity of the infected RBCs to adhere to uninfected RBCs, leading to rosetting of cells (Carlson *et al.,* 1990; Ringwald *et al.,* 1993). Previous studies have implicated the ABO blood group type in rosetting (Thakur and Verma, 1992). Blood group antigens A and B are trisaccharides attached to a variety of glycoproteins and glycolipids on the surface of erythrocytes, and these trisaccharides are thought to act as receptors for resetting on

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uninfected erythrocytes and bind to parasite rosetting ligands such as PfEMP-1 and sequestrin (Martin *et al.,* 1979; Ockenhouse *et al.,* 1992). Variation in erythrocytes was found to be closely related with ability of malarial parasites to penetrate into the blood cells (Fabiola *et al.,* 1994).

There is ample evidence for this from the field that the peak prevalence of Plasmodium falciparum malaria infection is known to shift to younger age groups as transmission intensity increases (Boyd 1949; Molineaux and Gramiccia 1980). Malaria is currently affecting more people in the World than any other disease. It is currently endemic in over 100 countries and is one of the 10 most prevalent and deadly diseases in the world (WHO, 2002). The disease is caused by tropical parasite that kills people more than any other communicable disease except tuberculosis. About 300 to 500 million clinical cases occur every year with over 1.2 to 2.7 million deaths, of which 90% occur in sub-Saharan Africa (WHO, 2002).

Genetic factors have played an important role in the composition of the erythrocytes (Miller *et al.,* 1976). In separate studies, Aikawa *et al.,* (1978) and Wertheimer *et al.,* (1989) suggested the participation of receptors in the adherence and invasion of erythrocytes by parasites. Host composition was also found to induce changes in resistance or persistence of the parasites in the erythrocytes. Knight *et al.,* (1963) and Martin *et al.,* (1979) reported that glucose -6- dehydrogenase increase red blood cell resistance to plasmodium falcifarum. However, sickle cell anemia and thalassemia were referred to protective factors against *P. falcifarum* infection (Allison *et al.,* 1979; Friedman *et al.,* 1978). It was also affirmed that erythrocytes with hemoglobin- E- were more resistance to Plasmodium vivax infection (Ray *et al.,* 1963). Miller *et al.,* (1976) found that West African black Gambians were resistance to *P. vivax* malaria when Duffy group antigens were absent.

Researchers have reported association between blood groups and diseases. Clarke *et al.,* (1960) associated blood group O with rheumatic carditis while McDonald and Zuckerman (1962) found association between blood group O and A_2 influenza virus infection. Acute viral hepatitis was associated with blood group A than blood group O (Lenka *et al.,* 1981). Blood group B was associated with Urinary infection (Lomberg *et al.,* 1983).

Epidemiological patterns of malaria are widely different from one place to another (Himeiden *et al.,* 2005). Specific data of a place collected can help in the making of a tailor-made design of improved programme for strategic malaria control for a particular location. There are available effective low-cost strategies for the treatment, prevention and control of malaria. But any attempt to prevent or control a disease such as malaria in any area or in a locality should first of all be preceded by an extensive evaluation of the magnitude of the prevailing situation. Malaria has been the subject of study in many parts of Nigeria (Molineaux and Gramaccia, 1980; Adams and Eze, 2000; Fawole and Onadeko, 2001; Ukpai and Njoku, 2001; Okafor and Oguonu, 2006; Falade *et al.,* 2008; Ibekwe *et al.,* 2009; Agomo *et al.,* 2009).

MATERIALS AND METHODS

I. Ethical Consideration

The research committee obtained its clearance from the management of the General Hospital Jama'are after submitting the copy of the proposal of the research.

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II. Study Area

Jama'are local government is about 200 km to the north of Bauchi town, the state capital in the north-eastern Nigeria. It has a landmass of about 493km^2 and population of about 117, 482. They are predominantly Fulani by tribe although other tribes were found there. Their main occupations were farming and animal rearing. Geographically, the Jama'are was a Sudan savannah. The first rainfall of the year usually drops around late June and extends through September. The issue of malaria infection had been a recurrent issue in this period, with its peak at August virtually every year. People had been superstitious about this period because of the higher cases of malaria witnessed.

III. Data Collection

The study was retrospective. A total of 106 medical files of malaria infected patients comprised of 48 (45.28%) males and 58 (54.72%) females with a mean age of 29.01±10.33 years were collected from the registry unit of General Hospital Jama'are between June and September, 2014 after obtaining the ethical clearance of the hospital committee on ethical regulation. The biodata and clinical data records of the patients were randomly selected. The biodata comprised of age, sex, and locality while clinical data were blood groups, rhesus and malarial statuses of each patient. The data were grouped into six age ranges with an interval of nine years between each successive group.

IV. Statistical Analysis

The distribution of the ABO blood groups, rhesus status and prevalence of malaria infections in age groups were expressed as simple percentage, whereas association between gender, blood group and the malaria infection were analyzed as chi-square test of association using Minitab (version 16) statistical software.

RESULTS

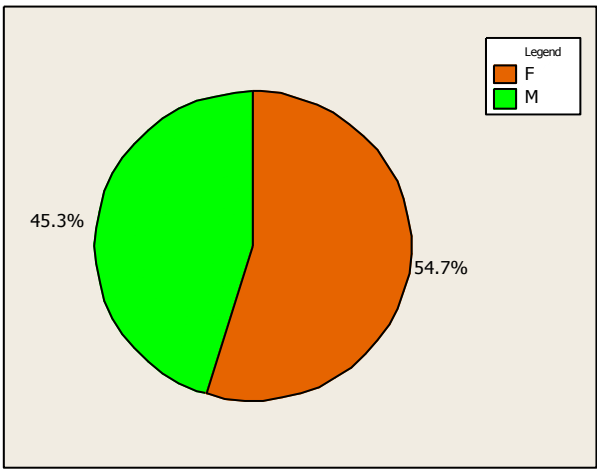

Figure 1: Pie Chart of Gender Prevalence to Malaria Infection in Jama'are

Table I: Prevalence Rate of Malaria Infection in Different Age Groups

Age group (yrs)	Frequency	Percentage (%)
<16	4	3.77
16-25	39	36.79
26-35	40	37.74
36-45	15	14.15
46-55	6	5.66
56-65	2	1.89
Total	106	100

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Table II: Distribution of ABO Blood groups among Malaria infected Patients in Jama'are

Blood Group	Frequency	Percentage (%)
A	15	14.15
AB	11	10.38
B	23	21.70
O	57	53.77
Total	106	100

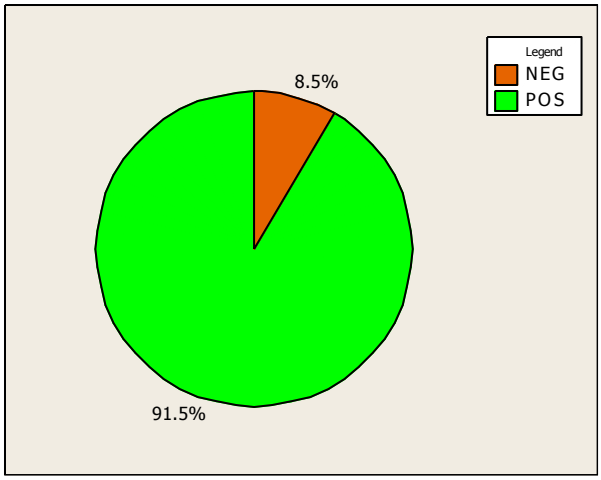

Figure 2: Pie chart of Rhesus factors among Malaria Patients in Jama'are

Table III: Chi-square test of Association between Gender and ABO blood groups of Malaria Infected Patients

Gender	A	AB	B	O	Total
F					
Count	10	4	15	29	58
Expected count	8.21	6.02	12.58	31.19	58.00
M					
Count	5	7	8	28	48
Expected count	6.79	4.98	10.42	25.81	48.00
Total	15	11	23	57	106

$\chi^2 = 3.723$, DF = 3, $P = 0.293$

The rate of malaria infection was higher among female than male with the proportion of 54.72%and 45.28% respectively as shown in figure 1.

Table 1 showed that the rate of malaria infection was higher in age groups 26-35 and 16-25 years had the highest rate of 37.74% and 36.79% respectively. The rate of infection the age range of 56-65 and <16 years were the least with 1.89% and 3.77% respectively.

The distribution to ABO groups to malaria infection was shown in table 2. The order of infection followed that O > B >A >AB with frequency of O 57(53.77%), B 23 (21.70%), A15 (14.15%) and AB 11 (10.38%) respectively. The incidence of malaria infection was highest in blood group O and least in group.

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The incidence of Rhesus factor malaria infection was presented in figure 2. The rate of infection was highest among the rhesus positive patients.

Table 3 showed the chi-square test of association between ABO blood groups and malaria infection in male and female patients. The rate of blood group O infections was higher in both sexes. The infection in blood group AB indicated lower incidence in both sexes. There was no statistically significant association (χ^2 = 3.723, DF = *3*, *P* = 0.293) between gender and malaria infection.

DISCUSSION

Generally the rate of malaria infection was higher among the females (54.72%) than the males (45.28%) as shown in figure 1. This study differed with the results obtained by the previous research of malariologist which found that more malaria cases in males than in females (Gupta and Chowdhuri, 1980). The difference in result could possibly arose from the genetic makeup of individuals and qualitative and/or quantitative variation in structure and chemical composition of the receptor sites on the erythrocytic membrane of the various groups may play an important role in determining susceptibility (Russell, 1963; Miller and Carter, 1976).

There was high rate of malaria infection among the age groups 26-35 and 16-25 years and least lower rate at the age range of 56-65 and <16 years as shown in table 1. The finding contrasted the results of Yahaya *et al.*, 2012 which reported higher incidence of the infection among 0-5 years age group. The disparity in the two findings could be attributed to the fact that the as part of the common Fulani culture and African at large, the adolescents and adult spent longer hours outside both at the day and night. This could exposed them to mosquitoes bite which might result in malaria infection compared to the 56-65 and <16 years age group. Considering the nature of their age, younger and elderly were given more attention in term of protection against the bite of mosquitoes by staying indoors and sleeping in mosquitoes fortified zones such in the mosquitos' nets or insecticides treated room and therefore come down with low malaria infection compared to the adolescents and adolescents and the adults.

Table 2 showed that the incidence of malaria infection was generally higher in blood group O (53.77%) than blood groups B (21.70%), A (14.15%) and AB (10.38%) respectively. This study was contrary to the findings of Pathirana *et al* (2005) in research conducted in Sri lanka which reported that where there was low percentage of blood group O (23.8%) and higher percentage of blood group A severe malaria (32.5%) patients that came down with severe malaria as compared to those with other blood groups. This discrepancy in results could possibly be due to mutation in the genetic mechanism that confers blood group A some protection against the attack of the malaria parasite. Variation in location and the time of infection is another factor that might have affected the blood group genetic expression.

The association between gender and malaria infection was presented as chi-square in table 3. The proportion of infection was higher in female than male gender; however there was no statistically significant association (χ^2 = 3.723, DF = 3, *P* = 0.293) between the genders and the malaria infection. This was in line with the findings of Gilles and Warrell (1993) which reported that there was no scientific evidence to prove the higher prevalence being related to gender as susceptibility to malaria infection is not influenced by gender. The reports of Abdullahi *et*

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al., (2009) however contradicted this finding as reported that male had higher prevalence of 30.24%, when compared with their female counterparts that had the prevalence rate of 24.47% at statistically significant value of ($p < 0.05\%$).

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CONCLUSIONS

The prevalence of malaria infection was higher among the female gender. Blood group O had the highest incidence of infection. The adolescents and adults were mostly the victims of malaria infection. Although the female gender and blood group O had the highest incidence of malaria infection, there was no statistically significant association between gender, blood group and malaria infection. It is therefore pertinent that the vulnerable age group to be cautious of their exposure to mosquitoes' bites so as to reduce the pressure on the already overstretched health facilities.

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