International Journal of Clinical and Diagnostic Pathology

ISSN (P): 2617-7226
ISSN (E): 2617-7234
www.patholjournal.com
2020; 3(4): 19-22
Received: 05-09-2020
Accepted: 11-10-2020

Dr. Revathy S
Assistant Professor, Department of Pathology, Aarupadi Veedu Medical College and Hospital, Vinayaka Missions University, Pondicherry, Tamil Nadu, India

Dr. Vijayaraja S
Assistant Professor, Department of Conservative Dentistry & Endodontics, Indira Gandhi Institute of Dental Sciences, Sri Balaji Vidhyapeeth, Pondicherry, Tamil Nadu, India

Dr. Velvizhy R
Assistant Professor, Department of Pharmacology, Aarupadi Veedu Medical College and Hospital, Vinayaka Missions University, Pondicherry, Tamil Nadu, India

Corresponding Author:
Dr. Velvizhy R
Assistant Professor, Department of Pharmacology, Aarupadi Veedu Medical College and Hospital, Vinayaka Missions University, Pondicherry, Tamil Nadu India

Association of secretors and non-secretors in ABO blood group with incidence of rheumatic fever in south Indian population: An observational study

Dr. Revathy S, Dr. Vijayaraja S and Dr. Velvizhy R

DOI: https://doi.org/10.33545/pathol.2020.v3.i4a.307

Abstract
Background: The ABH secretors amongst blood groups are known to be associated with some bacterial infections. The prevalence of such secretors and association with incidence of rheumatic fever was studied in south Indian population.
Aims/Objectives: To characterise the association of secretors and non-secretors in ABO Blood group with incidence of Rheumatic fever in south Indian population.
Methodology: An observational study was conducted on 200 subjects, recruited by convenient sampling after meeting the inclusion and exclusion criteria. The procedure involved collection venous blood and unstimulated whole saliva samples, determination of ABO and Rh blood groups (agglutination method), evaluation of the secretor status (Haemagglutination Inhibition Technique) and Antistreptolysin O titre levels. The descriptive statistics were reported as frequencies and percentages while inferential statistics by chi-square or ANOVA test as needed.($p<0.05$ were considered significant).
Results: The study consisted male to female ratio of 1:3 with a mean age 18 ±4.65 years. Around 58% (n=116) were found to be secretors and 42% (n=84) were non secretors amongst the ABO groups. Considering the incidence of rheumatic fever, all of the secretors, were proved negative for Rheumatic factor in serum.
Conclusion: The secretors are more prevalent in study population with a higher association with male sex and blood group B. The secretor status of the ABO blood groups had nil association with occurrence of rheumatic fever in the given study population.

Keywords: ABO blood groups, secretors, rheumatic fever

Introduction
The ABH blood group system after its discovery by Karl Landsteiner (1901), was identified to be either as 'secretor' or 'non-secretor' with respect to his genetic ability to secrete ABH blood group substances [1]. A and B antigens of ABO blood group are converted from their precursor, H substance by the 5th week of intrauterine life. This conversion of H substance into either A or B is partial, while in case of group O there is no conversion of H substance. These group specific substances ABH are not only confined to red cells but may be detected in most body fluids [2, 3]. The agglutinogens of the ABO system present in the body tissues appear in lipoidal and water soluble form. In about 80% of people they appear in water soluble form and can be demonstrated in all body fluids except cerebrospinal fluid. [3] The person who possess only lipoidal form are known as 'non-secretors', while those who possesses a water soluble form are known as 'secretors'.[4]The ABH secretors secrete A,B and H substances, respective of their blood group while the blood group 'O' group secretes only H substance. 'A' blood group secretes A&H substances while 'B' blood group secretes B&H substances in the fluid [4, 5].
The ABH secretions are controlled by FUT2 secretor gene located on the short arm of chromosome 19 ["Se" dominant and "se" recessive alleles]. The FUT2 gene encodes for enzyme glycosyltransferase (α-2-L-Fucosyl transferase) which is metabolically activated in the cells in the lining epithelium of the gastrointestinal tract (GIT), urogenital tract (GUT) and respiratory tract (RT). Thus they are replicable in wide range of fluid like saliva, bile, gastric juice, mucus, semen, vaginal secretions and urine. The ABH secretions also precipitate in the sweat, tears, milk and amniotic fluid [6].

The human saliva is non-invasive and essential diagnostic tool which has soluble forms of the A and B antigens (actually discovered in red blood cells) [7]. The Saliva of ABH secretors contains additional mucinal sugars compounds that are bacteriostatic in nature. Thus, the non-secretors are reported to have high incidence of oral and GIT disorders (*H. pylore* infections), epithelial dysplasia and neoplasm compared to secretors [8].

Increased degree of protection against bacterial lectins may be associated with secretion of antigen into saliva and mucus [7, 8]. Secretors have also a greater risk for diseases like tuberculosis, rheumatic fever, juvenile diabetes, haemolytic anaemia and viral infections. Whereas, non-secretors are reported to have a tendency toward duodenal ulcer, recurrent urinary tract infection, multiple sclerosis, arthritis and grave's disease [7]. Rheumatic fever (RF) results from the body's autoimmune response to a throat infection caused by Streptococcus pyogenes, also known as the group A Streptococcus bacteria. Rheumatic heart disease (RHD) refers to the long-term cardiac damage caused by either a single severe episode or multiple recurrent episodes of ARF [9].

The group A beta haemolytic streptococcal infection is the cause of the rheumatic fever and RHD [10, 13]. It has been reported that secretors are prone to RF and fewer reports exist in this area [14, 16]. The existing literature is historic and needs validation in current times. This research lacunae had instigated the present stud, in which we aimed to study the prevalence of secretor status and screen for rheumatic fever among secretors in southern India.

Methodology

Study settings

The Observational study was conducted from April/2016 to August/2016 (a period of 5 months) at the Department of Pathology of Tertiary care hospital at Chennai. A sample of 200 subjects, who recruited by convenient (non-probability) sampling were considered for the study after meeting the inclusion and exclusion criteria. The approval of the Institutional Ethics Committee, [IEC NO: 41/MARCH 2016] was taken before initiating the study. The project was approved by Indian Council of medical research [ICMR Ref no 2016-03501]. The healthy individuals reporting to OPD of XXX tertiary care hospital between the age group of 5 to 20 years were included for the study. The subjects who had any history of recent blood transfusion (<3 months), congenital bleeding disorders, bone marrow transplantation and those unwilling were excluded from the study.

The procedure involved collection of 2ml of venous after obtaining written informed consent from the participants. The unstimulated whole saliva samples were collected as per previously stated standards [18]. and were dropped on a piece of washed cotton cloth and air dried. The air dried clothes with saliva was kept in coded envelops. The ABO and Rh blood group was determined by tube agglutination method. The secretor status was determined by "Haemagglutination Inhibition Technique" (HIT) as per standards [19]. The HIT procedure briefly involved, cutting of dried saliva stained cloths (1cm^2) and soaking in 1 ml of 0.9% saline for 10 to 15 minutes. Around 0.1 ml of saliva solution was taken in 3 marked clean test tubes, one drop of each diluted anti-sera was added to the corresponding tubes contained diluted saliva. The tube contained the saliva – anti-sera mixture was kept in refrigerator for 2 hours at 4^{o}C. The tubes were brought to room temperature and one drop blood of own blood group was added to each test tube. After mixing the sample, one drop from each test tube was placed in a clean glass slide and was examined under the microscope for agglutination reaction. The test samples with no agglutination were deemed as 'secretors' and the samples with agglutination are 'non-secretors'. After determining the secretor status, serum from the stored blood sample was screened for Antistreptolysin O (ASO) titre levels.

Statistical analysis

Data was analyzed using R software (version 3.6.1). The categorical variables are depicted as range/ frequencies, while the continuous variables as mean ± standard deviations. The one way ANOVOA were used as needed for intergroup comparisons; the chi-square test for evaluating the associations between the variables as needed. A $p<0.05$ was considered significant in all instances.

Results

The study consisted of a sample of 200 participants, of which 66.6% (n=150) were females. The male to female ratio of 1:3. The age rage of the participants was 5 to 20 years with an mean age of 18 ±4.65 years. Considering the secretors, 58% (n=116) were found to be secretors and 42% (n=84) were non-secretors amongst the ABO group participants. There was no gender difference on the frequency of serectors and non-secretors status (Table 1). In Rhesus positive individuals 56.5% were secretors and 43.4% were non-secretors. In rhesus negative individuals 68% were secretors and 32% were non-secretors (Table 1). Distribution of secretor status in A, B, AB and O blood group in the study are shown in Table 2. Considering the incidence of rheumatic fever, all of the secretors, were proved negative for Rheumatic factor in serum.

Table 1: Distribution of gender and Rh status amongst secretors and non-secretors

Variable	Secretor	Non-Secretor	p value
Gender			
Male	60%(30)	40% (20)	0.74
Female	57.3% (86)	42.6% (64)	
Rh status			
Positive	56.6% (99)	68%(17)	0.28
Negative	43.4%(76)	32%(8)	

Rh: Rhesus status of blood group; $p<0.05$ is considered significant.

Table 2: Distribution of gender and Rh status amongst secretors and non-secretors

Blood Group	Secretor	Non-Secretor	p value
A	24% (28)	24% (20)	0.97
B	45% (52)	45% (n=36)	
AB	1.7% (2)	1.1% (1)	
O	29.3% (34)	32.1% (27)	

$p<0.05$ is considered significant

Discussion

The gender Distribution of the current study showed a slight male predominance, which was also shown by Saboor *et al.* [3]. The prevalence of secretors in the current study is lower as opposed to the Indian studies, wherein a higher rate of secretors, corresponding to 79.6% and 76.7% were shown [19, 20]. These variations may be attributed to racial differences and the sample size in these studies.

The frequency of ABH secretors in the world population is about 80% with a geographic and ethnic difference as

highlighted Race and Sanger [20] The current this study showed that the frequencies of secretors were 58% which is in line with the findings reported by Saboor et al and Shoaib *et al*. [3, 22].

Considering the blood groups, in the current study, blood group B has the highest secretor (45%) frequency while blood group AB has the lowest secretor level (1.7%). Similar findings were seen in the studies conducted by Saboor et al and Devi *et al*. [3, 23].

In the present study, 58% of secretors were screened for Rheumatic factor and none of the individual among the secretors revealed antibody in their serum, this finding are in contrast with the study conducted by Haverkorn MJ, this finding may be attributed to sample size and the age group of the individuals. The Saliva of ABH secretors contains additional mucinal sugars compounds that are bacteriostatic in nature. Thus, the non-secretors are reported to have high incidence of oral and GIT disorders (*H.pylore* infections), epithelial dysplasia and neoplasm compared to secretors [8].

The concepts that protection against bacterial lectins and that the Secretors had higher incidence of bacterial infections are well reported [7, 8]. The non-secretors are reported to have GIT, GUT and autoimmune disorders.[7] The Rheumatic fever (RF) is caused by B haemolytic Streptococcus bacterial infection [9]. The previous studies [13-16] which had reported a higher association of non-secretors to have RF are historic and needs vliaduation in current times. The association was reported to occur but without clear insights on causal mechanism or just to have a protective bacteriostatic effect [24, 25]. The results of study clearly show no incidence of RHD or RF ins south Indian population studied.

The strengths of the current study are evaluation and validation of a unstudied association, while the limitations lie in the small sample. The future directions are to test the incidence of RF/ RHD in larger samples and amongst various age groups. The current results need such vast studied samples tested under multiple centers for asserting screening protocols or clinical guidelines.

Conclusion

The secretors are more prevalent in study population with a higher association with male sex and blood group B. The secretor status of the ABO blood groups had nil association with occurrence of rheumatic fever in the given study population.

References

1. Mourant AE, Kopec AC, Domaniewska-Sobczak K. Blood groups and diseases: a study of associations of diseases with blood groups and other polymorphisms. London: Oxford University Press 1978, 2.
2. Chung CS, Pitt EL, Dublin TD, Heterozygous ABH. secretor and susceptibility to Rheumatic fever, Am J Hum Genet 1965;17(4):352-58.
3. Saboor M, Ullah A, Qamar K, Mir A, Moinuddin. Frequency of ABH secretors and non secretors: A cross sectional study in Karachi. Pak J Med Sci 2014;30(1):189-193.
4. Wilkinson SL. The Lewis, secretor, and soluble ABH antigen: The I and P blood group systems. In: Rudmann SV, editor. Textbook of Blood Banking and Transfusion Medicine. 2 nded. Elsevier Saunders 2005. pp. 82-97.
5. Campi C, Escovich L, Moren A, Racca L, Racca A, Cotoruelo C, *et al*. Expression of the gene encoding secretor type galactoside 2-α-L-Fucosyltransferase (FUT2) and ABH antigens in patients with oral lesions. Med Oral Patol Oral Cir Bucal 2012;17(1):63-68.
6. Wisthoff CM, Reid ME. ABO and related antigens and antibodies. In: Hillyer, Silberstein, Ness, Anderson, editors. Blood Banking and Transfusion Medicine (Basic principles & practice) 2nd ed. Churchill (USA): Livingstone Elsevier 2007, pp. 69-79.
7. D'adamo PJ, Kelly GS. Metabolic and immunologic consequences of ABH secretor and Lewis subtype status. Altern Med Rev 2001;6(4):390-405
8. Campi C, Escovich L, Moren A, Racca L, Racca A, Cotoruelo C, *et al*. Expression of the gene encoding secretor type galactoside 2-α-L-Fucosyltransferase (FUT2) and ABH antigens in patients with oral lesions. Med Oral Patol Oral Cir Bucal 2012;17(1):63-68.
9. Krishna Kumar R, Tandon R. Rheumatic fever and Rheumatic heart disease in the last 50 years. Indian J Med Res 137, April 2013, 643-58.
10. Neil SJ, McKnight A, Gustafsson K, Weiss RA. HIV-1 incorporates ABO histo-blood group antigens that sensitize virions to complement-mediated inactivation. Blood 2005;(105):4693–4699.
11. Greer JP, Foerster J, Rodgers GM, Paraskevas F, Glader B, Arber DA, *et al*. Wintrob's Clinical Hematology. 12thed. LWW Business 2009, pp. 631-671
12. D'Adamo PJ, Kelly GS. Metabolic and immunologic consequences of ABH secretor andLewis subtype status, Alternative Medicine Review 2001;6(4):395.
13. Sika-Paotonu D, Beaton A, Raghu A, *et al*. Acute Rheumatic Fever and Rheumatic Heart Disease 2017. Mar 10 [Updated 2017 Apr 3]. In: Ferretti JJ, Stevens DL, Fischetti VA, editors. Streptococcus pyogenes: Basic Biology to Clinical Manifestations [Internet]. Oklahoma City (OK): University of Oklahoma Health Sciences Center 2016.
14. Chung CS, Pitt EL, Dublin TD, Heterozygous ABH. secretor and susceptibility to Rheumatic fever, Am J Hum Genet. 1965;17(4): 352-58.
15. Buckwalter JA, Naifeh GS, Auer JE. Rheumatic Fever And The Blood Groups. Br Med J 1962;2(5311):1023-1027.
16. Haverkorn MJ, Goslings WR. Streptococci, ABO blood groups, and secretor status. Am J Hum Genet 1969;21(4):360-375.
17. Lim WN, Kellner A, Schweitzer MD, Smith D, Wilson MG. Association of secretor status and rheumatic fever in 106 families. Am J Epidemiol 1965;82(2):103-111.
18. Henson BS, Wong DT. Collection, storage, and processing of saliva samples for downstream molecular applications. Methods Mol Biol 2010;666:21-30.
19. Alexander DJ, Allan WH, Biggs PM, *et al*. A standard technique for haemagglutination inhibition tests for antibodies to avian infectious bronchitis virus. Vet Rec 1983;113(3):64.
20. Vyas GN, Bhatia HM, Sukumaran PK, Balkrishnan V, Sanghvi LD. Study of blood groups, abnormal haemoglobin and other genetical characters in some tribes of Gujarat. Am. J. Physi. Anthropol 1962;20(3):255-65.
21. Kulkarni DG, Venkatesh D. Non-secretor status; a predisposing factor for vaginal candidiasis. Indian J Physiol Pharmacol 2004;48(2):225-9

22. Race RR, Sanger R. Blood groups in man.6th ed.Oxford: Blackwell Scientific Publication.1975;p.313
23. Shoaib M, Subhan F, Tahir F, Mazhar B, Saeed A, Sultan S, *et al*. Prevalence of blood groups and Rh factor in Bannu region (NWFP) Pakistan. Pak J Med Res Res 2004;43(1):8-10.
24. Devi AS, Meera T, Singh KP, Nabachandra H, Shah I. Secretors in Manipuri population: a study. Journal of Indian Academy of Forensic Medicine 2015;37(2):127-30.
25. Grundbacher FJ. Immunoglobulins, secretor status, and the incidence of rheumatic fever and rheumatic heart disease. Human heredity 1972;22(4):399-404.
26. Blackwell CC. The role of ABO blood groups and secretor status in host defences. FEMS Microbiology Immunology 1989;1(6-7):341-9.