ABH SECRETOR STATUS OF STUDENTS IN THE COLLEGE OF MEDICAL SCIENCES, UNIVERSITY OF MAIDUGURI BY INHIBITION METHOD

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ABSTRACT
Background: ABH blood group and secretor status of individuals are inherited independently although both may be associated with diabetes, autoimmune diseases and heart diseases.
Aim: A cross-sectional study was employed to determine the ABH blood group and secretor status of students in the University of Maiduguri.
Methodology: Two ml blood and 3ml saliva were collected from each study participants and were assayed independently. The ABO blood group and secretor status were determined by tube method and haemagglutination inhibition technique respectively.
Results: A total of 235 apparently healthy students of the College of Medical Sciences participated in this study. Of the 235 participants, 97.4% are ABH secretors whereas 2.6% are ABH non-secretors. One hundred and nineteen 119(50.6%) of the subjects are males, of which 115 are secretors while 4 are non-secretors. Among the 116(49.4%) females who participated, 114 are secretors while 2 are non-secretors. The distribution of ABO blood group among the subjects shows that 21.3% were group A, 20.8% group B, 8.5% group AB and 49.4% group O.
Conclusion: In this study, Blood group O is the commonest while AB was the least among the subjects. Overall, there are more secretors than non-secretors among the subjects. However, the study suggests that the ability to secrete ABH substances is independent of ABO blood group genes. The analysis also helps in revealing the prevalence of secretor status among the students. With the associations of disease and secretors, the secretor status of individuals may play a role in the diagnosis and management of diseases.
Keywords: ABO blood group, secretor status, ABH antigens

INTRODUCTION

In 1900, Karl Landsteiner recognized the existence of the ABO blood group system in humans comprising A, B and O groups. Later an AB blood group was added to the ABO blood group system by Decastello and Sturly in 1902. The molecular basis of the ABO blood group antigens was elucidated by Yamamoto, 1990. The gene codes a glycosyltransferase, which transfers N-acetyl D-galactosamine (group A) or D-galactose (group B) to the non-reducing ends of glycan on glycoproteins and glycolipids. The group O phenotype results from inactivation of the A1 glycosyltransferase gene and the non-reducing ends of the corresponding glycan in group O subjects express the blood group antigen.

The ABO blood group and secretor status of individuals are inherited independently. The ABH gene (FUT1) codes for the ABO blood group. The secretor gene (FUT2) interacts with FUT1 gene to determine the ability to secrete blood group antigens into body fluids and secretions. The term secretor or non-secretor refers to the ability of an individual to secrete ABO blood group antigens in bodily fluids such as saliva, sweat, tears, serum, gastrointestinal mucus secretion and semen where traces of water

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soluble A, B or O agglutinogens that determine blood group are found (D'Adamo and Kelly, 2011). ABH refers to "A" and "B" antigens of the ABO blood group system and "H" the heterogenetic substance which is found in persons of all ABO types including type "O" (Cohen *et al*., 1980; D'Adamo and Kelly, 2011). ABH secretion is controlled by two alleles, Se and se. Se is a dominant allele while se is a recessive one. Approximately 80% of Caucasians are ABH secretors (SeSe or Sese), whereas 20% of them are non-secretors. The major difference between the two is in their pattern of expression; The FUT1 (H) gene is expressed predominantly in erythroid tissues giving rise to FUT1 (H enzyme) whose products reside on erythrocytes, whereas the FUT2 (secretor) gene is expressed predominantly in secretor tissues giving rise to FUT2 (secretor enzyme), a products that reside on mucin in secretions (Orunshola and Audu, 2013). Although both the ABO blood group antigen system and secretor status have been described between 60-100 years ago, the function of ABO antigens both on red blood cell and in bodily fluids has remained an enigma.

Non-secretors are of a potential health disadvantage compared to secretors as an appreciable number of diseases have been associated with the inability to secrete ABH substances (Igbeneghu *et al*., 2015). Non-secretors have been reported to be more prone to recurrent urinary tract infection (May *et al*., 1989), thrombotic and heart disease (O'Donnell *et al*., 2002), duodenal and peptic ulcer and hyperpepsinogenemia (Odeigah *et al.,* 1990; Sumii*et al.,* 1990; Dickey *et al.,* 1993), recurrent idiopathic hyperplastic candida vulvo-vaginitis and oral candidiasis (Bufford-Mason *et al*., 1988; Thom *et al.*, 1989; Lamey *et a*l., 1991; Chaim *et al*., 1997), *Neisseria* meningococcal disease (Blackwell, *et al*., 1986, 1990; Zorgani *et al*., 1994) and infection caused by *Haemophilus influenzae* (Blackwell *et al*., 1986).

Other disease states associated with ABH non-secretors are chronic obstructive pulmonary diseases (Cohen *et al*., 1980; Kauffman *et al*., 1996), dental caries and abscess (Triadou *et al*., 1983), myocardial infarction (Hein *et al*., 1992; Ellison *et al*., 1999), rheumatic fever and rheumatic heart diseases (Dublin *et a*l., 1964; Robinson *et al*., 1984; Jhinghan *et al*., 1986), diabetes mellitus (Peter and Gohler, 1986, Patrick and Collier, 1989, Sambo *et al*., 2016) and immunological disorders (Tandon *et al*., 1979; AL-Agidi and Shukri, 1982; Blackwell *et al*., 1988), Athreya *et al*., (1967) reported a relationship between ABH secretor status and the lethality of *plasmodium falciparum* malaria. Olorunshola and Audu (2013) also reported the relationship between ABH secretor status and sickle cell disease. Absence of the blood group antigen in secretions is a health disadvantage, as this appears to increase susceptibility to a number of diseases. ABH non-secretors have a higher prevalence to various autoimmune diseases. Thus, it is evident that the determination of secretor and non-secretor status of ABH substances has forensic and clinical importance and a predisposition to certain disease condition can be assessed and preventative therapies can be introduced. This possibility has instigated the present study to determine the prevalence of ABH secretor and non-secretor status among apparently healthy students of the University of Maiduguri.

MATERIALS AND METHODS

This study was conducted from March to October, 2017. A total of 235 students within the age range of 18-50 years were recruited for the study. Two (2) millilitres of venous blood was collected from each participant into EDTA bottle. The blood samples were washed thrice with normal saline, 5% red cell suspension in normal saline was prepared and tested against Anti-A, Anti-B and Anti-AB serum.

After proper rinsing of the mouth of each participant with distilled water, a clean rubber band was given to the participants to chew to increase salivation. After discarding the first few drops, about 3mls of saliva was collected into a sterile plain container for the determination of secretor status.

The saliva was transferred into a test tube and placed in a boiling water bath for 10 minutes to denature salivary enzymes. It was then cooled and centrifuged at 10,000 RPM for 5 minutes; the supernatant was harvested, equal volume of it was placed into three labelled tubes A, B and H. Equal volume of diluted Anti-A, Anti-B and Anti-H were added to the appropriate tubes; Antisera-A into tube A, Antisera-B into B, Antisera-H into H tubes respectively. Control were included to ascertain the antisera. Each tube was mixed and incubated at room temperature for about 10minutes. A drop of standard red cells A, B and H was added into the corresponding tubes A, B and H. Each content of the tubes was mixed and incubated further for 10minutes at room temperature. Reaction or agglutination were observed. Control tubes must show agglutination to confirm potency of antisera. Absence of agglutination or reaction in tube A, B and or H indicates the presence of corresponding A, B and or H soluble antigen. Agglutination in any test sample tube indicated absence of soluble secretor antigen A, B and or H.

Tube A (Saliva + Antisera A), Tube B(Saliva + Antisera B) and Tube H (Saliva + Antisera H) then Incubate the content of each tube for 10minutes

↓

Add Standard red cells A, B and H to the content of Tube A, Tube B and Tube H respectively. Then reincubate for 10minutes

↓

If result in agglutination, it means **no secretor**
While no agglutination means **secretor positive** for the A, B or the H defending the antisera used in the first reaction.

RESULTS

A total of 235 apparently healthy students participated in the study comprising 119(50.6%) males and 116(49.4%) females. The distribution of ABO blood group among the subjects are(50) blood group A, (49) blood group B, (20) blood group AB and (116) blood group O. Out of the 50 blood group A subjects, 49 are secretors while 1 was non-secretor. Subjects withblood groups B and AB were all secretors whereas out of the 116 blood group O subjects, 111 were secretors while 5 were non-secretors.

The distribution of secretor status of the study subjects by sex is given in Table 2. Out of 119 male participants, 115(96.6%) were secretors while 4(3.4%) were non-secretors and of the 116 females that participated, 114(98.3%) were secretors while 2(1.7%) were non-secretors. Of the 119 male subjects, 30 were blood group A, 25 were blood group B, 8 were blood group AB and 56 were blood group O. Out of 116 female participants, 20 were of blood group A, 24 were of blood group B, 12 were of blood group AB and 60 were of blood group O

Table 1.Distribution of Secretor Status among the subjects based on ABO Blood Group

BLOOD GROUP	SECRETOR (%)	NON-SECRETOR (%)	TOTAL (%)
A	49(21.4)	1(16.7)	50(21.3)
B	49(21.4)	0(0.0)	49(20.8)
AB	20(8.7)	0(0.0)	20(8.5)
O	111(48.5)	5(83.3)	116(49.4)
TOTAL	**229**	**6**	**235**

Table 2.Distribution of Secretor Status according to Gender

SEX	SECRETOR (%)	NON-SECRETOR (%)	TOTAL (%)
MALE	115(50.2)	4(66.7)	119(50.6)
FEMALE	114(49.8)	2(33.3)	116(49.4)
TOTAL	**229**	**6**	**235**

Table 3.Distribution of ABO Blood Group based on Gender

	ABO BLOOD GROUP				
GENDER	**A (%)**	**B (%)**	**AB (%)**	**O (%)**	**TOTAL (%)**
MALE	30(60)	25(51)	8(40)	56(48.3)	119(50.6)
FEMALE	20(40)	24(49)	12(60)	60(51.7)	116(49.4)
TOTAL	**50**	**49**	**20**	**116**	**235**

DISCUSSION

In this study, we examined the ABH secretor status of apparently healthy subjects and determined its frequency among the medical college student, University of Maiduguri. The frequency of ABH secretors is 229(97.4%) whereas that of non-secretors is 6(2.6%). A similar higher frequency of secretors were reported by other researchers Emeribe *et al*., (1992), Olorunshola and Audu (2013) and Igbeneghu *et al*., (2015). Similarly, low frequency of ABH non-secretors (2.7%) was reported in kaduna by Olorunshola and Audu (2013) and relatively higher frequency of non-secretor (13.1%) in Calabar (Emeribe *et al.,* 1992) and (21.6%) in Osogboas reported by Igbeneghu *et al.,*(2015). A frequency of 60% secretors and 40% ABH non-secretors was reported by Akhter *et al.* (2011) in Dhakar. Jaff (2010) found a frequency of 76% secretors and 23.9% non-secretors in Iraq.

The result obtained from this study agrees with the findings by most authors on ABH secretor status that the number of secretors is more frequent than non-secretors. Because the study involved using the saliva samples of apparently healthy subjects, the evidence available explains the low incidence of non-secretors as compared to other studies based on individuals with specified disease conditions indicating that some disease conditions correlate with the ABH non-secretor status and so also genetics and geographical differences.

The ABO blood group of the study population given in Table 1 indicates that 50(21.3%) the most common ABO blood group phenotype is group O while the least common is AB. There are evidences indicating that blood groups play an important role in the susceptibility or resistance to various infectious and non-infectious diseases (Holbrook, 1993). Several other studies revealed that blood group O phenotype and ABH secretors were the most frequent in different ethnic and geographical population (Salih*et al.*, 2015). Jaff (2010) also reported that several studies had shown that group O individuals were less associated with many malignancies and that group O had been implicated in suppression of growth and spread of tumours.

We found no significant relationship between ABO blood group phenotype and secretor status and this agrees with the findings of (Sambo *et al.,*2016) but contradicts those of (Igbeneghu *et al.,* 2015), (Orunshola and Audu 2013), (Jaff, 2010) and (Emeribe *et al.,* 1992). Also, our findings suggest that there is no association between the sex and secretor status of the subjects which supports the findings of (Emeribe *et al.,* 1992).

CONCLUSION

The study demonstrates that secretors are more frequent than non-secretors and that blood group O was the commonest while AB was the least of the blood group phenotypes in the population studied. It further revealed that the ability to secrete ABH water soluble antigens in body fluids is independent of ABO blood group phenotype.

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