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Research Paper

ASSOCIATION OF MALARIA WITH PATIENTS WITH DIFFERENT GENOTYPES AND ABO-BLOOD GROUPS IN AWKA METROPOLIS

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Abstract

Malaria remains a big challenge in Africa where 45 countries including Nigeria are endemic. This study was to determine the association between plasmodium infection, Hemoglobin genotypes and Blood groups of patients in Awka metropolis of Anambra State, Nigeria. It will be interesting if certain hemoglobin genotypes and blood groups reduce vulnerability of plasmodium infection as the most severe health problems in developing countries. A total of 450 blood samples were examined, 400 blood samples were positive of Plasmodium infection 250 (62.5%) females, and 150 (37.5%) males) hemoglobin genotypes and blood group. Results showed that participants of hemoglobin genotypes AA were significantly infected than other hemoglobin genotypes plasmodium infection was more commonly associated with blood group O than other blood groups. Study appears to show significant association between Malaria infection, hemoglobin genotypes and blood group. The results showed that 400 patients were clinically diagnosed to have malaria parasites while the remaining 50 (12.5&) has no malaria parasites. The occurrence of Malaria among AA 240 (60%) genotypes was the most prevalent than AS 100 (15%) and SS 60 (1%) while the occurrence of malaria among blood group 200 (50%) was most prevalent than A80(20%), B70(17.5%) and AB50(12.5%) Hence hemoglobin genotypes and blood groups are predisposing factors for plasmodium infection in Awka metropolis.

Key words: Malaria, Genotypes, ABO-Blood-Groups Association, Awka Metropolis.

INTRODUCTION

Malaria is one of the most severe public Health problem and a leading cause of death in many developing countries especially Africa (WHO, 2012). Nigeria in Africa is one of the Malaria endemic countries with the world's third largest population at risk of stable malaria. Malaria accounts for over 30% of the national disease burden, making it a top health priority for allocation of resources for its prevention and control malaria is caused by parasites of the Genus-plasmodium with four main species that infect man-P. falciparum, plasmodium malaria, plasmodium ovale and plasmodium vivax, the four species are transmitted to man through the bite of infected female anopheles mosquitoes. Malaria parasite does not thrive well in the sickle

cell individuals (Alouch, 1997). This natural protection has made the hemoglobin S gene resilient in malaria infested areas, particularly Africa. The protection against malaria is bestowed only on people who have sickle cell trait and have inherited just a single gene because hemoglobin S is known to interfere with the growth and reproduction of malaria parasite (Aidoo, etal 2009) the allele that causes sickle cell anemia imparts resistance to malaria infection. However, individual with Hbess gene are not protected malaria (Creusel, etal 2014). Malaria parasites infect the red blood cells, of those with two normal allele leading to the bursting of the infected cells, but the red blood cells of individuals with one sickle allele are relatively resistant to malaria and do not normally get sickle cells anemia. The risk of malaria is lower in subject homozygous for hemoglobin AA and SS heterozygous hemoglobin As have few episodes of malaria than homozygous hemoglobin AA and SS Hemoglobin AA are very susceptible to malaria because the red cells are conducive to the growth and development of parasite (Akhigbe, 2009). An individual with antigen A in the red cell membrane is classified as having blood group. A if only B antigens are present, the blood group A. If only B antigens are present the blood group B. If both antigens are present the blood group will be AB and if no antigens are present the blood group is O (Adam, 2007). According to Ilezumba, 2009) some people were more prone to mosquito bites than others, individual's blood groups are selective to malaria infection and have resulted in the persistent increase in the prevalence of group O individuals especially after migration. The ratio of group O to A is higher in geographic regions where malaria is currently endemic (Bassey, 2010), Higher prevalence of group O and 100 prevalence of group A is found throughout sub-Sahara Africa where malaria parasite matches malaria's tropical distribution. In contract group A is a predominant blood group in the colder region of the word. The survival from malaria is associated with blood group A (NMCP, 2004).
The aim of the study is to determine the association of malaria among the patients with different genotypes and ABO blood groups

MATERIALS AND METHODS

Study Area, the research was carried out at the Diagnostic laboratory of Applied microbiology and Brewing. Nnamdi Azikiwe University, Awka, Nigeria
Sample size A total of four hundred and fifty (450) samples collected (280 females and 170 males).
Samples collection: Samples were collected from Nnamdi Azikiwe University, Medical Centre (200,) Bethel Medical clinic (150) and Onmed Diagnostic Laboratory, Awka (100) samples.
The study lasted from January 2013 to January 2015.
Methods of sample collection: Using a sterile needle and syringes and syringes, 2ml of blood was collected from patients after obtaining an informed consent for collection, the arms of the patients were swabbed with 70% Ethanol before collection of blood and the collected blood were dispended into anti-coagulant blood containers (EDOTA) for analysis.

Sample Analysis

The collected blood samples were used for malaria parasite tests, Hemoglobin genotype, Tests and ABO-blood groups tests.
Determination of parasite and blood films preparation. Thick and thin films were prepared and stained using Leishman's Stain for thin film and field's stain (A & B) for thick film. The blood films were used to identity parasite. The (Okoro, 2001) method were used for the staining process. (Okiro, 2001)
The parts of slides were parasites were well stained and white blood cells were evenly distributed. In the middle and towards the tall were selected, the oil immersion objective, objected were counted and the results were recorded as parasites per micro litre of blood.

Determination of ABO Blood Groups

White tiles glass method were used. The blood which was collected in the EDTA valutainers was used. A drop of 20% red cell suspension, each was mixed with a drop each of Anitisera A, B and D (Mmoclonal blood grouping kit, Biorex diagnostic limited BT41, IQS United Kingdom) were mixed and observed for reactions. Agglutination was observed and the result was interpreted.

All Rhesus negative groups were confirmed with a direct coombs test to rule out any weakly positive antigens (Bassey, 2010)

Determination of Hemoglobin Genotype

Equal volume of water and blood samples were dropped onto a slide and mixed very well to haemolyse the red blood cells. The haemolysed sample and the control sample (known Hb genotype AS were applied onto the cellulose acetate paper for electrophoresis at 220 volts for thirty 30 minutes. Electrophoresis movements of hemoglobin were observed, separations were also observed and movement of haemoglobin recorded after comparison with the control sample which indicated by double lines

Statistical Analysis, data collected was entered into MS Access – 207 and cleaned by building validation checks cleaned data set was uses SPSS (version 15.0) percentage of blood group was calculated using contigency tables and association between malaria infection, Haemologbin genotypes and ABO- blood groups, were tested using chi-square test. A two sided P- value of 0-05 was considered as significant.

RESULTS

The result show a total of four hundred and fifty (450) participants registered in the study, four hundred were Clinically diagnosed to have malaria parasite while the remaining fifty (50) had no malaria parasite, one hundred and fifty participants were 150 (37.5%) were males, two hundred and fifty 250 (62.5%) were females. Malaria distribution among various age groups shows that 70 (18.5%) occurred within the ages 11-15 years, 60 (15.0%) occurred within the ages of 16-20 years, 60 (15.0%) were found within the ages of 21 – 25 years 40 (10%) fell in the ages of 31 – 35 years, 15 (3.2%) were within the ages of 36 -40 years, while 15 (3.2%) were found within the ages of 46 – 50 years.

Haemologlobin Genotype among participants with malaria parasites, out of the total positive samples 240 (60%) had Hb genotype AA, 100 (25%) had Hb genotype AS, while 60 (15%) had Hb genotype SS among the 400 patients with parasitaemia .ABO blood groups among participants with malaria infection who were blood group A were 80 (20%) blood group B were 70(17.5%), Blood group AB 50(12.5%) while blood group O had 200 (50%) of all the total positive samples.

Statistical Analysis

Chi-Square test was used to analysed Association of malaria infection among different Hemoglobin genotypes and ABO – blood groups of the participated patients, As observed from the statistical analysis there was a positive correlation between HB genotypes and malaria infection among the study group

Table 1: Malaria Positive Participants Gender Distribution

Gender	No of occurrence	Percartage (%)
Male	150	37.5
Female	250	62.5
Total	400	100

Table 2: Prevalence of Malaria Among Different Age groups

Age Group (years)	No of occurrence	Percentage of occurrence (%)
5 – 10	70	18
11-15	100	26
16 – 20	60	15
21 – 25	60	17
26 – 30	40	10
31 – 35	40	10
36 – 40	15	30
41 – 45	10	20
46 – 50	5	10

Table 3: The Prevalence of Malaria among various Genotypes

Genotype	No of Occurrence	Percentage (%)
AA	240	60
AS	100	25
SS	60	15
Total	400	100

Table 4: Blood Groups Distribution among Malaria Positive Participants

Blood Group	No of Occurrence	Percentage (%)
A	80	20.0
B	70	17.5
AB	50	12.5
O	200	50.0
Total	400	100

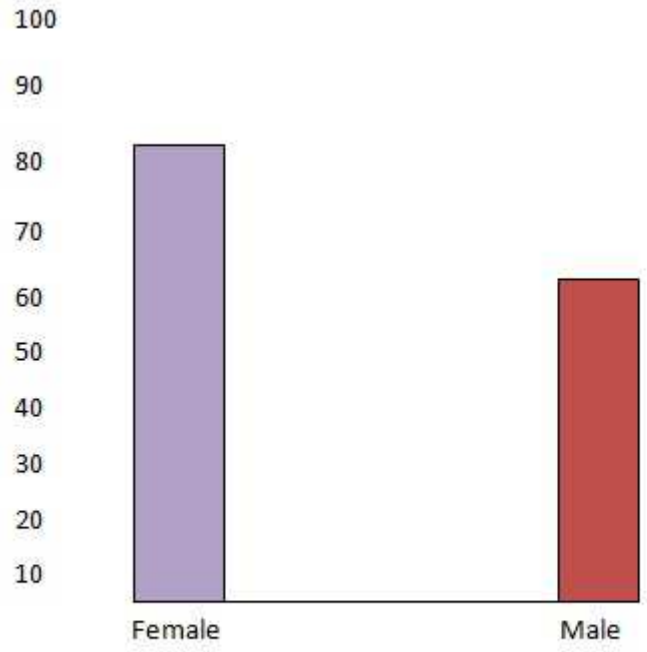

Fig 1 Gender Distribution of Malaria infection of participants

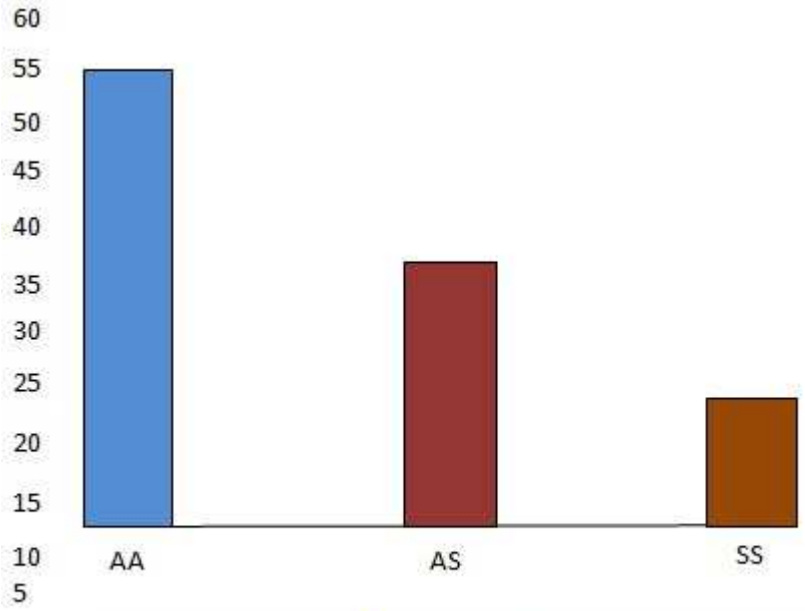

Fig 2 Prevalence of Malaria parasite among various Genotypes.

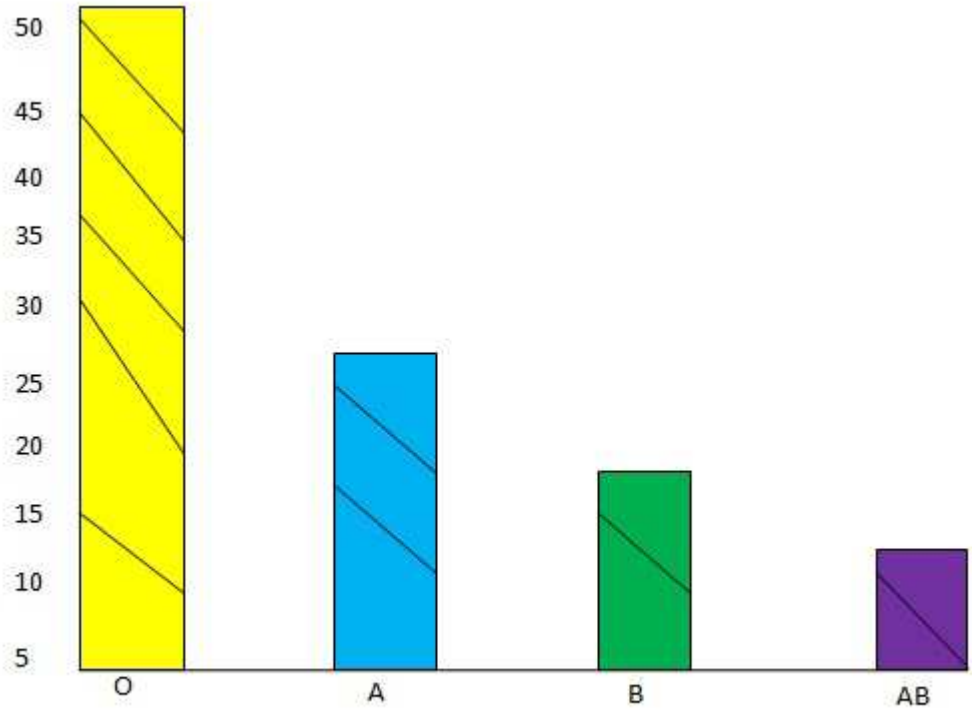

Fig 3 Distribution of Malaria parasite among various ABO blood groups

DISCUSSION

The study of association of malaria, genotypes and ABO blood groups amongst patients in Awka Metropolis.

The study showed that plasmodium, infection in haemogobin genotype. AS was low as shown in table 3 this is probably because red blood cells infected with malaria parasite deforms as a result of reduction in oxygen tension within the erythrocytes as it carries out its metabolism in line with (Pascal et al 2004). The result further showed that hemoglobin genotype SS were very low having (20.0%) positive to malaria parasite as shown in table 3. The low malaria infection in hemoglobin SS may be because it interferes with the growths and multiplication of malaria parasite Homozygous Hemoglobin S red cells produce membrance associated hemin which

oxidizes membrane lipid proteins and probably produce little of such products in accordance with (Pascal, etal 2004). Plasmodium infection was more common among hemoglobin AA individuals (60%) as shown in table 3 compared to hemoglobin AS and SS due to factors earlier mentioned in the study, the may support the hypothesis that hemoglobin AS and SS individuals suffer less malaria infection than those of hemoglobin AA (Salimonu, 2003) this study also revealed that there was relationship between malaria infection and Hb genotypes based on the statistical analysis at 0.05 level of significance. This indicates that the were difference in susceptibility to malaria among Hb genotype AA, AS and SS individuals as shown in table 3. This study also indicates that blood group O individuals were more susceptide to malaria than other blood groups A,B and AB while blood group AB was least infected with malaria as shown in table 4. In this study blood group O (50%) were more populated followed by blood group A (20%) blood group B (17.5%) and the lest was blood group AB (12.5%). This is in line with the report of (Uneke, etal 2006) that the ratio of blood to other blood groups is higher in geographic regions were malaria with low parlance of group AB is found throughout Sub-Sahara Africa, where plasmodium infection persist. Based on the statically analysis, there was no statistically significant relationship between occurrence of malaria and ABO blood group, that is to say that malaria can effect all blood groups secondly there was a statistically significant relationship between the occurrence of malaria and different hemoglobin genotype at equal, 0.05 level A significance, in other words occurrence of malaria depends on the different hemoglobin.

CONCLUSION

The study confirm that the relationship between prevalence of Malaria infections and haemoglobin genes is due to the sickling gene which is easily deformed and rapidly cleared from the circulation. Also confirm is that in a given population, the highest number of number of subject belong to ABO blood group O while the least numbers belong to blood group AB. Besides more than 50% of females sampled in ABO blood group belong to blood group O and the highest Malaria parasitamia rate was Observed among group O individuals. There was also a higher Malaria parasitamia rate among the female participants, compared to the male participants in all, there was a relative spread of malaria parasite a cross all blood groups.

RECOMMENDATION

More research efforts be made by researchers on the genetic link between Malaria, genotype and blood groups to allow for control and preventive effort in any of these areas.

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