Chest Heart Journal
Vol. 43, No. 2, July 2019

ORIGINAL ARTICLE

Prevalence of Secretor and Non-Secretor Status Among the Random Blood Donor

Kamrun Nahar[1], Jolly Biswas[2], Subrina yesmin Binni[3], SMA Zulker Nine[4], Sk. Golam Raihan[5], Snehasish Nag[6]

Abstract:

The present study was carried out in the department of Transfusion medicine, BSMMU, Dhaka, during the period July 2008 to June 2009 to find out prevalence of secretor and non secretor among the random blood donor. For this work 100 apparently healthy donor of age between 18-60yrs of either sex were taken. Secretor status of the saliva was detected by haemagglutination inhibition (HAI) method. Among all respondents 21.0% (n=21) were 19-25 years, 54.0% (n=54) within 25 to 35 years, 25% (n=25) were 35-46 years. Mean (±SD) age of the donors was 30.95 (±6.71) years and all donors were within 19 to 46 years age range. Approximately 49% (n=49) of the respondents are B, 35.0% (n=35) are A, 10.0% (n=10) are O and 6.0% (n=6) are AB blood groups. Out of all respondents of secretor status 39.2% (n=20) are A blood group, 41.2% (n=21) are B blood group, 5.9% (n=3) are AB blood group and 13.7% (n=7) are O blood group. In respondents with non secretor status 30.6% (n=15) are A blood group, 57.0% (n=28) are B blood group, 6.1% (n=3) are AB blood group and 6.1% (n=3) are O blood group (P>0.05). Among the respondents male was 85.0% (n=85) and female was 15.0% (n=15) of total study population. Among the male respondents 52.9% (n=45) are secretor and 47.1% (n=40) are non secretor and in female respondents 40.0% (n=6) are secretor and 60.% (n=9) are non secretor (p>0.05). Out of all respondents 51.0% (n=51) had secretor status and 49.0% (n=49) had non secretor status. There is no association of any type of blood group or sex differentiation among the secretor and non secretor status of the blood donor.

[Chest Heart J. 2019; 43(2) : 71-77]
DOI: http://dx.doi.org/10.33316/chab.j.v43i2.2019604

Introduction

In 1900, Karl Landsteiner, the Austrian physiologist discovered the existence of three blood groups in human beings which he designated as A, B and O. In 1902 fourth blood group AB was established by Von Decastlello and Sturle. Then the entire population was classified into group A, B,O and AB by the presence or absence of A and B antigens on red blood cell membrane.[1]

In human, over 400 red cell antigens have been identified[2] but the recognized blood group systems by the ISBT are 26 in number.[3] ABO system is the most important blood group system as far as the

1. Assistant Professor, Department of Transfusion Medicine, Bangladesh Medical College and Hospital, Dhanmondi, Dhaka, Bangladesh.
2. Professor Department of Transfusion Medicine, BSMMU, Dhaka, Bangladesh
3. Assistant Professor, Shahid Ziaur Rahman Medical college, Bogura, Bangladesh.
4. Specialist, Apollo Hospitals Dhaka, Bangladesh.
5. Medical Officer, Department of Transfusion Medicine, Bangladesh Medical college and Hospital, Dhanmondi, Dhaka, Bangladesh.
6. Registrar, Respiratory Medicine, NIDCH, Mohakhali, Dhaka

Correspondence to: Dr. Kamrun Nahar, Department of Transfusion Medicine, Bangladesh Medical college and Hospital, Dhanmondi, Dhaka, Bangladesh. Email: kamrunznp@gmail.com

Correspondence to:
Submission on: 10 May, 2019 **Accepted for Publication:** 22 June, 2019
Available at http.//www.chabjournal.org

transfusion is concerned. ABO system is under the control of ABO and Hh genes. The person who inherits at least one H gene produces N-acetyl galactosaminyl transferase, which converts H substance into A antigen. On the other way, person having B genes produces D-galactosyl transferase, and converts H substance into B antigen. O gene is amorph and no enzymes produced and thus H substance remains as H antigen on the red cell of O individual.[4]

The ABO determinants are oligosaccharides, which remain bound to cell membrane lipid as glycolipid and to proteins as glycolproteins[4]. These group specific oligosaccharides are not only confined to the red cells but also have a wide distribution. They also present on other tissue cells and in the body fluids, if the person is secretor. ABH substances are secreted in a water soluble form as glycoprotein by mucous glands, glands in the upper respiratory tract, gastrointestinal and the uterine. Prostatic gland and the lactating mammary glands of secretors also produce ABH substances.[1]

ABH blood group antigens are expressed by the attachment of the specific monosaccharide to precursor substances. There are four types of precursor substances. The human genome encodes two different ±1-2 fucosyl transferases corresponding to the products of H (FUT-1) and the secretor loci (FUT-2). The ± 1-2 fucosyl transferases (FUT-1) utilizes type 2,3,4 precursorsubstances and expresses h antigen on red cell. The (FUT-2) ± 1-2 fucosyl transferase utilizes type 1 precursor to express ABH antigen in secretor and plasma but can also use type 2 structures.[5]

The term secretor is applied to those persons who secret H with or without A or B group specific substances into secretory fluids like saliva and mucous of the digestive and respiratory tract etc. While those individuals who do not secret ABH group specific substances in body fluid are known as non secretors. A person who is an ABH secretor will secret group specific substances according to their ABO blood group: for example- group O individual will secret H soluble antigen and group A individual will secret A and H antigens.[6]

It is established that the secretor status is controlled by a pair of allelic genes- Se and Se. Those individual who are homozygous (Se Se) or heterozygous (Se Se) are secretors and those who are homozygous for se se are non secretors. It is not only the Se gene but also the interaction of Hh gene is necessary for an individual to be a secretor. So, for a person of A phenotype, to be secretor, must posses at least one A gene. One Se gene and one H gene. If a person is Bombay phenotype but posses Se gene will secret no ABH substances in the secretion due to lacking of H gene.[4]

ABH group specific substances are detected in the following secretion- Saliva, Tear, urine, Bile, Milk, Amniotic fluid, Seminal fluid. One of the richest and readily available sources is Saliva. So, Saliva is used in laboratory to detect the secretor status of an individual.

It can be quite useful to determine ABH secretor status as in certain doubtful cases of ABO grouping in conventional method, can be actually detected specially the subgroup of ABO system.[4]

The secretor or non secretor status also provides some degree of generalized information regarding disease condition. A Copenhagen study found the lifetime prevalence of peptic ulcer in ABH non secretor was 15%. Non Secretors are less resistant to infection by H. Pylori than secretors.[7]

A study among the women with acute uncomplicated pyelonephritis revealed that non secretor has a risk of recurrent urinary tract infection. Among 106 woman with acute uncomplicated pyelonephritis 41% (44 out of 106) were non secretors which was greater than the 22.6% (217 out of 960) of non secretors among control group (P<.001).[8]

Secretor status (secretor and non-secretor)

The term secretor is applied to those persons who secret H with or without A or B group specific substances into secretory fluids like saliva and mucous of the digestive and respiratory tract etc. While those individuals who do not secret ABH group specific substances in secretory body fluid are known as non-secretors. A person who is an ABH secretor will secret group specific substances according to their ABO blood group; for example, a group O individual will secret H soluble antigen and a group A individual will secret A and H soluble antigens etc.

It is established that the secretor status is controlled by a pair of allelic genes, Se and se. Thus individuals who are homozygous (SeSe) or heterozygous (Sese) are secretors and those who are homozygous for sese are non-secretors. It is not only the Se (FUT2) gene but also the interaction of Hh (FUT1) gene is necessary for an individual to be a secretor. Thus, for a person of A phenotype, to be a secretor, must possesses at least

one A gene, one Se gene and one H gene. If a person is Bombay phenotype but possesses Se gene will secret no ABH substances in the secretion due to lacking of H gene.[9]

Frequency of Secretor and non-secretor status

Approximately 80% of the random US population has inherited the Se gene and are secretors.[10] In Negroes 40% are non-secretors.[11] There was no study on secretor and non-secretor status, so far, in Bangladesh.

Objectives

General objective:

To find out the prevalence rate of secretor and non secretor status among the random blood donors

Specific objectives:

1. To find out the demographic status of the respondents
2. To find out the frequency of ABO blood group among different secretor status

Methodology

Type of study:

It was a cross sectional study

Study period:

This study was conducted during the period from July 2008 to June 2009 for duration one year

Study place:

This study was conducted at the Department of Transfusion Medicine, Bangabandhu Sheikh Mujib Medical University, Shahbag, Dhaka

Study population:

All voluntary blood donors who were attended in the Department of Transfusion Medicine, Bangabandhu Sheikh Mujib Medical University, Shahbag, Dhaka during the study period were considered as study population

Sample size:

Total 100 respondents were enrolled as study sample

Sampling method:

Systematic sampling

Variables:

- Age
- Sex
- ABO blood group
- Rh typing
- Height
- Weight
- Secretor status

Ethical consideration:

Prior to commencement of this study, the research protocol was approved. The aims and objectives of the study along with its procedure, risks and benefits of this study were explained to the respondents in easily understandable local language and then written informed consent from the patients or their parents were obtained. It was assured that all information and records would be kept confidential and the procedure would be helpful for both physicians and patients in making decision for management.

Data collection tool

Data were collected by semi-structured questionnaire by the investigator

Data analysis:

All the data were checked and edited after collection. Then the data were entered into computer and analyzed with the help of SPSS-14 (SPSS incorporation, Chicago, IL, USA) (Statistical package for social sciences) win version 14 software programmed. An analysis plan has developed keeping in view with the objectives of the study.

After processing of all available information, statistical analysis was done. For all statistical tests p less than 0.05 will be considered as statistically significant. Continues variable was presented as mean ± SD and numerical variable was presented as frequency and percentage. Chi square test was done to measure the level of significance.

Results and observation

Table-I

Distribution of the respondents by age (n=100)

Age (in year)	Frequency	Percent
19-<25	21	21.0
25-35	54	54.0
>35-46	25	25.0
Total	100	100.0
Mean ± SD (Range)	30.95 ± 6.71	(19-46)

Table shows the age distribution of the respondents. Among all respondents 21.0% were up to 25 years age, 54.0% within 25 to 35 years and 25.0% above 35 years. Mean (±SD) age of the donors was 30.95 (± 6.71) years and all donors were within 19 to 46 years age range.

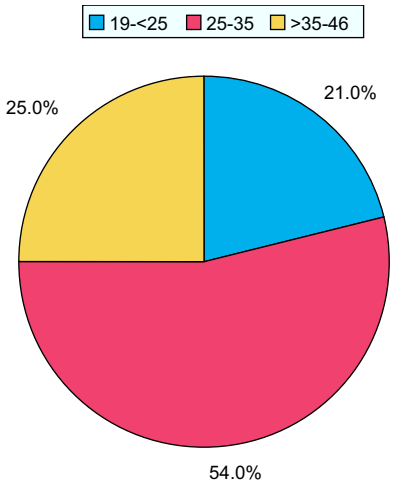

Fig.-1: *Pie diagram of the respondents by age*

Table-II

Distribution of the respondents by sex (n=100)

Sex	Frequency	Percent
Male	85	85.0
Female	15	15.0
Total	100	100.0

Sex distribution of the respondents revealed male was 85.0% and female was 15.0% of total study population.

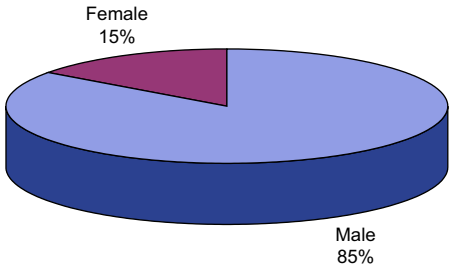

Fig.-2: *Pie diagram of the respondents by sex*

Table-III

Distribution of the respondents by blood group (n=100)

Blood group	Frequency	Percent
A	35	35.0
B	49	49.0
AB	6	6.0
O	10	10.0
Total	100	100.0

Table shows the blood group distribution of the respondents. Approximately half of the respondents had B, 35.0% had A, 10.0% had O and 6.0% had AB blood group.

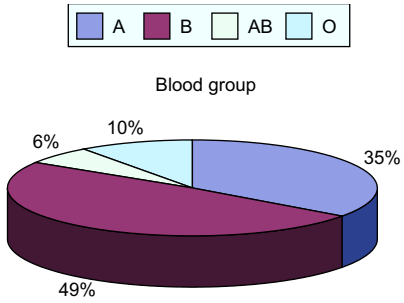

Fig.-3: *Pie diagram of the respondents by blood group*

Table-IV

Distribution of the respondents by secretor status

Secretor status	Frequency	Percent
Secretor	51	51.0
Non secretor	49	49.0
Total	100	100.0

Out of all respondents 51.0% had secretor status and 49.0% had non-secretor status

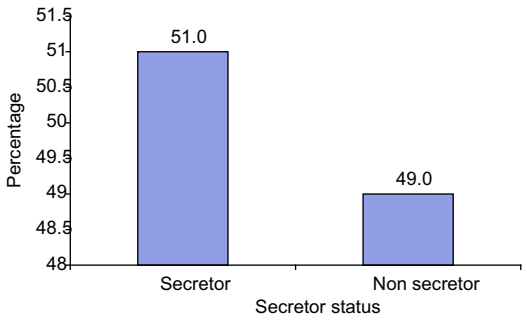

Fig.-4: *Bar diagram Secretor and non-secretor status of respondents*

Table-V

Distribution of the respondents by ABO blood grouping and secretor status

ABO Blood grouping	Secretor status		p value*
	Secretor	Non secretor	
A	20 (39.2)#	15 (30.6)	
B	21 (41.2)	28 (57.1)	
AB	3 (5.9)	3 (6.1)	0.351
O	7 (13.7)	3 (6.1)	
Total	51 (100.0)	49 (100.0)	

Figure within parenthesis denoted corresponding column percentage

* Chi square test was done to measure the level of significance

Out of all respondents of secretor status 39.2% had A, 41.2% had B, 5.9% had AB and 13.7% had O blood group. In respondents with non secretor status 30.6% had A, 57.0% had B, 6.1% had AB and 6.1% had O blood group. No statistically significant difference was observed between secretor and non secretor status in term of ABO blood grouping (p>0.05).

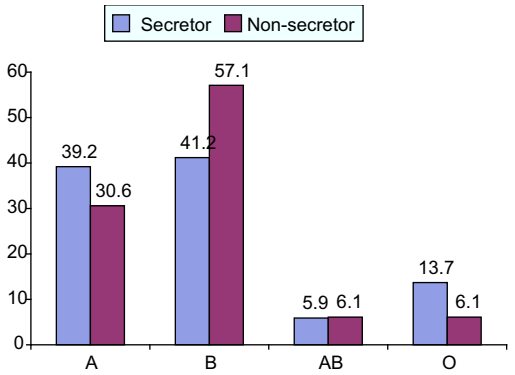

Fig.5: *Bar diagram of the respondents by ABO blood grouping and secretor status*

Table-VI

Distribution of the respondents by sex and secretor status

Sex	Secretor status		p value*
	Secretor	Non secretor	
Male	45 (52.9)#	40 (47.1)	
Female	6 (40.0)	9 (60.0)	0.355
Total	51 (51.0)	49 (49.0)	

Out of all male respondents 52.9% had secretor status and 47.1% had non secretor status and in female respondents 40.0% had secretor and 60.0% had non secretor status.

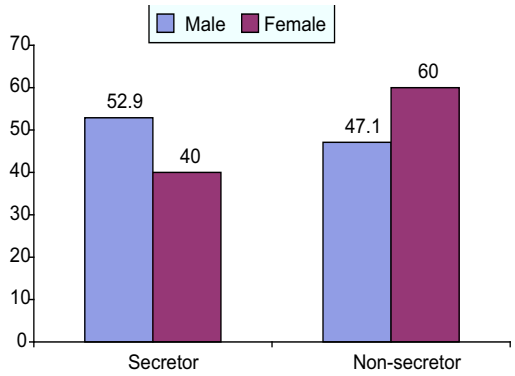

Fig.-6: *Bar diagram of the respondents by sex and secretor status*

Discussion:

A person can be either a secretor or a non-secretor. This is completely independent of whether their blood type is A, B, AB or O. In a simplified sense, a secretor is defined as a person who secretes their blood type antigens into body fluids and secretions like the saliva in mouth, the mucus in digestive tract and respiratory cavities, etc. A non-secretor on the other hand puts little to none of their blood type into these same fluids.

All respondents of the present study were within 19 to 46 years age range and mean (±SD) age of them was 30.95 (± 6.71) years. Maximum 54.0% respondents were within 25 to 35 years age group.

Sex distribution of the patient revealed male and female ratio 5.67:1 in present series.

In the present study out of all male respondents 52.9% (n=45) had secretor status and 47.1% (n=40) had non secretor status and in female respondents 40.0% (n=6) had secretor and 60.0% (n=9) had non secretor status.

Ronchetti et al[12] series 21.4% (n=42) male had non secretor and 78.6% (n=154) had secretor and in female controls 19.9% (n=33) had non secretor and 80.1% (n=133) had secretor status.

In the present study approximately half (n=49) of the patients had B, 35.0% (n=35) had A, 10.0% (n=10) had O and 6.0% (n=6) had AB blood group.

Out of all respondents of secretor status 39.2% (n=20) had A, 41.2% (n=21) had B, 5.9% (n=3) had AB and 13.7% (n=7) had O blood group. In respondents with non secretor status 30.6% (n=15) had A, 57.1% (n=28) had B, 6.1% (n=3) had AB and 6.1% (n=3) had O blood group (p>0.05).

In the present study among all blood donor 51.0% (n=51) had secretor status and 49.0% (n=49) had non-secretor status.

In Dodge series[13] of 531 salivas from school children in Belfast showed a non-secretor frequency of only 26.55% (n=41). Nerell[14] has collected together the figures of 12 investigated populations as far flung as Egypt and Canada with frequencies of non-secretors ranging from 11.1% to 25.4%. Pradhan et al[15] found 28.17% non-secretors among medical students at Kanpur. An investigation has been carried out by Nerell[16] on the frequency of secretors and non-secretors respectively in a

central Swedish population. Out of 2093 individuals tested, 1631 (78%) to be secretors and 462 (22%) non-secretors

All of these studies showed considerably lower frequency of non secretor status, but in the present study 49.0% (n=49) of non secretor status, it may be due to small sample size.

In a study by Chaim et al[17], the relative percentages of healthy subjects carrying oral candida were higher in O group. There were a higher number of non-secretors (48.9%) with oral and vaginal candida infection compared to their proportion (26.6%) in healthy population.

In Macafee[18] series, 387 out of 616 (62.83%) diabetic patients were secretor and 229 out of 616 (37.17%) non secretor, on the other side in control group 306 out of 475 (64.4%) and 169 out of 475 (35.58%) were Secretor and Non-secretor respectively.

It was observed that in Kulkarni and Venkatesh [11] series out of the 64 patients, 15 were secretors and 49 were non-secretors. However 43 subjects were secretors and 13 non-secretors among the 56 controls.

Our results suggest that secretor status was more frequent in normal blood donor in our country and it is comparable with a previously done Bangladeshi study by Akhter.[19] The frequency of ABH secretor and non secretor was 25 out of 42 (60.0%) and 17 out of 42 (40.0%) respectively.

Conclusion:

It can be concluded in the present study that secretor status of ABH blood group is dominant in normal blood donor of our country and comparable with many other studies conducted in different parts of the world.

In this study sample size was small and it is a single centered study. This study can be done with large sample and the detection of secretor status was conducted by conventional haemagglutination inhibition method not by highly sensitive ELISA method

Recommendations

1. A longitudinal study with large sample size should be conducted
2. Multicentred study should be conducted
3. ELISA method should be used instead of HAI method

References

1. Boorman KE, Dodd BE, Lincoln PJ. Blood group serology. 6th edn., Churchill Livingstone, UK. 1988; P.48-49, 82,120.
2. Brozovic B, Brozovic M. Manual of clinical blood transfusion. Churchill Livingstone, UK, 1987, p. 2
3. Greer JP, Rodgers GM, Foerster J, Paraskevas F, Lukens JN, Glader B (eds) 1999, Wintrobe's clinical hematology, 11th ed, Lippincott Williams and Wilkins, Philadelphia, USA p. 793
4. Mollison PL, Engelfriet CP, Contreras M. Blood transfusion in clinical Medicine. 10th edn. Blackwell Science, UK, 1997, p. 69-133.
5. Mollison P.L, Engelfriet CP, Contreras M. Blood transfusion in clinical Medicine. 11th edn. Blackwell Science, UK, 1997, p. 144-145.
6. Rahman M. Laboratory techniques on transfusion medicines, 2001; (11): P- 246.
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. Ishitoya S, Yamamoto S, Mistumori K, Ogawa O, Terai A. Non-secretor status is associated with female acute uncomplicated pyenolnephritis, BJU, International, June 2002; vol- 89. P. 851.
9. Mollison PL, Engelfriet CP, Contreras M. Blood transfusion in clinical Medicine. 10th edn. Blackwell Science, UK, 1997, p. 69-133.
10. Wilkinson SL. Secretor and soluble ABH antigens: The Lewis, I, P, and Globoside Blood Group Systems. In: Sally V. Rudmann (ed) Textbook of blood banking and transfusion medicine. 2nd edn. Chapter 4 Elsevier Health Sciences, 2005 p.86
11. Race RR, Sanger R. Blood groups in man, 6th edn. Blackwell Scientific Publications, Oxford 1975, p. 311-40

12. Ronchetti F, Villa MP, Ronchetti R, Bonci E, Latini L, Pascone R et al. ABO/Secretor genetic complex and susceptibility to asthma in childhood. Eur Respir J 2001; 17: 1236–1238.

13. Dodge JA. ABO blood groups and infantile hypertrophic pyloric stenosis. British Medical Journal, 1967;4:781-782.

14. Nerell G. Secretors of ABH antigen in a central Swedish population. Annals of Human Genetics 1964;27:119-123.

15. Pradhan S, Pradhan AC, Singh KN, Sarnuel KC, Singh B. Some observations on the secretion of blood group substances in the saliva in health. Indian Journal of Medical Sciences 1970;24:586.

16. Nerell G. Secretors of ABH antigen in a central Swedish population. Ann. Hum. Genet., Lond. 1963;27:119-23.

17. Chaim W, Foxman B, Sobel JD. Association of recurrent vaginal candidates and secretory ABO and Lewis phenotype. J Infect Dis 1997; 176: 828–830.

18. Macafee AL. Blood groups and diabetes mellitus. J. Clin. Path. 1964;17:39-41

19. Akhter S. Association or Non-association of secretor status with transfusion dependant thalassaemic patients. Bangladesh 2006