

Prevalence of Secretor Antigen and Association with Blood Group among Blood Donors Attending a Tertiary Care Blood Bank in Kerala

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Abstract: *Introduction and Rationale* About 80 % of the population secretes soluble blood group substances with A, B and O (H) specificity corresponding to each individuals blood type, the remaining 20 %, the non-secretors do not. Secretor status assessment serves as a supportive investigation in confirmation of blood groups, in case of blood group discrepancies, and in Forensic Medicine, for clarification of medico legal cases. By determining secretor status, predisposition to certain diseases also could be assessed. *Objectives* The study aimed to look for the prevalence of secretor antigen among blood donors and the association between blood group of the individual and secretor status. *Materials and Methods:* The study was a cross-sectional prevalence study. Prevalence of secretor status in the population was ascertained to be 80 % from literature. With this prevalence and a margin of error of 10 % of prevalence, sample size was calculated to be 100 blood donors. Blood Group and secretor status of donors were determined, analysed using Chi-Square *Results:* Of the 220 donor samples studied, secretor positivity come to be 129 (58.6 %) and the rest of the donors were non-secretors. The main blood group associated with secretor positivity was A, even though the main prevalent blood group was O. 57.1 % of Rh Positive individuals were secretor positive and 80 % of Rh Negative individuals were secretor positive ($P=0.082$). 55 % of males were secretor positive where as 75 % of females were secretor positive ($P =0.042$.) *Conclusion:* Main blood group associated with secretor positivity is A group. There was a significant association between secretor antigen and gender, with more of females having secretor positivity. A statistical significance between Rh status and secretor reactivity could not be established.

Keywords: Secretor Status, Blood Donor

1. Introduction

An Austrian Scientist Karl Landsteiner discovered ABO blood group system in early 1900, and it still remains the mainstay of blood group investigations in forensics.^{1, 2} The main reason for this is that it is the primary, most common, conspicuous and easily detectable groups implicated in Hemolytic transfusion reaction(HTR) and Hemolytic diseases of newborn (HDN).³ According to him people of this world irrespective of age, sex, caste, colour etc. can be broadly divided into four main groups A, B, AB & O. The basis for this classification was antigenic characters present on RBC membrane. Blood group is one of the important evidences because once the blood group is established it remains unchanged throughout life²

In 1930, PUTKONEN noted that a person could be either secretor or non-secretor with respect to his genetic ability to secrete ABH blood group substances in secretions^{4,5} like saliva, the mucus in digestive tract and respiratory cavities etc.⁶. Main differences between secretors and non-secretors are quantitative and qualitative components of their saliva mucus and other body secretions⁷.

ABO blood group substance present in the body tissue appear in lipid and water soluble forms.⁸ If people are ABH secretors, they possess water soluble antigen and secrete them according to their blood groups and that is, group O people will secrete H substance. Group A people will secrete A&H substance etc.^{9,10} About 80% of the population secretes soluble blood group substances with A, B and O (H) specificities corresponding to each individuals blood type, the remaining 20%, the “non-secretors” do not.¹¹

A person who possesses only the lipid form are known as Non-secretors. They secrete out very minor or none of their blood group antigens into different body fluids.¹² Secretor status can be a helpful aid in sorting out discrepancies in blood group determination of an individual. Especially in determination of subgroups of ABO system secretor status can act as a co-investigation.¹³

In addition to ABO blood group application in blood transfusion and forensic medicine, numerous studies have found strong relations between individuals susceptibilities to some diseases and their ABO blood groups,¹⁴ as well as their secretory status.¹⁵ Non-secretor have an increased risk for duodenal ulcer, recurrent urinary tract infection, persistent candida infection, auto immune diseases & dental caries¹⁵. By determining secretor status predisposition to these conditions can be assessed and preventive therapies can be introduced.

Purpose of this study is to look for the prevalence of secretor antigen and to determine whether there is any association between secretor status and blood group of an individual.

2. Rationale of Study

- Blood group discrepancies: The main rationale of assessment of secretor status is as a supportive investigation in confirmation of blood groups, in case of blood group discrepancies, in routine blood bank practice and also in Forensic Medicine, for clarification of medico legal cases.
- Predisposition to diseases: Decreased secretor antigens could affect bacterial attachment and persistence on mucosal epithelia. Consistent with this theory is that non secretors have an increased risk for urinary infections, candidiasis and dental cavities. Further, Non Secretors

are found to have changes in their immune function and increased incidence of auto immune disorders, they are also found to have increased levels of clotting factors and heart disease.

- To look for association between blood group of the individual and secretor status

Thus by determining secretor status, predisposition to certain diseases also could be assessed.

3. Aims and Objectives

- Prevalence of secretor antigen among blood donors attending blood bank of a tertiary care hospital blood bank in Kerala

Table 1: Prevalence of secretor status in different provinces

	Secretors	Non-Secretors
Gujarat ¹⁶	79.6%	20.4%
Karnataka(2013) ¹⁷	76.78%	23.22%
Bangladesh(2011) ¹⁸	60%	40%
Pakistan(2014) ¹⁹	64%	36%
Manipur ²⁰	49.5%	50.5%
Iraq(2010) ²¹	76%	24%
South Nigeria(1992) ^{22,23}	86.9%	14.1%
Lahore ²⁴	68.8%	31.2%

Table 2: Secretor status in relation to blood group, Rh and Gender

S No	Name of study	Main blood group associated	Rh and secretor status		Gender and secretor status	
			Rh Positive	Rh Negative	Male	Female
1	A Sylviadevi et al;2015 ²⁰	O			54.46%	43.85%
2	Muhammed saboor et al;2014 ²⁵	B	Se-63.6%	76.9%	78%	21%
3	Khalid M Salih et al;2015 ²¹	O			64%	58%
4	Sagisakaiwas ²⁶ etal;2013	A				
5	Javaria et al;2015 ²⁴	B	Se -54.3%	70.5%		
6	Sikander Haroon et al;2014 ²⁷	O			93.6%	92.6%
7	Christopher Igbeneghu et al;2012 ²⁸	O			78.7%	77.7%

4. Methodology

The present study was conducted in the Department of Transfusion Medicine of a tertiary care hospital blood bank in Kerala. Ethical approval for this study was obtained from the ethics committee of the hospital.

Study Type-Prevalence study.

Inclusion Exclusion criteria

All donors fulfilling eligible donor criteria attending blood bank RCC over 2 month period from Nov 15th to Jan 15th 2016. Donors without informed consent were excluded.

Sample Size

Prevalence of secretor status in the population was ascertained to be 80% from literature⁽²⁰⁻²⁴⁾. With this prevalence and a margin of error of 10% of prevalence, sample size was calculated to be 100. To account for error in methodology and owing to the easily available donor population, a total of 220 donors were recruited for this study, out of which 188 were males and 32 were females who were in the age group of 18 to 54. Sample size was calculated from the formula,

$$N = 4Pq \div d^2 \quad N=100$$

Materials

Saliva and blood samples were collected from donors attending RCC blood bank.

Method

2 ml of blood from each blood donor was collected. ABO blood grouping (forward and reverse grouping) was carried out using saline washed red cells and commercially prepared monoclonal Anti A, Anti B and Anti D.

Collection and processing of Saliva

2ml of saliva was collected from each donor for determination of secretor status. Haemagglutination Inhibition test on saliva of the donors was done to determine secretor status. Results of procedure done on saliva samples were tabulated. Percentage prevalence of secretor status was calculated. SPSS software was used for analysis

5. Result and analysis

A total of 220 sample were studied, out of which 188(85.4%) were male and 15 were female. Results were tabulated and entered into Excel format, SPSS version 11 was used for analysis. Association between secretor antigen to blood group, Rh, gender and oral history was calculated. Statistical test used was chi square. P value ≤ 0.05 was considered as significant.

Secretor status

Of the 220 donor samples studied, secretor positivity come to be 129(58.6%) and the rest of the donors were non-secretor.

Table 3: Prevalence of secretor status

Secretor status	Percentage	
Positive	129	58.6%
Negative	91	41.3%
Total	220	100%

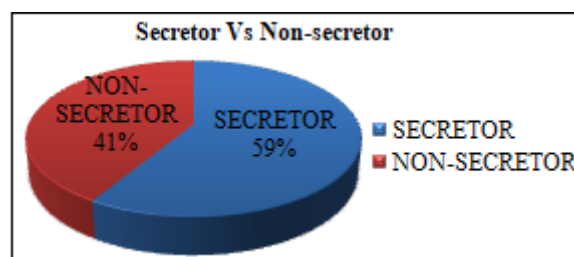


Figure 1

Blood group and Secretor status

The second objective was to look for any association between secretor status and Blood Group of donors. The main blood group associated with secretor positivity was A. Even though the main prevalent blood group was O, only 57% of O group individuals were secretor positive. Of 58 A group samples, 41 samples (70.7%) were secretor positive

Table 4: Association between Blood Group and Secretor Status

Blood Group	Secretor Status		Total
	Positive	Negative	
A	41(70.7%)	17(29.3%)	58(100%)
B	32(59.3%)	22(40.7%)	54(100%)
AB	3(18.6%)	13(81.3%)	16(100%)
O	53(57.6%)	39(42.4%)	92(100%)

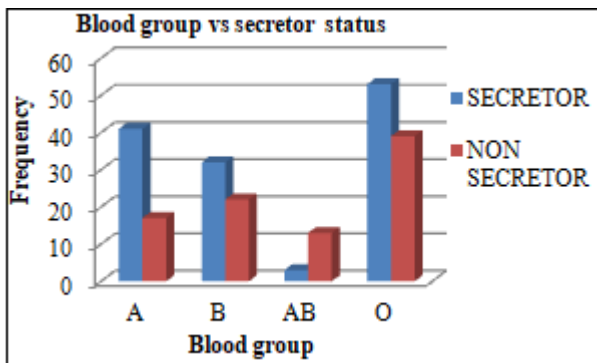


Figure 2

Rh and Secretor status

The distribution of secretor status in relation to Rh status of the individual was looked into. 57.1% of Rh positive individuals were secretor positive and 80% of Rh negative individuals were secretor positive

Table 5: Association between Rh and secretor status

Rh	Secretor		Total
	Positive	Negative	
Positive	117(57.1%)	88(42.9%)	205(100.0%)
Negative	12(80.0%)	3(20.0%)	15(100.0%)
Total	129(58.6%)	91(41.4%)	220(100.0%)

CHISQUARE =3.09 P Value= 0.082

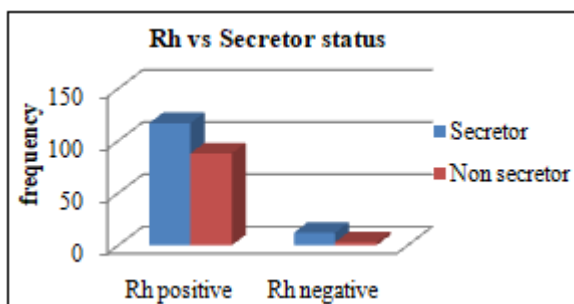


Figure 3

Gender and Secretor Status

55% of males were secretor positive where as 75% of females were secretor positive.

Table 6: Association between gender and secretor status

Gender	Secretor		Total
	Positive	Negative	
Male	105(55%)	83(43%)	188(85.4%)
Female	24(75%)	8(23%)	32(14.5%)
Total	129(58.6%)	91(41.4%)	220(100%)

CHISQUARE = 4.134 P Value =0.042

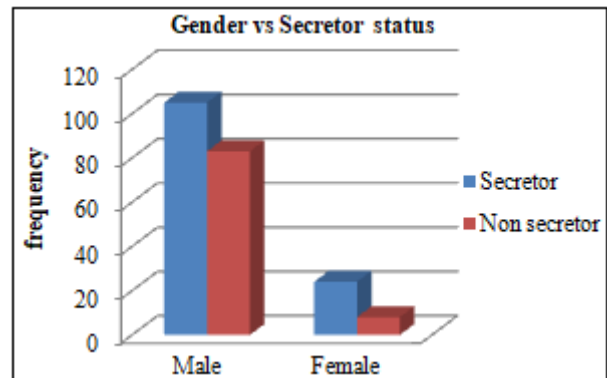


Figure 4

Table 7: Summary of analysis and result

Prevalence of secretor status	58.6%
Main blood group associated with secretor antigen	A
Secretor status more prevalent in	Females P=0.042
Secretor status not associated with	Rh antigen P=0.08

6. Discussion

SECRETOR, as used in blood banking, refers to secretion of ABH antigens in fluids such as saliva, sweat, tears, semen, and serum. If people are secretors, they will secrete incomplete antigens according to their blood groups. ABO blood groups and secretor status has relevance in blood group discrepancies, certain diseases and in clinical and Forensic Medicine. Various disease conditions can alter antigenic expression and antibody potency, leading to discrepant results on blood grouping, Malignancies like leukemia and Non- Hodgkin's Lymphoma alter the red cell antigens and show weaker reactivity during cell grouping. In such patients, saliva studies may help to confirm the patient's actual blood group if the individual is a secretor.

Studies conducted on the prevalence of secretor status in different population's shows markedly variable results due to racial, ethnic, genetic and environmental factors.

Prevalence

On tabulating the results, the percentage of secretor antigen was found to be 58.6% (P value= 0.003). This is in agreement with the result from the studies by S. Akther, GM Kibria et al⁽¹⁸⁾. In this study, secretor status was detected from the saliva by the haemagglutination inhibition method and the frequency of ABH secretor was 60%. In Calabar, Southsouth Nigeria, Emeribe et al., (1992) reported an incidence of 86.9% secretors {P =0.001}.²⁹Jaff (2010) in Iraq reported a frequency of 76% secretors³⁰, while Saboor et al., (2014) reported a frequency of 64% secretors in Karachi, Pakistan.²⁵ All these findings showed that secretors were more than non-secretors. In most of the studies, it was

seen that to every non-secretor, there were about four secretors.

Association with Blood Group

The association of secretor antigen to blood group was looked into. Out of 129 secretors detected, 53 samples {57.6%} belonged to O group, 58 {70.6%} were A group ($P=0.003$). The remaining belonged to B and AB groups.

Thus, in the present study majority of secretors were A group individuals. This conforms to the study conducted by Sagisaka K, Iwasa M et al; (2008), where the maximum prevalence of secretor was in A group (62%)²⁶. In three other studies,^{20,25,31,32} the main blood group associated with secretor antigen was O group. In yet another study at Karachi the main blood group associated with secretor status was B group.²⁵

Association with Rh antigen

Of the 220 donors, secretor status in Rh positive individuals comes to 57.1% and Rh negative to 80% ($P=0.08$). A statistically significant association between secretor antigen and Rh positivity could not be established. This could be because there were only 15 Rh negative samples, out of which 12 {80%} were secretor positive.

Results of studies by various researchers show a percentage of secretor reactivity in Rh positive samples to be 63.6%²⁵ and 54.3%.²⁴ This is in support of our data of 57.1%. So also, the percentage of secretor reactivity in Rh negative individuals come to 70.5% and 76.6%, supporting our data of 80%. This finding is supported by data from literature.

Association between secretor status and gender

There was a significant difference in secretor reactivity between male and female genders. In males, the percentage of secretors came to 55%, whereas in females, the percentage of secretor positivity came to 75% ($P=0.042$). Our data shows a predominance for females for secretor status.

The studies analyzed from literature^{20,27,28} does not show much difference in percentage of secretor positivity between males and females, a minimal difference seen shows a male predominance. This difference in our finding in our data could be because female donors comprised only 14.5% of total samples

Strength of the Study

- Large sample size.
- Protocol strictly adhered to

Limitations of the Study

Male to female ratio in the sample was 85.5% and 14.5%. Since the female donor population was small, it was difficult to determine whether a statistical significance obtained between gender and secretor status is actually true.

7. Summary and Conclusion

There was a significant association between secretor antigen and gender, with more of females having secretor positivity. A statistical significance between Rh status and secretor reactivity could not be established. These two findings

should be further analysed using a better sample size, adequately represented with female gender and Rh negatives.

8. Recommendation

In case of blood group discrepancies, secretor status test on saliva is a recommended procedure which aids in coming to a conclusion.

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