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Research Article

URINARY SCHISTOSOMIASIS: ASSOCIATION WITH ABO BLOOD GROUP AND EFFECT ON SOME HAEMATOLOGICAL PARAMETERS

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ABSTRACT
The present study was carried out to determine the relationship between urinary schistosomiasis and ABO blood group and the effect of urinary schistosomiasis on some haematological parameters among children at Ilie, a rural community in Southwestern Nigeria, a total of 200 subjects (7-14 years) divided into two groups were examined. The first group consisted of 100 individuals who had *Schistosoma haematobium* infection while the second group consisted of 100 healthy controls. Urine samples were collected from the subjects for detection of *S. haematobium* ova and 5 mL of blood was withdrawn from each participant for complete blood count and ABO blood grouping. Results showed that infection with urinary schistosomiasis was not significantly associated with A, B, and O blood groups (χ^2 = 2.69; df = 2; p = 0.26) but severe urinary schistosomiasis varied significantly with A, B, and O blood groups (χ^2 = 9.81, df = 2, p = 0.007). Severe urinary schistosomiasis was significantly more associated with group A individuals than group O individuals (χ^2 = 9.87; df = 1; p = 0.002). While the mean values of haemoglobin concentration, lymphocyte and eosinophil counts for the control subjects (122.0 g/L, $2.0x10^9$ /L and $0.3x10^9$ /L respectively) were within the normal ranges, the mean values of haemoglobin concentration and lymphocyte count for the infected subjects were below the normal ranges (105.0 g/L, $1.0x10^9$ /L respectively) while the eosinophil count was above the normal range ($1.5x10^3$ /L). The present study showed that severe urinary schistosomiasis varied significantly with ABO blood groups with group A being the most associated. Also, it was associated with anaemia and eosinophilia.

Keywords: *ABO Blood Group, Haematological Parameters, Urinary Schistosomiasis*

INTRODUCTION
Schistosomiasis is one of the most common human parasitic diseases which poses serious health hazard second only to malaria in tropical and sub-tropical countries. About 200 million people are infected worldwide 60% of which are symptomatic (Gryseels *et al.*, 2006). The people at high risk include children who live in endemic areas and come in contact with fresh water harboring the infected snail intermediate host.

In Nigeria, schistosomiasis is hyperendemic in many states in Northern and Southwestern Nigeria while low to moderate endemicity exist in Southeastern Nigeria (Ofoezie, 2002). Of the many species of *Schistosoma* infecting humans, *S. haematobium* is on the lead affecting more than 153 million people worldwide (WHO, 2007). It is the most prevalent species in Nigeria occurring in nearly all endemic foci (Ofoezie, 2002). It is characterized with haematuria, dysuria, nutritional deficiency, growth retardation, bladder lesions, high risk of bladder cancer, and kidney failure (Mostafa *et al.*, 1999). There are reports on the prevalence of urinary schistosomiasis in various parts of the country (Okoli and Odaibo, 1999; Mafiana *et al.*, 2003; Oladejo and Ofoezie, 2006; Opara *et al.*, 2007; Biu *et al.*, 2009; Imarenezor *et al.*, 2013) but its effect on blood cells has not been well documented. Also, reports on the association between ABO blood group and schistosomiasis are scanty (Kassim and Ejezie, 1982; Oniya and Jeje, 2010). This scarcity of reports on the effect of *S. haematobium* on blood cells and its association with ABO blood group prompted this investigation in Ilie, a urinary schistosomiasis endemic community in Southwestern Nigeria.

MATERIALS AND METHODS

Subjects

The study was carried out in Ilie, a rural community in Southwestern Nigeria. The study population consisted of 200 human subjects (7-14 years) who were divided into two groups of 100 each. The first group consisted of 100 male pupils infected with *S. haematobium* from schools in Ilie, the rural community and the second group consisted of 100 apparently healthy male pupils. Ethical approval for this study was obtained from the Joint Ethical Committee of Ladoke Akintola University Teaching Hospital, Osogbo and Ladoke Akintola University of Technology, Ogbomoso, Oyo State, Nigeria.

A sample of 5 mL of venous blood was collected from each participant into ethylene diamine tetra-acetic acid (EDTA) bottle for full blood count. Full blood count was done using an automated Coulter counter Sysmex KX-2IN model. ABO blood group antigens tests were performed by standard tube and tile techniques (Waters, 1994). Urine samples were collected between 10.00 and 14.00 h and detection of *S. haematobium* ova was carried out by microscopy and infection with Schistosome egg counts ≥ 50 /10mL was considered severe (Cheesbrough, 1999).

Statistical Analysis

The statistical package for Social Sciences (SPSS version 14) was used for statistical analysis. Values obtained for the physical and haematological parameters in the different study groups were expressed as mean±standard deviation and compared using student's t test. A p-value of <0.05 was considered to be significant.

RESULTS AND DISCUSSION

The physical and haematological parameters and ABO blood group of *S. haematobium*-infected subjects and control subjects are given in table 1. The mean age and body mass index (BMI) of the *S. haematobium*-infected subjects were not significantly different from those of controls. The mean values of haemoglobin concentration and haematocrit were significantly lower in *S. haematobium*-infected subjects than in control subjects ($p < 0.001$ and $p < 0.001$ respectively). The mean value of leucocyte in *S. haematobium*-infected subjects was significantly higher compared to that of control subjects ($p < 0.001$). While the mean values of neutrophil, eosinophil and monocyte were significantly higher in *S. haematobium*-infected subjects than in controls ($p < 0.001$, $p < 0.001$, $p < 0.001$), the mean value of lymphocyte was significantly lower ($p < 0.001$). There was no significant difference in the mean values of platelet count between *S. haematobium*-infected subjects and controls ($p = 0.1$). Of the 100 infected subjects, 43 (43%) had blood group O, 35(35%) had blood group A, 17 (17%) had blood group B and 5(5%) had group AB while 49 (49%), 25 (25%), 22 (22%) and 4 (4%) of the control subjects had blood group O, A, B and AB respectively. There was no significant association between frequency of urinary schistosomiasis infection and A, B and O blood groups ($\chi^2 = 2.69$, df = 2, $p = 0.26$).

The physical and haematological parameters of subjects who had schistosome ova ≥ 50 /10mL were compared to those of subjects who had < 50 /10mL and the results are given in table 2. The mean age and body mass index (BMI) of subjects who had schistosome ova ≥ 50 /10mL were not significantly different from those of subjects who had < 50 /10mL. However, the mean values of haemoglobin concentration and haematocrit were significantly lower in subjects who had schistosome ova ≥ 50 /10mL than in subjects who had < 50 /10mL ($p < 0.001$ and $p = 0.04$ respectively). Also, the mean values of total leucocyte and eosinophil were significantly higher in subjects who had schistosome ova ≥ 50 /10mL than in subjects who had < 50 /10mL ($p < 0.001$ and $p < 0.001$ respectively) but their mean values of neutrophil, lymphocyte and monocyte were not significantly different ($p = 0.14$, $p = 0.24$ and $p = 0.38$ respectively). Of the 26 subjects with severe infection (schistosome eggs ≥ 50 /10mL), 5, 15, 5 and 1 had blood groups O, A, B and AB respectively while 38, 20, 12 and 4 of those who had schistosome eggs < 50 /10mL had blood groups O, A, B and AB respectively. Severe urinary schistosomiasis varied significantly with blood groups O, A and B ($\chi^2 = 9.81$, df = 2, $p = 0.007$). It was significantly more associated with group A (42.9%) individuals than group O (11.6%) ($\chi^2 = 9.87$, df = 1, $p = 0.002$). Also, it was more associated with group B (29.4%) than group O (11.6%) but the difference was not statistically

significant (Yates $\chi^2 = 1.64$, p = 0.20). Similarly, it was more associated with group A (42.9%) than group B (29.4%) but the difference was not statistically significant ($\chi^2 = 0.87$, df = 1, p = 0.34).

Table 1: Physical and haematological parameters and ABO blood group of subjects infected with *S.haematobium* and controls

Parameter	Infected subjects n = 100 Mean±SD /No.	control subjects n = 100 Mean±SD/No.	p-value
Physical			
Age (years)	11.8±1.9	12.3±1.9	0.09
BMI (Kg/m^3)	18.6±3.2	19.1±2.5	0.13
Haematological			
Haematocrit (%)	31.5±3.9	36.0±5.4	<0.001
Haemoglobin conc. (g/L)	105.0±16.0	122.0±13.1	<0.001
Leucocyte count (10^9/L)	7.3±1.1	5.2±2.1	<0.001
Neutrophil	4.4±0.9	2.8±0.7	<0.001
Lymphocyte	1.0±0.7	2.0±0.6	<0.001
Eosinophil	1.5±0.8	0.3±0.1	<0.001
Monocyte	0.4±0.1	0.1±0.1	<0.001
Platelet count (10^9/L)	212.0±74.0	230.0±81.0	0.1
ABO phenotype			
O	43	49	0.39
A	35	25	0.12
B	17	22	0.37
AB	05	04	1.0

Table 2: Physical and haematological parameters and ABO blood group of subjects infected with *S.haematobium* with high (≥ 50/ 10ml) and low (< 50/10 ml) concentration of ova in urine

Parameter	Ova group ≥50 n = 26 Mean±SD/No	Ova group <50 n = 74 Mean±SD/No	p-value
Physical			
Age (years)	11.4±1.8	11.5±1.9	0.65
BMI (Kg/m^3)	18.0±3.0	18.8±3.2	0.14
Haematological			
Haematocrit (%)	30.0±4.2	32.0±3.9	0.04
Haemoglobin conc. (g/L)	98.0±10.0	107.0±10.5	<0.001
Leucocyte count (10^9/L)	7.8±0.6	7.1±1.1	<0.001
Neutrophil	4.5±0.7	4.3±0.8	0.14
Lymphocyte	1.0±0.6	1.1±0.7	0.24
Eosinophil	2.1±0.7	1.3±0.8	<0.001
Monocyte	0.4±0.1	0.4±0.1	0.38
Platelet count (10^9/L)	206.0±69.0	214.0±75.0	0.29
ABO phenotype			
O	05	36	<0.004
A	15	14	<0.006
B	05	10	0.72
AB	01	04	1.0

Discussion

The present study showed no significant association between urinary schistosomiasis infection and frequencies of ABO blood groups. Kassim and Ejezie (1982), Deribew *et al.*, (2010) and Oniya and Jeje (2010) reported similar observations. This implies that differences in ABO blood group do not influence

infection with *S. haematobium.* However, ABO blood groups influenced the severity of the infection. Group O individuals were significantly protected against severe infection while group A individuals were significantly susceptible to it. This observation is in line with those of Ndamba *et al.,* (1997) and Deribew *et al.,* (2012) who reported significantly higher intensity of urinary schistosomiasis among children of blood group A compared to those of group O but differs from the reports of Oniya and Jeje (2010) which observed no association between severe urinary schistosomiasis and ABO blood groups. Although the exact mechanism of susceptibility to severe infection is not known, one probable explanation is that in blood groups other than group O there is enhanced ability of young schistosomula to adsorb host blood group antigens on to their surfaces which mask antigenic sites thereby preventing specific anti-parasite antibody from binding (Clegg, 1974, Deribew *et al.,* 2012).

Anaemia was associated with urinary schistosomiasis *Schistosoma haematobium*-infected subjects had lower haemoglobin concentration compared to the controls and the value was below the lower limit of normal range while that of the controls was within the normal range (Cheesbrough, 2000). Also, lower haemoglobin concentration was observed among infected subjects who had ≥ 50 /10mL than those who had less. Anaemia among *S. haematobium* subjects observed in this study is in line with the findings of some researchers (Davis *et al.,* 1981; Latham *et al.,* 1990; Prual *et al.,* 1992) but at variance with the report of others (Mengue *et al.,* 1993). Anaemia caused by *S. haematobium* is due to chronic blood loss as ova penetrate the urinary tract and heavy infection is characterized by iron loss and red cell haemolysis (Prual *et al.,* 1992; Mohammed *et al.,* 2006) resulting in iron deficiency anaemia.

This study showed that haemoglobin concentration was related to the intensity of infection. This is consistent with the report of Deribew *et al.,* (2013) who observed a significantly negative correlation between egg intensity and haemoglobin, Okafor and Elenwo (2007) who reported that egg intensity was significantly related to haemoglobin concentration and Friedman *et al.,* (2005) who reported that the risk of anaemia correlated with infection intensity.

Our result showed significantly higher leucocyte count among the infected subjects compared to the controls. Also, among the infected subjects, leucocyte and eosinophil counts were significantly higher in those who had ≥ 50/10ml than those who had less. The increase in leucocyte observed was due to increases in neutrophils, eosinophils and monocytes and signified a general immunological response. This result is consistent with earlier report of Mohammed *et al.,* (2006) who reported increases in these blood cells in addition to increase in lymphocyte. However, while the neutrophil and monocyte counts in infected subjects were still within the normal ranges, the eosinophil count was above the upper limit of the normal range signifying eosinophilia. This result is in line with those of other researchers (Davis *et al.,* 1981; Mohammed *et al.,* 2006) who reported a significant relationship between eosinophilia and intensity of infection. Infection with schistosomes had been observed to be capable of stimulating eosinophil production and severe eosinophilia had been associated with parasitic infection (Dacie *et al.,* 1994).

Conclusion

Severe urinary schistosomiasis was significantly associated with group A individuals, anaemia and eosinophilia.

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