ABO BLOOD GROUP AND SECRETOR STATUS IN HIV INFECTION IN OSOGBO, SOUTHWESTERN NIGERIA

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ABSTRACT

The present study was carried out to determine whether there is any association between ABO blood group, secretion of ABO antigens and HIV-1 infection. A total of 240 individuals of age ≥16 years consisting of 117 HIV-1 positive individuals and 123 HIV negative individuals (controls) participated in this study. A sample of 5 mL of blood was withdrawn from each participant for HIV and ABO blood grouping tests. Antibodies to HIV were carried out using determine rapid HIV-1/HIV-2 test kit and Enzyme linked immunosorbent assay (ELISA) and then confirmed with Western blot (WB). Secretors and non-secretors phenotypes were determined by haemagglutination inhibition technique using saliva. Of the 117 HIV-1 individuals, 101(88.9%) were secretors and 13(11.1%) were non-secretors while 92 (74.8%) and 31(25.2%) of the 123 HIV negative subjects were secretors and non-secretors respectively. Secretors were significantly more associated with HIV infection than non-secretors (χ^2 = 7.953, df = 1, p = 0.005). ABO blood group was not significantly associated with HIV infection (χ^2 = 1.66, df = 2, p = 0.558). There was a significant association between group O and secretor in controls (χ^2 = 5.964, df= 1, p = 0.015) but not in HIV infection (χ^2 = 0.004, df = 1, p = 0.949). These findings suggest that while there is no association between ABO blood groups and HIV infection, secretion of ABH antigens is associated with HIV infection.

Keywords: ABO blood group, ABH antigens, Secretors, Non-secretors, HIV infection.

INTRODUCTION

The ABO blood group system is a classification of human blood based on the inherited properties of red blood cells as determined by the presence or absence of the antigens A and B, which are carried on the surface of the red cells. Persons may therefore be group A, group B, group AB, or group O. The ABO blood group has been associated with a number of diseases. For example, group A individuals are more associated with such cancers as ovarian, cervical, rectal, breast, stomach and leukaemia than other blood types (Greenwell, 1997); group A individuals are more susceptible to coronary heart disease than group O individuals (Anstee, 2010); groups A and B are more susceptible to thrombotic disorders than group O while the latter are more prone to bleeding than the former (Schleef *et al*., 2005; Clark and Wu, 2011); group O are more associated with peptic ulcer than the other blood types (Reid *et al*., 2012). Studies so far carried out on association

between ABO and HIV infection have been inconclusive (Motswaledi *et al*., 2013). According to Motswaledi et al. (2013) studies which have reported group O to be highly

susceptible to HIV infection are deficient in their statistical analysis and have been contradicted by other investigators.

The ability or inability to secrete ABH antigens in water soluble form is controlled by a pair of alleles, with dominant allele, Se for secretion and se for non-secretion. Persons with genotype SeSe and Sese are called secretors and those with genotype sese are non-secretors. This ability or inability to secrete ABH blood group substances into body fluid has been linked with susceptibility to a number of infections. For instance, non-secretors have been significantly associated with infections caused by *Haemophilus influenza* (Blackwell *et al*., 1986a), *Neisseria meningitides* and *Streptococcus pneumoniae* (Blackwell *et al*., 1986b), *Candida* species (Thom *et al*., 1989), *Escherichia coli* (Sheinfeld *et al*., 1989) and *Plasmodium* spp (Igbeneghu and Olisekodiaka, 2014) than secretors. Also, non-secretors have been reported to be at greater risk of gastroduodenal disease (Dickey *et al*., 1993), ankylosing spondylitis, diabetes mellitus, Graves' disease (Shinebaum *et al*., 1987; Blackwell *et al*., 1987; Collier *et al*., 1988), thrombotic and heart disease (D'Adamo and Kelly, 2001) than secretors. On the other hand, secretors have been reported to be more susceptible to infections caused by norovirus (Thorven *et al*., 2005), influenza virus, rhinovirus, respiratory syncytial virus and echovirus than non-secretors (Raza *et al*., 1991). Ali *et al*. (2000) reported a significant association between HIV 1 infection and secretion of ABH substances among Senegalese commercial sex workers and Kindberg *et al*. (2006) reported slow disease progression of HIV 1 in non-secretors. In Nigeria, we are not aware of any study on the relationship between ABO blood group and secretor status in HIV infection. Therefore the aim of this study was to determine whether there was any association between ABO blood group and the ability to secrete ABH antigens in HIV infection.

METHODOLOGY

STUDY AREA AND SUBJECTS

The study was carried out at Osogbo in Osun State, Southwestern Nigeria. Participants in both the HIV and control groups were drawn from individuals attending HIV clinics of Ladoke Akintola University of Technology Teaching Hospital and Osun State General Hospital, Asubiaro, both in Osogbo, Osun State, Nigeria. A total of 240 individuals of age ≥16 years participated in this study. Informed consent was obtained from the participants. The individuals were divided into two groups. The first consisted of 117 with HIV infection. The second group (control group) consisted of 123 apparently healthy individuals without HIV infection as of the time of investigation. Ethical approval for this study was obtained from the Joint Ethical committee of Ladoke Akintola University of Technology, Ogbomoso and Ladoke Akintola University of Technology Teaching Hospital, Osogbo, Nigeria.

From each participant, 5 ml of venous blood was collected into ethylenediaminetetraacetic acid (EDTA) bottle and plain bottle for HIV testing and ABO blood grouping and 2 ml of saliva was collected for determination of secretor and non-secretor phenotypes. ABO blood grouping was done by standard tile and tube techniques (Dacie and Lewis, 1994). Antibodies to HIV were determined using determine rapid HIV 1/HIV 2 test kit (Abbott), enzyme linked immunosorbent assay (ELISA) (GenScreen plus HIV Ag-Ab test kit, Pasture, Paris) and then confirmed with Western blot (New-

LAV Blot 1, BioRad, France). Secretor and non-secretor phenotypes were identified using the haemagglutination inhibition technique (Rahman, 1997).

The statistical package for social sciences (SPSS) 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

Of the 240 subjects who participated in this study, 124 (51.7%) were females and 116 (48.3%) were males. Of the 124 female participants, 61 (49.2%) had HIV infection and 63 (50.2%) were controls while 56 (48.3%) of the 116 male participants had HIV infection and 60 (51.7%) were controls. There was no significant association between males and females infected with HIV infection ($\chi^2 = 0.02$, df = 1, p = 0.887). Also, the mean ages of the HIV infected and control groups were not significantly different (t = 0.57, p = 0.29).

The distribution of ABO blood group among the HIV-infected subjects and controls is given in Table 1. Altogether, 117 (48.8%) had HIV-1 infection and 123 (51.2%) were controls. Of the 117 individuals with HIV infection, 47.0%, 27.3%, 23.1% and 2.6% had blood type O, A, B and AB respectively while 51.2%, 21.1%, 23.6% and 4.1% of the 123 controls had blood type O, A, B and AB respectively. The O, A and B blood groups distributions in the HIV and control groups were similar overall ($\chi^2 = 1.66$, df= 2, p = 0.558) and in both males ($\chi^2 = 0.60$, df= 2, p = 0.741) and females ($\chi^2 = 0.69$, df= 1, p = 0.706). Also, Table 1 shows that blood groups O and non-O distributions in the HIV and control groups were similar overall ($\chi^2 = 0.425$, df= 1, p = 0.514) and in both males ($\chi^2 = 0.028$, df= 1, p = 0.867) and females ($\chi^2 = 0.541$, df= 1, p = 0.462). This implied that there was no significant association between ABO blood group and HIV infection overall and in both sexes.

Of the 240 individuals examined in this study, 196 (81.7%) and 44 (18.3%) were secretors and non-secretors respectively with 101 (81.5%) of the 124 females and 95 (81.9%) of the 116 males as secretors. There was no significant relationship between secretors status and sex ($\chi^2 = 0.008$, df = 1, p = 0.929). The distribution of secretors and non-secretors among the HIV-infected subjects and controls is given in Table 2. Of the 117 subjects with HIV infection, 104 (89.0%) were secretors and 13 (11.0%) were non-secretors while 92 (75%) and 31 (22.0%) of the 123 controls were secretors and non-secretors respectively. The secretor status distributions in the HIV and control groups varied significantly overall ($\chi^2 = 7.953$, df = 1, p = 0.005) and in both male ($\chi^2 = 3.987$, df = 1, p = 0.045) and female ($\chi^2 = 3.976$, df = 1, p = 0.046) groups. This implied that the ability to secrete ABH substances varied significantly with HIV infection.

ABO and secretor status distributions among the HIV individuals and controls are given in Table 3. Among the HIV individuals who were secretors, 47.1% had blood group O, 27.9% A, 23.1% B, 1.9% AB while among the HIV individuals who were non-secretors, 46.1% O, 23.1% A, 23.1% B, 7.7% AB. Similarly, for the controls who were secretors, 57.6% had blood group O, 18.5% A, 20.7% B, 3.3% AB while among the non-secretor controls, 32.3% had blood group O, 29.0% A, 32.3% B, 6.5% AB. There were no significant association between secretor status and O, A and B

blood groups for HIV individuals ($\chi^2 = 0.004$, df = 1, p = 0.949) and controls ($\chi^2 = 5.523$, df = 2, p = 0.063). However, while secretor status did not vary significantly between blood types

O and non-O in the HIV group (χ^2 = 0.004, df = 1, p = 0.949), it varied significantly between blood types O and non-O in the control group (χ^2 = 5.964, df = 1, p = 0.015) with O individuals being more secretors than non-O individuals. This implied that O secretors were not associated with HIV infection.

TABLE 1: ABO BLOOD GROUP DISTRIBUTION IN THE HIV INDIVIDUALS AND CONTROLS IN OSOGBO, SOUTHWESTERN NIGERIA

Blood group	All Subjects		Males		Females	
	HIV(%)	Controls(%)	HIV(%)	Controls(%)	HIV(%)	Controls(%)
O	55(47.0)	63(51.2)	29(51.8)	32(53.3)	26(42.6)	31(49.2)
A	32(27.3)	26(21.1)	15(26.8)	12(20.0)	17(27.9)	14(22.2)
B	27(23.1)	29(23.6)	12(21.4)	14(23.3)	15(24.6)	15(23.8)
AB	3(2.6)	5(4.1)	0(0.0)	2 (3.3)	3(4.9)	3(4.8)
TOTAL	117	123	56	60	61	63

TABLE 2: SECRETOR STATUS DISTRIBUTION IN THE HIV INDIVIDUALS AND CONTROLS IN OSOGBO, SOUTHWESTERN NIGERIA

Secretor status	All Subjects		Males		Females	
	HIV (%)	Controls (%)	HIV (%)	Controls (%)	HIV (%)	Controls (%)
Secretor	104(88.9)	92(74.8)	50(89.3)	45(75.0)	54(88.5)	47(74.6)
Non-secretor	13(11.1)	31(25.2)	6(10.7)	15(25.0)	7(11.5)	16(25.4)
TOTAL	117	123	56	60	61	63

TABLE 3: ABO BLOOD GROUP AND SECRETOR STATUS DISTRIBUTIONS IN THE HIV INDIVIDUALS AND CONTROLS AT OSOGBO, SOUTHWESTERN NIGERIA

Blood group (%)	HIV Individuals		Controls	
	Secretor (%)	Non-secretors (%)	Secretor (%)	Non-secretor
O	49(47.1)	6(56.1)	53(57.6)	10(32.3)
A	29(27.9)	3(23.1)	17(18.5)	9(29.0)
B	24(23.1)	3(23.1)	19(20.7)	10(32.3)
AB	2(1.9)	1(7.7)	3(3.3)	2(6.5)
TOTAL	104	13	92	31

DISCUSSION

In this study, the distribution of ABO blood groups in the control group was similar to previous reports of studies from the same region (Falusi *et al*., 2000; Igbeneghu *et al*., 2012). Since the distribution of ABO blood groups in the test group was similar to that of the control group, it implied that there was no significant association between ABO blood group and HIV infection in the study population. This observation is in line with the reports of Ukaejiofo and Nubila (2006) and Banu *et al.* (2011) who found no association between ABO blood group and HIV infection. It can therefore be said that the ABO blood group system does not seem to influence HIV infection.

In this study, the frequency of secretors and non-secretors in the control group compared with what is obtainable worldwide where about 20% are non-secretors (Dacie and Lewis, 1994). However, the distribution of secretors and non-secretors in the test group was significantly different from that of the control group. We observed that HIV infection was more associated with secretors than non-secretors. Similar observation of significant association between secretor status and HIV were reported by Ali *et al*. (2000) on commercial sex workers in Senegal and Blackwell *et al*. (1991) on a small study group. The observed association between ability to secrete ABH antigens and HIV infection is thought to be related to variations in cell surface carbohydrates between secretors and non-secretors by Ali *et al*. (2000) who opined that non-secretors might be at decreased risk for HIV-1 infection due to possession of either unmodified lactotetrasylceramide or lack of fucosylation which prevent the virus from binding to or crossing the epithelium.

In this study, a significantly high incidence of secretor status in blood group O individuals was observed among the controls compared to the non-O individuals. This is in line with the study of Jaff (2010) who reported a similar observation among apparently healthy individuals. The fact that the incidence of secretor status in blood group O individuals among the HIV subjects was not significantly different from that of the non-O implied that group O individuals were not more susceptible to HIV infection than the other blood groups.

In conclusion, this study shows an association between the ability to secrete ABH antigens and HIV 1 infection, but not between the ABO blood group system and HIV 1 infection and interactions between ABO and secretor status have no influence on HIV 1 infection.

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