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Research Article

Non-Secretors of ABH Antigens Are Susceptible to Falciparum Malaria

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Abstract: ABH secretor status has been associated with a number of infectious diseases. This study was carried out to determine whether secretion of ABH antigens was associated falciparum infection. A total of 600 individuals (284 males and 316 females) of age ≥16 years participated in this study after clinical examination and informed consent was obtained. The participants consisted of three groups. The first group consisted of 200 patients with symptomatic malaria. The second group consisted of 200 individuals with asymptomatic malaria while the third group (control group) consisted of 200 apparently healthy individuals without malaria as of the time of investigation. Blood and saliva samples were taken from each participant for examination of malaria parasite and secretor status respectively. Thick and thin Giemsa stained blood smear were prepared for malaria parasite examination and identification. Secretor status was determined among the participants using haemagglutination inhibition technique. The results showed that the proportion of non-secretors in the symptomatic malaria group (30.5%) was significantly higher than that of non-secretors in the control group (20.5%) ($\chi^2 = 5.264$, df = 1, p = 0.022). The proportion of non-secretors in the asymptomatic malaria group (26.5%) was not significantly different from that of non-secretors in the control group (20.5%) ($\chi^2 = 2.003$, df = 1, p = 0.157). We conclude that Non-secretion of ABH substances is associated with acute falciparium malaria.
Keywords: ABH substances, ABO blood group, Secretor, non-secretor, falciparum malaria.

INTRODUCTION

The secretor status of individuals has been linked with a number of diseases and disorders. The ability or inability of some persons to secrete water soluble ABH substances is genetically controlled. Non-secretors have been associated with some autoimmune diseases, and a number of bacterial and fungal infections [1-3]. On the other hand, secretors have been reported to be more susceptible to infections caused by norovirus [4], influenza virus, rhinovirus, respiratory syncytial virus and echovirus [5], HIV [6, 7]. The aim of this study was to determine the relationship between ABH secretor status and symptomatic and asymptomatic falciparum malaria.

MATERIALS AND METHODS

The study was carried out in Osogbo, an urban town in Southwestern Nigeria. It is about 88 Km by road NE of Ibadan. Osogbo is the trade center for a farming region. Yam, cassava, grain and tobacco are grown. Cotton is grown and used to weave cloth. The population is largely members of the Yoruba ethnic group. It has two major health facilities which were used for the collection of samples.

Participants were drawn from patients attending malaria clinics of Ladoke Akintola University of Technology Teaching Hospital, Osogbo and Osun State General Hospital, Asubiaro, Osogbo, both in Osun State, Nigeria and apparently healthy persons in the town and those who visited these facilities for blood donation or routine investigation. Ethical approval for this study was obtained from the Ethical Committee of Ladoke Akintola University Teaching Hospital, Osogbo, Nigeria.

A total of 600 individuals (284 men and 316 women) of age ≥16 years participated in this study after clinical examination and informed consent was obtained. The individuals were divided into three groups. The first group consisted of 200 symptomatic malaria patients. The second group consisted of 200 individuals with asymptomatic malaria while the third group consisted of 200 apparently healthy individuals without malaria as of the time of investigation. A sample of 5 ml of venous blood and 2 ml of saliva were collected from each participant for laboratory investigations. Thick and thin blood films stained with

3% Giemsa were examined for identification of malaria parasite. At least 200 microscopic fields were examined before declaring a smear as negative. ABO blood group antigens tests were performed by standard tile and tube techniques [8]. Controls were set up appropriately. The anti-A and anti-B were used according to the manufacturer's instructions. Secretor and non-secretor phenotypes were identified using the haemagglutination inhibition test [9].

The statistical package for social sciences (SPSS) software package was used for statistical analysis. Differences between percentages and proportions were tested by chi-square test. Sample means were compared by student's t test. A p-value of < 0.05 was considered to be significant.

RESULTS

The distribution of the study participants by sex is given in Table 1. Of the 600 participants, 284 (47.3%) were men and 316 (52.7%) were women. The mean age of the men (35.4±10.4 years) was not significantly different from the mean age of the women (33.9±11.1 years). Two hundred (33.3%) of the 600 participants had symptomatic malaria, 200 (33.3%) had asymptomatic malaria and 200 (33.3%) were apparently healthy individuals (controls) as of the time of the investigation. There was no significant difference in the distributions of men and women among the three groups ($\chi^2 = 1.016$, df = 1, p = 0.602).

The distributions of secretors and non-secretors among the test and control subjects are given in Table 2. Of the 200 symptomatic malaria subjects, 139 (69.5%) were secretors and 61 (30.5%) were non-secretors; 147 (73.5%) and 53 (26.5%) of the 200 asymptomatic malaria subjects were secretors and non-secretors respectively while 159 (79.5%) and 41 (20.5%) of the controls were secretors and non-secretors respectively. Non-secretors in the symptomatic malaria group were significantly higher than non-secretors in the control group ($\chi^2 = 5.264$, df = 1, p = 0.022). Non-secretors in the asymptomatic malaria group were higher than non-secretors in the controls but the difference was not statistically significant ($\chi^2 = 2.003$, df = 1, p = 0.157). Overall, non-secretors in the malaria groups (symptomatic and asymptomatic) were significantly higher than non-secretors in the control group ($\chi^2 = 4.454$, df = 1, p = 0.035). The distributions of ABO blood group phenotypes in test groups and control group are given in Table 3. There was no significant variation in the distribution of ABO blood group phenotypes among the symptomatic malaria group, asymptomatic malaria group and controls ($\chi^2 = 2.183$, df = 6, p = 0.902). There was no significant difference between ABO distribution in the symptomatic malaria group and control group ($\chi^2 = 1.527$, df = 3, p = 0.676) or between ABO distribution in the asymptomatic malaria group and control group ($\chi^2 = 1.475$, df = 3, p = 0.688). The secretor status and ABO blood group distributions in the test groups and control group are given in Table 4. Secretor status did not vary significantly with ABO blood group phenotypes in the symptomatic malaria group ($\chi^2 = 2.287$, df = 3, p = 0.515) or asymptomatic malaria group ($\chi^2 = 3.179$, df = 3, p = 0.365) but varied significantly with ABO blood group phenotypes in the control group ($\chi^2 = 8.5$, df = 3, p = 0.036). In the control group, blood group O individuals who were secretors were significantly more than non-O individuals who were secretors ($\chi^2 = 8.089$, df = 1, p = 0.004). There was no significant difference between group O individuals who were secretors and non-O group who were secretors in the symptomatic malaria group ($\chi^2 = 0.675$ df = 1, p = 0.411) or in the asymptomatic group ($\chi^2 = 2.027$, df = 1, p = 0.155).

Table 1: Showing Distribution of Malarial subjects and controls by sex among the Study Population in Osogbo, Southwest Nigeria

Subjects	Malarial (test) groups (%)		Control group (%)	
	Symptomatic	Asymptomatic		Total (%)
Male	90 (45.0)	94(47.0)	100(50.0)	284(47.3)
Female	110 (55.0)	106(53.0)	100(50.0)	316(52.7)
Total	200(33.3)	200(33.3)	200(33.3)	600(100.0)

Table 2: Showing Distributions of ABH Secretors and Non-secretors in Malarial groups and control group in Osogbo, Southwest Nigeria

Subjects	Malarial (test) groups(%)		Control group(%)	Total(%)
	Symptomatic	Asymptomatic		
Secretors	139(69.5)	147(74.5)	159(79.5)	445(74.2)
Non-secretors	61(30.5)	53(26.5)	41(20.5)	155(25.8)
Total	200(33.3)	200(33.3)	200(33.3)	600(100.0)

Table 3: Showing Distribution of ABO Blood Group Phenotypes in Malarial groups and Control group in Osogbo, Southwest Nigeria

Subjects	Malarial (test) groups(%)		Control group(%)	Total(%)
	Symptomatic	Asymptomatic		
O	94(47.0)	96(48.0)	103(51.5)	293(48.8)
A	51(24.0)	48(25.5)	42(21.0)	141(23.5)
B	44(21.5)	43(22.0)	46(23.0)	133(22.2)
AB	11(6.5)	13(5.5)	9(4.5)	33(5.5)
Total	200(33.3)	200(33.3)	200(33.3)	600(100.0)

Table 4: Showing Secretor Status and ABO Blood Group Distributions in the Malarial Groups and Control Group in Osogbo, Southwest Nigeria

Subjects	Malarial groups(%)				Control group(%)	
	Symptomatic		Asymptomatic			
	S	NS	S	NS	S	NS
O	68(72.3)	26(27.7)	75(78.1)	21(21.9)	90(87.3)	13(12.7)
A	33(68.8)	18(31.2)	32(66.7)	16(33.7)	29(69.0)	13(31.0)
B	32(72.7)	12(27.3)	32(74.4)	11(25.6)	34(73.9)	12(26.1)
AB	6(54.5)	5(45.5)	8(61.5)	5(38.5)	6(66.7)	3(33.3)
Total	139(69.5)	61(30.5)	147(73.5)	53(26.5)	159(79.5)	41(20.5)

DISCUSSION

This study showed that there was a significant relationship between secretor status and falciparum malaria. Individuals who were non-secretors were more prone to malaria than secretors. Many infectious diseases had been associated with inability to secrete ABH substances. For instance, non-secretors had been associated with urinary tract infection [10], oral candidiasis [11, 12], vaginal candidiasis [13], influenza [1] and meningitis and pneumonia [2]. This observed association may be linked with the Le^a antigens which are present in greater amounts on the epithelial surfaces of non-secretors.

The results of this study showed that secretor status was not dependent on sex either in the test or control groups. This is line with reports of many other studies carried out on either infected subjects or apparently healthy ones. Also, this study showed no significant association between ABO blood group phenotypes distribution in the test and control groups. This is consistent with the results of our previous studies carried out in the same region [17]. Our view is that the parasite can readily invade any of groups O, A, B and AB but its ability to flourish in the blood type differs. Studies had shown that rosette formation which had been linked to severity of malaria [18] were more associated with parasitized red blood cells of either A, B or AB blood groups than with those of O blood group [18-20].

The results in this study showed a significant relationship between ABO blood group phenotypes distribution and secretor status in the control group. Emeribe *et al.* [14] and Jaff [16] reported similar findings in seemingly healthy individuals. However, the results obtained in the test groups differed from those of the control as ABO blood group distribution did not vary significantly with secretor status. Blood group O secretors were significantly less associated with malaria than non-O secretors. Group O secretors had been reported to be protected from some diseases or have less aggressive diseases [16]. That a large number of O individuals secrete ABH antigens compared to the other blood groups is largely responsible for the low incidence of malaria observed in this blood type.

CONCLUSION

We conclude that non-secretion of ABH substances is associated with acute falciparum malaria. Therefore, non-secretors should take extra measures to guard against coming down with malaria infection.

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