

PREVALENCE OF MALARIA PARASITAEMIA AND ITS ASSOCIATION WITH ABO BLOOD GROUP IN PATIENTS ATTENDING GENERAL HOSPITAL BILLIRI LOCAL GOVERNMENT AREA, GOMBE NIGERIA.



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Abstract

This study was carried out to investigate ABO blood groups association with malaria parasitaemia among patients attending general hospital Billiri local government area, Gombe State from the month of June to August 2013. One hundred and eighty (180) randomly selected person comprising 95 males and 85 females were examined for malaria parasitaemia and typed for ABO blood group using standard parasitological and haematological procedures. The overall prevalence of malaria parasitaemia was 96.67%, but prevalence varied with sex and age. Prevalence of malaria parasitaemia was significantly higher in males (97.89%) than in females (92.29%) ($p < 0.05$). Among the age groups, prevalence of malaria parasitaemia was 100% in 1-10 years and lowest (90%) in 11-20 years age group. The difference in prevalence among the age groups was significant ($p < 0.05$). Plasmodium falciparum was the most prevalent species accounting for 91.38% of positive cases of malaria parasitaemia, followed by P. ovale (6.32%) and P. malaria (2.11%). ABO blood group prevalence was 28.89%, 17.78%, 10.55% and 42.78% for blood groups A, B, AB and O respectively. Malaria parasitaemia prevalence varied significantly ($p < 0.05$) with blood group, being highest 100% in blood group AB, 98.70% in group O, 96.15% in group A, and 90.62% in group B. The study reveals that patients attending General Hospital Billiri Local Government Area is

hyperndemic for malaria andthat ABO blood group could be a factor that influences susceptibility to infection by human plasmodium species.

Keywords: *Malaria, Billiri, Parastaemia, ABO blood group,*

Background of the Study

Malaria is caused by a plasmodium parasite which spends its life in both humans and certain species of mosquitoes, four species of plasmodium that cause malaria in humans; are Plasmodium falciparum, Plasmodium vivax, Plasmodium malariae, and Plasmodium ovale. Of these, plasmodium falciparum is the most important in most parts of the tropics and is responsible for most severe illness and deaths. It is possible that malaria has reached its maximum world dissemination between the 1855, when it was found in southern Canada and in 1922-1923 when it touched the arctic cycle in Russia. Presently, the disease ranks first in terms of morbidity and mortality worldwide. The genus plasmodium has been found in man and mammals (Ilozumba and Uozie, 2009).

Despite the high morbidity and mortality, certain individuals are resistance to malaria infection due to different immune response by the host and to a varying extent, and certain characteristics possessing protective value against infection such as A B O blood group type, sickle cell trait (HBAS) and sickle cell disease (Hbss) (Otajevwo, 2013). The association of genetic markers man has been the subject of numerous investigations since the protection afforded by sickle-cell hemoglobin against infection by falciparum malaria parasite. A broad range of available evidence suggest that the origin, distribution and relative proportion of ABO blood groups in humans may have been directly selective genetic pressure from plasmodium falciparum infection. Clinical reports of ABO blood groups and plasmodium falciparum infection reveals a correlation between disease severity and ABO groups (WHO, 2008).

However, several studies undertaken have been unable to link ABO blood groups to the incidence of malaria or to the repeat attacks of malaria. Recent studies of the pathogenesis of malaria have shown that parasite triggered red blood cell rosette formation association with the severity of clinical disease and malaria. Rosetting was established as a plasmodium falciparum virulence factor, the expression of which is modified by a host factors (Otajevwo, 2013). Anti-Rosetting activity, presumably mediated by antibodies, was found in sera from patients in malaria endemic areas, and it was demonstrated that such activity was more abundant in individuals with uncomplicated malaria than in those with cerebral disease, suggesting that humoral immunity protects against rosette formation in vivo. (Cox,

1981). Erythrocytes from individuals with sickle-cell trait, A-and B-thalassemia trait or with HbE formed smaller and weaker rosettes than did normal HbAA red blood cells. It is thought that an understanding of the nature of the relationship (if any) between ABO blood groups and malaria parasitaemia would provide an invaluable window in the effort to contain the malaria scourge, and that studies of malaria parasitaemia from that stand point in populations of malaria endemic regions will be helpful in explaining any such relationship. This is an investigation into malaria parasitaemia and possible association between malaria parasitaemia and ABO blood group among patients attending general hospital Billiri L.G.A Gombe state, Nigeria.

Statement of the Problem

Despite the above researches, there is however, still lack of consensus on possible association between ABO blood group genes and malaria parasitaemia (Omotade et al, 1999). This might be due to limited data on the association between malaria and red blood cell ABO antigens (Nkwo-Akenji et al., 2004). Hence, results of more studies on ABO blood groups association with malaria parastaemia in different parts of Nigeria and other neighboring countries would be needed before a more definite statement on the apparent trend could be made (Ilozumba and Uzozie, 2009). It is to further extend the frontiers of any possible association between malaria infection and ABO blood groups that this study aimed at investigating malaria parasitaemia association with ABO blood groups among patients attending general hospital Billiri L.G.A was carried out with the following objectives:

1. To determine whether there is association between malaria parasitaemia and gender
2. To determine whether there is association between malaria parasitaemia and age
3. To determine the prevalence of plasmodium species among patients attending general hospital Billiri
4. To determine the frequency distribution of malaria parasitataemia and blood grouping

Materials and Methods

The Study Area

Billiri Local Government Area lies within Lat. 9°50'N; 11°09'E and Long. 9.833°N 11.150°E. It covers an area of 737km² (285 sq m) with a population of 202,144 as at 2006 census. It is 45km away from the capital. The major occupation of the people of Billiri is farming.

Sampling Techniques/Collection

Blood samples collected from 180 patients visiting the Billiri General Hospital from June –August. Several methods have been derived from selecting samples that will be representative of the population. These sampling techniques include the random sampling method applied in collecting data. This is because every member has the chance of been selected without specifying. About 2 mm³ of blood was collected from each subject by venipuncture. A tourniquette was tied around the upper arm to increase blood pressure in the veins.

Examination of Blood for Malaria Parasites:

Thick and thin films were prepared using standard laboratory procedures, and examined using oil immersion (x 100) objective. Species specific characteristics of human Plasmodium species as listed by Smyth (1994) and Brooks et al (2004) were utilized in identifying the species of Plasmodium encountered.

Typing Blood for ABO Blood Group

The ABO blood group of each subject was determined using cell grouping in accordance with the procedures of Rosenfield (1976) and Cheesbrough (2000) . Anti- A, and Anti- B sera, made by Diagnostic Products in Healthcare, 28 Sterling Avenue, Edgware, Middlesex HA88BP, UK, were used.

Data Analysis

Chi-squared test was employed to determine significant differences in prevalence. Infection parameters were defined according to Bush et al., (1997)

Results

The prevalence of malaria parasitaemia in the sampled population is shown on Table 1. Out of the 180 persons examined for malaria parasitaemia, 174 (96.67 %) were positive for Plasmodium species. 93 (97.89 %) out of the 95 males examined, and 81 (95.29%) out of the 85 females examined were positive for malaria parasitaemia respectively. Chi-squared test showed that there was significant difference in prevalence among males and females. ($P < 0.05$). Malaria parasitaemia was present in all the age groups. (Table 2) However, prevalence varied from one age group to another. The 1 – 10 years age group had the highest prevalence of 100 %, and was followed in descending order by the 21 - 31 years and above, 30 years, and 11-20 year age groups, with prevalence of 97.89%, 96.36% and 90.00 %, respectively.

Chi-squared test showed the difference in prevalence among the age groups to be significant ($P < 0.05$). The prevalence of different species of Plasmodium in the sampled population is shown on Table 3. Plasmodium falciparum was identified in 159 (91.38 %) out of the 174 positive cases, thus making it the commonest cause of malaria parasitaemia in the population, P. ovale was identified in 11 (6.32 %) while P. malariae was identified in 4 (2.30 %) of the positive cases. P. vivax was not identified in the study area. The frequency distribution of ABO blood groups in the sampled population and prevalence of malaria parasitaemia among the subjects of the different blood groups is shown on Table 4. 77 (42.78 %) of the 180 persons typed for ABO blood group were group O. 52 (28.89 %) were group A, 32 (17.78 %) were group B, while 19 (10.55 %) were group AB. Malaria parasitaemia was present in all the blood groups, but prevalence varied among the groups. All 19 (100 %) of AB blood group individuals had malaria parasitaemia. For the O blood group, 76

(98.70 %) out of the 77 individuals were positive. In blood group A, 50 (96.15 %) out of the 52 individuals in the group were positive, while in blood group B, 29 (90.62%) of the 32 individuals were positive. Chi squared test showed the differences in prevalence of malaria parasitaemia among the ABO blood groups to be significant ($p < 0.05$).

Table 1: Prevalence of Malaria Parasitaemia among Patients Attending Billiri General Hospital by Gender

Gender	No. Examined	No. Infected with Plasmodium	Prevalence (%)
Male	95	93	97.89
Female	85	81	95.29
Total	180	174	96.67

Table 2: Prevalence of Malaria Parasitaemia among patients Attending Billiri General Hospital by Age

Age (years)	No. Examined	No. Infected with Plasmodium	Prevalence (%)
1 - 10	10	10	100.00
11 - 20	20	18	90.00
21 - 30	55	53	96.36
31 Above	95	93	97.89
Total	180	174	96.67

Table 3: Prevalence of Plasmodium Species among patients Attending Billiri General Hospital

Species	No. Examined	No. Infected with Plasmodium	No. Infected by species	Infection due to species (%)
P. falciparum	180	174	159	91.38
P. ovale	180	174	11	6.32
P. malariae	180	174	4	2.30
Total	180	174	174	100.00

Table 4: Frequency Distribution of ABO Blood Group patients Attending Billiri General Hospital and prevalence of Malaria parasitaemia in Relation to Blood Grouping

Blood Group	Total No. Examined	No. belonging to Blood group	Frequency (%)	No Infested by plasmodium	Prevalence (%)
A	180	52	28.89	50	96.15
B	180	32	17.78	29	90.62
AB	180	19	10.55	19	100.00
O	180	77	42.78	76	98.70
Total	180	180	100.00	174	96.67

Discussion

This study reveals that prevalence of 96.67% for malaria parasitaemia recorded in patients attending general hospital Billiri was hyperendemic for malaria, and, this is in contrast with the work reported 68.4%, 58.3%, 43.2%, 10% and 6 % obtained respectively from patients visiting hospitals in Gombe Specialist hospital, (unpublished, 2010) coastal dwellers of Lagos State (Nebe et al, 2002), blood donors in Ibadan (Edington and Gillies, 1976), (Mbanugo and Emenalo, 2004) and blood donors in Maiduguri (Ahmed et al, 2001). Findings in this study shows that prevalence of malaria parasitaemia is age-related corroborates the results of some earlier studies in Nigeria (Mbanugo and Ejims, 2000; Nebe et al., 2002; Coker et al., 2001). Prevalence of malaria parasitaemia was highest (100%) in the 1-10 years age group and declined significantly ($P < 0.05$) in older groups. A similar trend was observed for children in Awka (Mbanugo and Ejims, 2000) and coastal dwellers of Lagos State (Nebe et al., 2002).

Plasmodium falciparum was the most prevalent species in patients attending general hospital Billiri LGA, accounting for 91.38% of positive cases. The finding was consistent with results obtained by investigators in other locations and populations in Nigeria. The species was the only one identified in children in Awka (Mbanugo and Ejims, 2000) and had the highest prevalence of 97.6 %, 94.4 % and 92.5 % in Maiduguri (Ahmed et al., 2001), coastal areas of Lagos State (Nebe et al., 2002), and Owerri (Mbanugo and Emenalo, 2004), respectively. The prevalence of ABO blood groups among patients attending general hospital Billiri was in line

with the study on infants conducted in Ibadan (Omotade et al., 1999). Both studies show blood group O to be the most prevalent group. However, the prevalence of 42.78% recorded for blood group O in patients attending general hospital Billiri is higher than 54.2 % obtained for the infant population at Ibadan by Omotade et al., (1999).

Conclusion

This study further confirms that in all, there was a relative spread of malaria parasites across all blood groups. There was a statistical significant association of malaria parasitaemia and ABO blood groups among all patients sampled and this association may be due to the significant association that occurred among the patients with blood group O as shown by statistics.

It is recommended that findings in this study should be reviewed using much larger sample size. The practical implication of findings in this study is that based on the statistical insignificant association of malaria infection with ABO blood groups of sampled subjects generally, both males and females of ABO blood groups A, B, AB and O are equally at risk under any given circumstance. Consequently, available malaria prophylactic and therapeutic strategies by health agencies should be directed at individuals of all groups without any discrimination or preference for a particular group.

Recommendations

1. Having considered malaria in different blood groups among patients attending General Hospital Billiri L.G.A, it is recommended that, findings in this study should be reviewed using much larger sample size.
2. Available malaria prophylactic and therapeutic strategies by health agencies should be directed at individuals of all groups without any discrimination or preference for a particular group.
3. Good environmental management to include construction of sloppy gutters to allow free flow of water is very important in reducing breeding sites.
4. Use of long-lasting insecticide nets (LLINS) effectively especially to the under 5 age groups who are both susceptible and act as good reservoir host for gametocyte stage could be very important in reducing the scourge.
5. Free supply of long-lasting insecticide nets (LLINS) at maternity and ensure that they are utilized effectively will help a lot.

6. Free medication until one is certify free from the disease is very important because many cases are relapsing ones and could encourage development of resistance.

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