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Investigation of ABH antigens secretion in blood and saliva samples among some under graduate students (Sudan)

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Abstract
This study was carried to identify the ABH antigens secretors and non-secretors among some students of El-Imam El-Mahdi University in Sudan. Blood and saliva samples were randomly collected from two hundred (200) students (110 males and 90 females). The blood samples were analyzed for ABO and Rhesus factor by the Slide method. The secretor status of saliva was determined by hemagglutination inhibition method. The ABO grouping of the total population was dominated by O (56.5%) followed by A (25.5%), B (16.5and AB (1.5%). Saliva samples showed that (61.5%) of the study population were ABH secretors and (38.5%) were non-secretors. The secretor status frequencies among the ABO groups were A (49%), B (51.5%), AB (66.7%) and O (45%). Some gender differences were shown on the frequency of secretor and non-secretor status among the studied group.

Keywords: Saliva, ABH, Secretor, ABO, Rh -factor

Introduction

The (ABH) blood group system was firstly reported by Karl Landsteiner (1901). In blood banking the term "ABH" refers to the secretion of (ABO) blood group antigen in the different fluids, such as saliva, sweat, tears, semen, and serum (Herny V. Br. 2000) [9]. The term 'secretor' or 'non-secretor' refers to the ability of an individual to secrete ABO antigens in body fluids. The ABO blood group antigens are found on the surfaces of the red blood cells (Samson T. *et al.*, 2022). Blood is considered as one of the important evidencein crime scenes and disasters because once the blood group is determined it is unchanged throughout the life (Kathuria NS *et al*. 2023) [21]

A and B antigens were found to be present in red cells and soluble in saliva (Daniels G, 2002) [6]. A person can be described as secretor or non-secretor depending on his genetic ability to secrete ABH substances (Daniels G .2002) [6]. Now the ABH blood group antigens A, B and H are reported to be present in red blood cells, lymphocytes, platelets, tissue cells, body fluids and in secretions except CSF (Neil S J. *et al.*, 2005, Greer J. P. *et al.*, 2009) [8, 19]. The differences between secretors and non-secretors may be qualitative or quantitative constituents of saliva, mucus and other body secretions (D'adamo P, 2001). The ABH secretions are controlled by fucosyletransferase2 "FUT_2" secretor gene which is located on the short arm of chromosome number 19 in a form of two alleles denoted as dominant (Se) and recessive amorphic in their pattern of inheritance (se). The secretion of A, B and H in saliva and other body fluids is controlled by the pair of alleles, Se and se, known as secretor genes (Javier A, *et al.*, 2008.). the (Se Se) and (Se se) produce a dominant secretor phenotype while the (se se) produces a recessive non-secretor phenotype (Wisthoff C. *et al.*, 2007) [32]. The (FUT_2) gene encodes for enzyme glycosyle transferase α-2-L- Fucosyl transferase, which, become active in goblet cells, and mucus glands of gastrointestinal tract, saliva, bile, gastric juice, mucus, urogenital tract seminal fluid, vaginal secretions, urine and respiratory tract as well as in the sweat, tears, milk and amniotic fluid (Wisthoff C. *et al.*, 2007) [32]. The ABH secretors , secrete ABH substances according to their blood groups, where "A" group secretes A and H, "B" secretes B and H , AB secretes A B and H ."O" group secretes H substance only as shown by table (1) .The ABH secretion in Saliva may contain some compounds in the mucin ,which, aggregate certain bacteria and decrease their activity compared with the non-secretors who may have high incidence to mouth diseases , esophageal cancer, and epithelial dysplasia (Campi C, *et al.*, 2012) [4].

Table 1: ABH Substances in saliva (Smart E, 2008, Wilkinson S. L, 2005) [28, 31].

ABO group	Substance in saliva
A	A and H
B	B and H
AB	A, B and H
O	H

The intestinal ABH secretions increase the hydrolase enzyme activity, that, effects bacteria and lectin adherence to the microvilli of the intestine and prevent the attachment of H. pylori to the gut wall, and decrease the incidence of Pylori infections (Azevedo M, *et al.*, 2008) [3]. the ABH secretor status is important for the growth of normal flora in the gastrointestinal tract where, some bacteriaproduces ABH degrading enzymes for constant food supply. On the other handthe absence of ABH secretion allows microorganisms adherence and increase the risk of duodenal ulcer, celiac disease, urinary tract infections viral infectionoral lesion and persistent candida infections (Kulkarni D. G, Venkatesh D, 2004 [15], Samson T. *et al.*, 2022). The (Rh) antigen is a most complex human blood grouping, as a second important

blood group system in transfusion medicine. The (Rh) factor depends on the presence of D-antigen on erythrocytes.the major application of the Rh system is the danger of (Rh D) incompatibility between mother and fetus (Samson T. *et al.*, 2022). The antigen H substance is a precursor for other ABO blood group antigens. In H non-secretor people, lower levels of immune globulin A (IgA) have been reported in both serum and saliva and that, may results in weaker specific immune responses at mucosal surfaces, compared to the secretors. Moreover, lower levels of immune globulin G (IgG) can be one of the causes of increased susceptibility to autoimmune diseases (Sedigheh Bakhtiari, *et al*., 2020). Hoskins L. C. *et al*., (1969) [10, 27], reported that the host's blood type and secretor status may influence the specificity of A, B and H degrading activities in feces, indicating that, these genetic traits also influence the specificity of BGD enzymes. In a study carried by Samson T. *et a* (2022), the ABO distributions were, group O (65.5%), A (16.6%), B (15.1%) and AB (2.8%), whereas, the incidence of secretors in group O was (89%), A (85%), B (79%) and (67%) in AB. The frequencies of the Secretor, Se and Non-secretor, se genes were reported to be (0.543 and 0.45) respectively, while, the frequencies of the SeSe, Sese, and sese genotypes were (0.294, 0.496, and 0.209), respectively (Samson T. *et al*., 2022)

Methodology

Blood and saliva samples were collected randomly in clean, dry tubes from 200 university students (110 males and 90 females). Their ABO and Rhesus blood group were determined by slide method and their secretor status was studied by hem agglutination method of saliva.

Results and discussion

Table 2: Secretors and non-secretors among the study cases

Status	Number	Percentage
Secrtors	123	61.5%
Non- secrtors	77	38.5%

The analysis showed that, (61.5%) of the total population were secretors and (38.5%) were non-secretors as shown by (table 2). This may agree with Saboor M. *et al.*, (2014), reported that, the (ABH) secretors were (64.4%) and the non-secretors (35.6%). Akhter *et al.*, (2011) [2] reportedsecretors percentage as (60 %) in Bangladesh. Surekha, K Saraswathi Gopal, *et al* (2025) [29] reported that, the 95% secretor rate.

Imoru, *et al.*, (2020) [11] reported (82.3%) secretors in Northern Nigeria. According to Muddathir *et al.*, (2015) [18] the secretors were (31.8%) among Sudanese. ABH secretors and non-secretors were reported as (97.4%) and (2.6%) respectively by Abdu *et al.*, (2020) [1]. According to Sedigheh Bakhtiari, *et al*., (2020) [27], (80%) of Caucasians is ABH secretors, and (20%) are non-secretors. Motghare p. *et al*., (2011) [17] reported that, the ABH secretors as (83%). The global ABH secretor status frequency was estimated to be about (80%) secretors and (20%) non-secretors (Jaff M. S, 2010). Rajawat G. *et al.*, (2023) [12, 21] reported that, the antigens secretors in saliva as (83.3%) and the Non-secretors (16.7%).

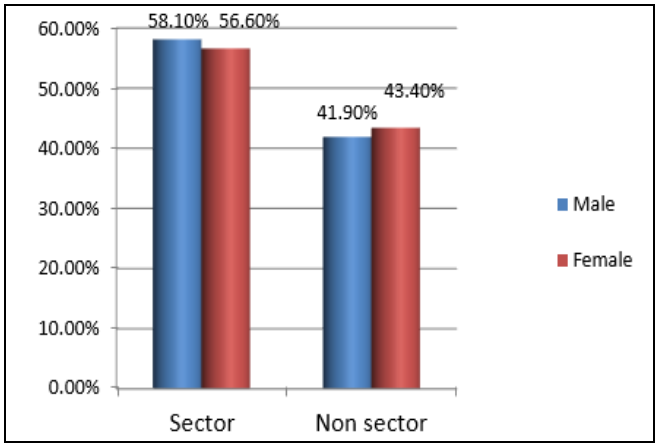

Fig 1: ABH secretion in Males and females among the study population

As shown by Fig.1, there were some gender differences on the frequency of secretors and nonsecretors status among the studied group. According to Rashmi Metgud, *et al*, (2016) [22], (100%) secretor status was observed with blood groups A and O for both males and females, while B and AB revealed 95% secretor status. Samson T, *et al.*, (2022) reported that 85% of the participants were secretors and 15% were non-secretors with no statistically significant differences between male and female gender.

Table 3: Rh +ve and Rh-ve Secretors and non -secretors

Rhesus factor	Secretors	Non, secretors
Rh +ve	83(62.9%)	52(37.1%)
Rh -ve	50(76.9%)	15(23.1%)

For Rh- D (+ve) and Rh- D (-ve) classification (62.9%) were Rh +ve secretors and (37.1%) were non-secretors, while the Rh -ve secretors were (76.9%) and the non-secretors were (23.1%) as shown by table (4). Rajawat G. *et al.*, (2023) [21] reported Rh +ve as (94%) and Rh -ve as (6%).

Table 4: ABO blood classification and ABH Secretion status frequency

Blood group	Number	Secretors	Non, secretors
A	51 (25.5%)	49%	51%
B	33 (16.5%)	51.5%	48.5%
AB	3 (1.5%)	66.7%	33.3%
O	113 (56.5%)	45.1%	54.9%

The total study individuals were dominated by O group (56.5%) followed by A (25.5%), B (16.5%) and AB (1.5%) For A groups (49%) were ABH secretors and 51% non-secretors. The secretors of B group were (51.5%) and the non-secretors were (48.5%). Relatively high difference was shown by AB group where the secretors were (66.7%) and the non-secretors were (33.3%). The lowest number of secretors was shown by those of O group (45.1%) compared with the non- secretors (54.9%). In a study carried by Samson T. *et al.*, (2022), the Secretors status of ABO blood groups were, A (71.4%) B (79.5%), AB (45.5%), and O (61.5%). Rajawat G. *et al.*, (2023) [21], reported that from 300 individuals, 250 were secretors and 50 non-secretors with AB and A group majority. Secretors are more than non-secretors. Samson T, *et al.*, (2022) stated that the ability to secrete ABH substances is independent of the ABO groups and group A individuals are more secretors.

Conclusion

Among the study population, (61.5%) were ABH secretors and (38.5%) non-secretors. The frequencies of the secretor status among the ABO groups were, A (25.5%), B (16.5%), AB (1.5%), and O (56.5%). Some gender differences were shown on the frequency of secretor and non-secretor status among the studied group

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