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Frequency of ABH Secretors/Non Secretors and Its Clinical Significance: A Cross Sectional Study in Gwalior

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Abstract: *The ABO blood group and secretor status of individuals is inherited independently. ABO blood group antigens are inherited by A, B & H genes and gene responsible for secretor state is Se (Se/Se & Se/se) gene. If recessive gene se/se is inherited person is non secretor. These group specific substances, ABH may be detected in most body fluid as soluble form in secretors except cerebrospinal fluid (CSF). One of the richest and most available source is saliva. Secretor status of a person can be quite useful to determine certain doubtful cases of ABO blood grouping and also has clinical significance. A total number of 1001 blood donors were randomly registered and studied for secretor/ non-secretor status in the present study. From the study, we conclude that secretors are more prevalent in our region (72.4%) and probable frequency Se and se gene was .475 and .525 while frequency of SeSe, Sese and sese allele genes was .226, .498 and .276 respectively. Secretors have an added degree of protection against the environment, particularly with respect to microorganisms and lectins. Non secretors are more prone to different varieties of auto-immune diseases and TTIs infections. Alcoholism has been associated with the Non-secretor blood type. Secretor status of an individual is also helpful to identify weaker variants of ABO group.*

I. Introduction

The ABO blood group system is widely credited to have been discovered by the Austrian scientist Karl Landsteiner, who identified the O, A and B blood types in 1900[1]. Interestingly, the antigens comprising this blood group system were among the first human genetic markers identified [2, 3]. Later on, AB blood group was added to the ABO blood system by Alfred Von Decastello and Adriano Sturli in 1902 [4]. This major blood group system consists of four blood types: A, B, AB and O [5]. These antigens are genetic markers inherited as Mendelian characteristics in a co-dominant autosomal fashion. In 1930, Putkonen noted that a person could be either secretor or non-secretor with respect to his/her genetic ability to secrete ABH blood group substances in secretions [5]. Weiner in 1943 discovered that A & B substances are present in saliva of most A & B individuals (secretors) [6]. The ABO blood group and secretor status of individuals is inherited independently. ABO blood group antigens are inherited by A, B & H genes and gene responsible for secretor state is Se (Se/Se & Se/se) gene. If recessive gene se/se is inherited person is non secretor. These group specific substances, ABH may be detected in most body fluid as soluble form except cerebrospinal fluid (CSF). One of the richest and most available sources is saliva [7]. The H, Fucosyltransferase 1 (FUT 1) gene codes for the ABO blood group. The secretor, Fucosyltransferase 2 (FUT 2) gene interacts with FUT 1 gene to determine the ability to secrete blood group antigens into body fluids and secretions. Absence of the blood group antigen in secretions is a health disadvantage, as this appears to increase the susceptibility to a number of diseases. There are certain diseases which show evidence of association with non secretor status [8]. ABH non secretors also have a higher prevalence of different varieties of auto-immune diseases including ankylosing spondylitis, Sjogren's syndrome, multiple sclerosis, reactive arthritis, psoriatic arthropathy and grave's disease. Non-secretors have high incidence of diseases of mouth, esophageal cancer, and epithelial dysplasia as compared to secretors [9].
Secretor status of a person can be quite useful to determine certain doubtful cases of ABO blood grouping by conventional method, especially the subgroups of ABO system [10]. Present study was aimed to evaluate the prevalence of secretor status of blood donors in Gwalior region and its clinical significance.

II. Materials And Methods

This work was carried out in Blood Bank, Department of Pathology, at a tertiary care hospital of central India from 1st February 2015 to 31st January 2016. Donor's questionnaire form was filled in accordance of standard protocol for blood donation and relevant past medical history of illness was also taken from the donors, those were registered for the project. For ABO and Rh-D blood grouping, with all aseptic precautions 5 ml blood was collected either from ante-cubital vein of blood donor by disposable syringe, or procured from the

blood unit of the donor. To know the secretor status of donor, 3-5 ml of saliva was collected in a sterile tube. Prior to collection, donors were asked to rinse their mouth thoroughly with distilled water and for increasing salivation they were requested to chew wax, paraffin, or a clean rubber band. After collection, Saliva tube was kept for 8-10 minutes in boiling water bath to denature the salivary enzymes, cooled and centrifuged for 5 minutes at 1000 rpm and then supernatant was collected and diluted with equal volume of normal saline. Denatured diluted saliva was used to know the secretor status of donors. For ABO grouping, Red Cell suspension: 20% in normal saline for conventional tube method and 0.8% in low-ionic strength saline (LISS) for column agglutination method (Gel Technology) was prepared. ABO blood grouping of the donors was done by conventional tube methods/ column agglutination method. For conventional method, commercial monoclonal Antisera; Anti-A, Anti-B, Anti-AB, Anti Rh-D make Tulip were used. For detection of ABO sub-groups, lectins Antisera (Anti-H, Anti-A1), extended ABO grouping Gel card and results of saliva grouping were used.
For the saliva grouping, 1: 32 dilution of anti-sera A and B while 1:8 dilutions of anti-sera H was prepared. Agglutination inhibition test along with positive and negative control was performed, using Neutral gel cards of make- Tulip to know the secretor/ non-secretor status of an individual. Card was well allowed to stand at room temperature for 15 minutes before use. Test procedure is as follows. (Table no.1)

Table no 1-Agglutination Inhibition Saliva Test for secretor status.

S.No	Substance (Antigen)	Test	Positive Control	Negative Control
1.	Test for A substance	0.025 ml of anti-A + 0.05 ml of denature diluted saliva	0.025 ml of anti-A + 0.05 ml of known A substance saliva	0.025 ml of anti-A + 0.05 ml of saline
2.	Test for B substance	0.025 ml of anti-B + 0.05 ml of denature diluted saliva	0.025 ml of anti-B + 0.05 ml of known B substance saliva	0.025 ml of anti-B + 0.05 ml of saline
3.	Test for H substance	0.025 ml of anti-H + 0.05 ml of denature diluted saliva	0.025 ml of anti-H +0.05 ml of known H substance saliva	0.025 ml of anti-H + 0.05 ml of saline

After completing the above test procedure the labelled test cards were incubated at room temperature for 20 minutes. Then, 0.025 ml of A, B and O red cells were added to micro-well marked A, B, H and controls. Further cards were incubated at room temperature for 15 minutes and then Centrifuged at 1000 rpm for 10 minutes. Results were observed as follows-

- In Positive control, if there is agglutination inhibition (No agglutination) and in Negative control there is agglutination, it means test procedure is correct.
- If in the test's tubes there is no agglutination (i.e. agglutination inhibition), person is Secretor for ABH substance.
- If in the test's tubes there is agglutination, person is Non-Secretor for the corresponding substance.

Probable Gene frequency of Se/se and frequency of allele genes: SeSe, Sese and sese were calculated by using Hardy-Weinberg Theorem for probabilities and possibilities. All data was collected, compiled and compared statistically by frequency distribution and percentage proportion. Chi-square ($\chi 2$) test was applied to know the statistically significant difference (*p* value) of the data. Epicalc version 2000 software was used for the same.

III. Observation & Results

A total number of 1001 blood donors were randomly registered and studied for secretor/ non-secretor status in this region of central India. Out of 1001 cases, 725 (72.4%) were secretors and 276 were non-secretors (27.6%); statistically significant (*p*= .000001). Male: female ratio of donors was 96.8% (969n): 3.3% (32n); statistically significant (*p*= .000004). Out of 32 females, 24 (75%) were secretors and 08 (25%) were non-secretors and for 969 males, 701 (72.3%) were secretors and 268 (27.7%) were non-secretors. Prevalence of transfusion transmitted infection (TTI's) i.e. HIV 1 & 2, HCV, HBsAg, VDRL, Malaria in the present study was 3.8% (38) reactive and 96.2% (963) non-reactive. Among 1001 cases, most prevalent TTI was HBsAg 2.6% (26) followed by HCV 0.79% (08), HIV 1 & 2 0.19% (02), Malaria 0.9% (01) and Syphilis 0.9% (01). We observed that TTI positive cases were more in non-secretors. Out of 26 HBsAg positive cases; 11 were secretors and 15 were non-secretors, in 08 HCV positive cases; 03 were secretors and 05 non-secretors and the entire cases positive for HIV 1 & 2, malaria and syphilis belonged to non-secretors.
Age group wise distribution of donors in the present study was- 50 (4.9%) were below 20 years, 604 (60.3%) between 21-30 years, 279 (27.8%) between 31-40 years, 62 (6.2%) between 41-50 years and 06 (0.6%) between 51-60 years which is statistically significant (*p*= .000001). Among different age groups, secretor and non-secretor status was shown in the figure no. 1.

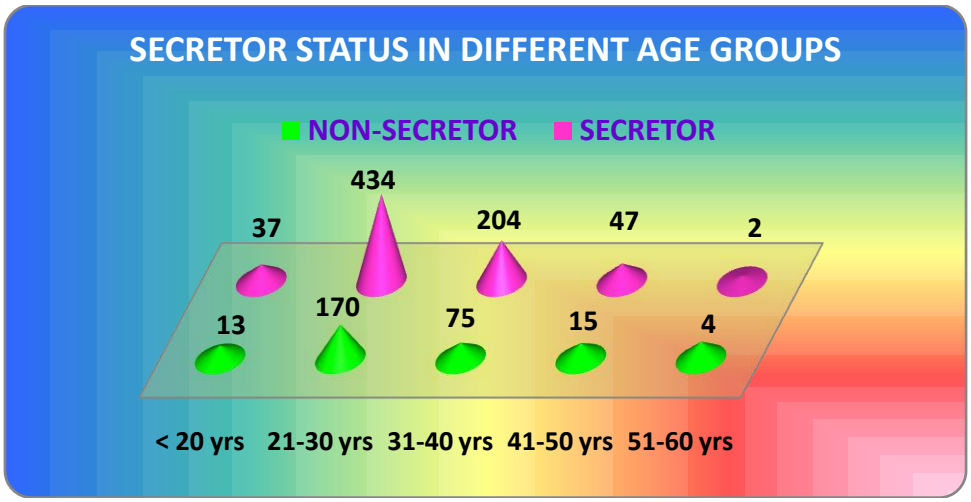

Figure No.1- Secretor Status in Different Age Groups

ABO group distibution of donors were 223 (22.3%) of A group, 340 (33.9%) of B group, 313 (31.2%) of O group and 125 (12.5%) of AB group; statistically significant (*p*= .000001). Distribution of secretor and non secretor state among different ABO group are summarised in fig. no.2 . In the study, 912(91.1%) cases were Rh positive and 89 (8.9%) Rh negative; statistically significant (*p*= .000001)

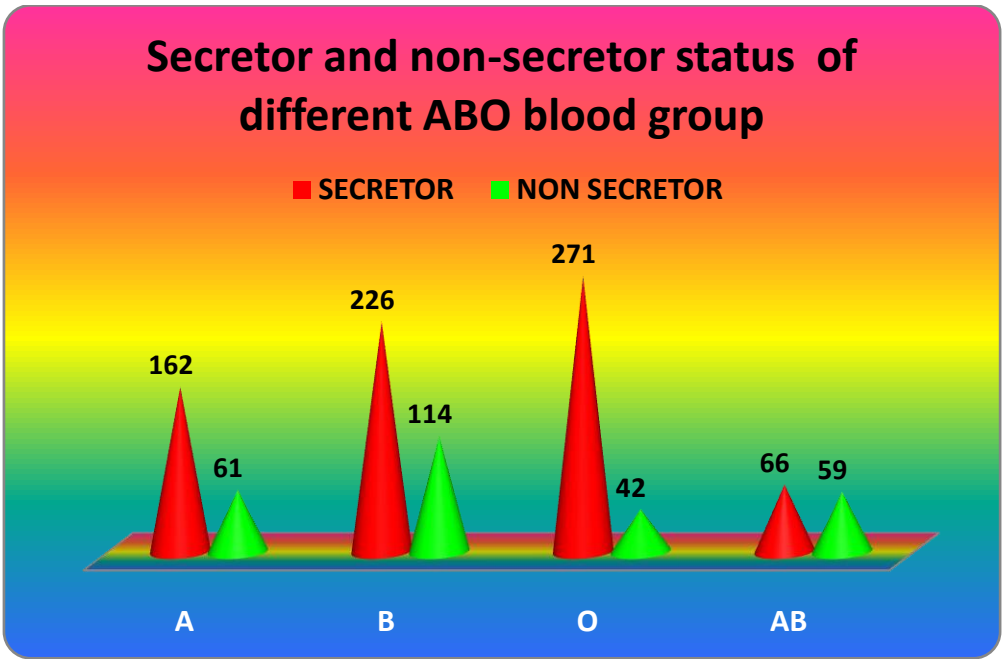

Figure No.2- Secretor and Non-Secretor Status of Different ABO Blood Group

At the time of donation, donors were fit for donation as per standard questionnaire. A total number of 1001 cases in the study were enquired for the history of past discomfort and illness. Out of 1001 cases 51.9% (520) donors were in good health till date and there no history of clinical illness, 45.1% (451) donors gave the history of their past illness, which is summarized in table no.2 and 03% (30) of donors didn't respond to the questionnaire. Out of 45.1% donors with relevant history of past illness, maximum reported multiple system disorder history i.e. two system involvement 36.8% and three system involvement 30.2%, whereas 33.3% donors gave history of only one system disorder. The overall incidence in 1001 cases for single, double and triple system involvement were 14.9%, 16.6% and 13.6% respectively. Also, 39.9% donors had a history of alcohol intake while rest 59.9% was non-alcoholic. Higher incidence of alcohol intake was reported in non-secretors 63% while in secretors it was 37 %. (Table No.2)

Table No.2- Common Health Problems in Blood Donors and Its Relation with Secretor Status.

System Disorders	Prevalence of symptoms P=0.000004	Secretor Cases P=0.000003	Non-Secretor Cases P=0.000003	Comment & p value
Digestive discomfort Gastritis, Dyspepsia Loose Motion, etc.	321 (32.1%)	148 (46.1%)	173 (53.9%)	Non secretors are more prone to digestive disorders. P=0.1629
Respiratory disorders- Recurrent Cough & Cold Recurrent Viral infections Breathlessness	185 (18.5%)	102 (55.1%)	83 (44.9%)	Secretors are more prone to respiratory disorders. P=0.16244
Autoimmune- Joint Pain Swelling Of Joints Restriction Of Movement	80 (7.9%)	26 (32.5%)	54 (67.5%)	Non secretors are more prone to autoimmune disorders. P=0.00174
Cardiovascular-Hypertension Breathlessness Angina	92 (9.2%)	42 (45.7%)	50 (54.3%)	Non secretors are more prone to cardiovascular disorders. P=0.4042
Metabolic – High Blood Sugar Low Blood Sugar Thyroid disorder, etc.	20 (1.9%)	08 (40%)	12 (60%)	Non secretors are more prone to metabolic disorders. P=0.3710
Renal- UTI Fungal Infection	110 (10.9%)	49 (44.5%)	61 (55.5%)	Non secretors are more prone to renal disorders. P=0.2525
Oral Ulcers/ Dental Hygiene	82 (8.2%)	40 (48.8%)	42 (51.2%)	Oral / dental hygiene is poor in non-secretors. P=0.82519
Alcoholism	400 (39.9%)	147 (37%)	253 (63%)	Non secretors are more comfortable with alcohol consumption. P=0.000001

The subgroup of A & B were encountered in the study is summarized in table no 3 &4. Out of 223 cases of 'A' group 190 A_1 positive, 26 A_2 and 07 weak variants of 'A' group were detected in the study. They were 02 of A_3, 02 of A_{int} and 01 each case, A_{end}, A_x and A_m. Out of 340 cases of B group 337 were B, and 03 weaker variants i.e. B_X, B3 and B_M one each were reported in the study. Out of 125 AB group, 112 were A_1B, while 13 were A_2B. Weaker variant of A & B in AB group was not evaluated in the study.

Table 3-Serological Reactions of Weak Subgroups of A Phenotype

ABO Phen-otype	Total No.	Forward Grouping			Reverse Grouping				Lectin		Saliva Test			Adsorption Elution	
		Anti-A	Anti-B	Anti-AB	A_1 Cells	A_2 Cells	B Cells	O Cells	Anti-A_1	Anti-H	A	B	H	Group O sera	Group B Sera
A_3	2	2+	-	1+	0	0	4+	-	-	4+	1+	-	2+	1+	1+
A_{int}	2	4+	-	4+	0	0	4+	0	1+	4+	1+	-	1+	2+	2+
A_{end}	1	1+	-	1+	-	-	4+	-	-	4+	-	-	1+	1+	1+
A_x	1	wk	-	1+	2+	-	4+	-	-	4+	-	-	1+	1+	-
A_m	1	0	0	Wk	0	0	4+	0	1+	4+	3+	-	4+	-	-

Table 4- Serological Reactions of Weak Subgroups of B Phenotype

ABO Phen-otype	Total No.	Forward Grouping			Reverse Grouping				Lectin	Saliva Test			Adsorption Elution	
		Anti-A	Anti-B	Anti-Ab	A1 Cells	A2 Cells	B Cells	O Cells	Anti-H	A	B	H	Group O	Group A Sera
B_x	1	-	wk	2+	4+	4+	-	-	4+	-	-	1	1	-

												+	+	
B_3	1	-	2+	Wk	4+	4+	-	-	4+	-	1+	-	1 +	1+
B_m	1	-	-	-	4+	3+	-	-	4+	-	1+	-	2 +	2+

Probable frequency of Se and se gene and frequency of SeSe , Sese and sese allele genes in the study was calculated by using Hardy-Weinberg Theorem for probabilities and possibilities as shown in table no.5

Table no. 5-Phenotype, Genotype and Gene Frequency in present study

Phenotype			Gene		Genotype	
	No.	Frequency	Calculated	Frequency	Calculated	Frequency
Secretors	725	.724	Se	.475	SeSe	.226
					Sese	.498
Non-secretors	276	.276	se	.525	sese	.276

IV. Discussion

It is a universal fact that blood is man's absolute and unchangeable identity [11]. Although almost 400 blood group antigens have been reported, the ABO and RhD are recognized as clinically significant and dominant blood group antigens. ABO blood group system derives its importance from the fact that A and B are strongly antigenic and anti A and anti B occur naturally in the serum of persons lacking the corresponding antigens [12]. ABO Blood group antigens (substances) are secreted by the secretors into various body fluids. Non-secretors secrete out very minor or none of their blood group antigens into different body fluids. Increased degree of protection against bacterial and fimbrial lectins may be associated with the secretion of these antigens into saliva and mucus. However, secretors are more prone to hemolytic anemia and viral infections that have been cited by Raza MW et al 1991 [13]. Whereas, non secretors have a higher prevalence of autoimmune diseases including ankylosing spondylitis, reactive arthritis, sjogren's syndrome, psoriatic multiple sclerosis, grave's disease, peptic ulcer, metabolic syndromes, oral ulcers etc .[14, 15]

In our study out of 1001 cases, 725 (72.4%) were secretors and 276 were non-secretors (27.6%). These findings were similar to the study done by Igbeneghu C et al 2014 in which out of 740 cases; 78.1% were secretors and 21.9% non-secretors [16]. In our study prevalence of secretor was higher in comparison to studies done by Saboor M et al (64.4% secretor and 35.6% non secretor) [17] and Akhter S et al (60% secretor and 40 % non secretor)[18] while lower to study done by Sikander et al (93% secretor and 07% non secretor) [19]. A lower incidence of secretor status was also reported by Rahil A et al (31.8% secretor and 68.2% non secretor)[20] and Sylvia Devi A. et al (49.5% secretor and 50.5% non secretor) [21]. Frequency of ABH secretor status in the world population is about 80% secretors and 20% non secretors [22]. Wide variation of secretor status in different studies may be due to geographical distribution and racial differences.

In our study, out of 1001 cases, 223 (22.3%) were of A group, 340 (33.9%) of B group, 313 (31.2%) of O group and 125 (12.5%) of AB group. Predominence of B group was also reported by Nasim F.H et al 1987 from Bahawalpur, Pakistan 36.6%[23] and by Saboor M et al [17] from karachi,Pakistan 35.6% while predominence of O group was reorted by Akhter S et al [18] from Dhaka, Fridpur 36%. It may/ may not be related to the distribution of ABO group in the population beecause of random sampling of the cases.

In the present study, 912 (91.1%) cases were Rh positive and 89 (8.9%) Rh negative. Distribution of secretor and non secretor state among different ABO group was : In A group 72.6% were secretors and 27.4% non-secretors, in B group 66.4%were secretors and 33.6% non secretors, in AB group 52.8% Secretors and 47.2% non secretors lastly, in O group 86.3% were secretors and 13.7% non secretors. While in a study done in

southwestern nigeria by Igbeneghu C et al 2014, secretor and non secretor status was 65.9% and 34.1% in A group, 70.4% and 29.6% in B group, 70% and 30% in AB group and 86.2% and 13.8% in O group [16] . Secretor and non secretor status in study done by sylvia A. et al was 51.1% and 45.9% in A group, 46.4% and 53.6% in b group, 40.5% and 59.5% in AB group and 54.1 and 45.9% in O group [21]**.** In our study and study done by ibeneghu et al, uniformly in all the groups, secretors were more prevalent, while in the study by A.Sylvia devi et al non-secretors were reported predominantly in blood group B and AB.

In present study with the contemplation of Rh status along with ABO group secretor status of the donors i.e. out of 223 cases of A group; A positive were 215 and A negative were 08 . In A positive 74.4% were secretors and 25.6% non secretors, in A negative 25% were secretors and 75% non-secretors. Out of 340 cases of B group; Rh positive were 312 and negative were 28. In B positive 71.1% were secretors and 28.8% non secretors, in B negative 14.2% were secretors and 85.7% non-secretors. Out of 125 cases of AB group; Rh positive were 94 and negative were 31. In AB positive 54.2% were secretors and 45.7% non secretors, in AB negative 48.3% were secretors and 51.6% non-secretors. Out of 313 cases of O group; Rh positive were 291 and negative were 22. In O positive 89.6% were secretors and 10.3% non secretors, in O negative 45.5% were secretors and 54.5% non-secretors. With this in our study, we observed that in Rh negative cases non-secretors are more prevalent than secretors, while in other similar studies this type of distribution were not reported; in best of our knowledge.

In present study of 1001 cases prevalence of transfusion transmitted infection (TTI's) i.e. HIV 1 & 2 , HCV, HBsAg, VDRL, Malaria were 3.8% (38) reactive and 96.2% (963) non-reactive. Among the total 1001 cases, most prevalent TTI was HBsAg 2.6% (26) followed by HCV 0.79% (08), HIV 1 & 2 0.19% (02), Malaria 0.9% (01) and Syphilis 0.9% (01) respectively. Higher incidence of HBsAg positive cases was because of higher prevalence of HBsAg in our region as reported by Sharma D.C et al [24]. In the present study, we observed that TTIs infections are more common in non secretors as compare to secretors. Prevalence of males and females donors in the present study was 96.8% (969) and 3.3% (32) respectively, mimic with our previous study on "female contribution in blood donation…" in this area [25]. In present study out of 32 females; 24 (75%) were secretors and 08 (25%) were non-secretors and out of 969 males; 701 (72.3%) were secretors and 268 (27.7%) were non-secretors. A study conducted by Sherwani SK, et al [19] indicated that secretor and non-secretor ratio among the young population were tested which showed that out of 300 females 278 were secretors and out of 250 males 234 were secretors. No remarkable distribution was observed in secretor status among males and females in the present study.

Age group wise distribution in the present study was 50 (4.9%) cases were below 20 years of age, 604 (60.3%) between 21-30 years, 279 (27.9 %%) between 31-40 years, 62 (6.1 %%) between 41-50 and 06 (0.6%) between 51-60 years correspondingly. The study revealed that the most common age group of the donors was between 21-30 years, followed by age groups 31-40, 41-50, <20 and lastly 51-60 with the prevalence of 60.3%, 27.8%, 6.2%, 4.9% and 0.6%. Among different age groups secretor and non-secretor status are as follows- In donors <20 years among 50 cases 37 (74%) were secretors and 13 (26%) non-secretors, in 21-30 years out of 604 cases, 434 (71.9%) secretors and 170 (28.1%) non-secretors, in 31-40 years total 279 cases out of which 204 (73.2%) were secretors and 75 (26.8%) non-secretors, in 41-50 years total 62 cases with 47 (75.8%) secretors and 15 (24.2%) non-secretors and in 51-60 years total number of donors were 6 in which 02 (33.3%) were secretors and 04 (66.7%) non-secretors. In all the groups secretor status is similar as seen in entire study except in the age group of 51-60 years where non-secretors were 66.7% but in this group sample size is too small to draw any relevant observation.

At the time of donation, donors were fit for donation as per standard questionnaire. A total number of 1001 cases in the study were enquired for the history of past discomfort and illness, out of which 51.9% donors were in good health till date, 45.1% donors gave the history of his/her past illness which included signs and symptoms related to - digestive problems, gastritis, breathlessness, metabolic disorders, joint pain, alcoholism, urinary tract infection, oral ulcers poor dental hygiene etc., whereas 03% of donors didn't respond to the questionnaire. Out of 45.1% donors with relevant history of past illness maximum reported multiple system disorder history i.e. two system involvement 36.8% and three system involvement 30.2%, whereas 33.3% donors gave history of only one system disorder. The overall incidence in 1001 cases for single, double and triple system involvement were 14.9 %, 16.6% and 13.9% respectively. Also, 39.9% donors had a history of alcohol intake while rest 59.9% was non-alcoholic. Higher incidence of alcohol intake was reported in non-secretors 63% while in secretors it was 37%. From the above related findings we have drawn following observations that secretors are on the brighter side and have a protection from the following diseases such as gastric problems including ulcers, gastritis, metabolic disorders, Sjogren's syndrome, oral ulcers, poor dental hygiene, respiratory disorders etc. but are more prone towards viral infections, and hemolytic anaemia [13]. This is also reported by M.Saboor et al, S Akhter et al, Abdel Rahim et al and A.Sylvia Devi et al. It is said that every cloud has a silver lining; likewise in cases of non-secretors they possess protection against norvovirus infection causing acute gastroenteritis as reported by Nordgren J et al [26].

Not only secretor/ non secretor status but also certain blood groups make somebody prone towards communicable and non-communicable diseases [27]. The prevalence of coronary heart diseases in blood group A was found higher than in all other ABO blood groups; from England [28], from other parts of Europe [29] and from USA [30]. The women who are not secretors of blood group antigens have 2-3 fold higher risk of developing UTI's [31]. Individuals of blood group O and those who are non-secretors of their ABO blood group antigens are over-represented among patients with gastric or duodenal ulcers [32]. In short, non-secretors are associated with susceptibility to a number of infectious diseases as indicated by few research manuscripts [33, 34]. In our study alcoholism is more common in non-secretors; statically significant (p=0.000001). Alcohol consumption can causes a reduction in the ability to secrete ABH blood group substances in the saliva of alcoholics quoted by Egesie UG et al 2005[35]. Alcoholism has been associated with the Non-secretor blood type. On the positive side, alcohol consumption appears to exert a protective effect on lung function and to lower the risk of heart disease more in Non-secretors than in Secretors. The key principle with the use of alcohol is for Non-secretors (and everybody actually) is moderation [36]. With the help of secretor status of donor, we have identified few weaker blood groups of A & B (table no 3 & 4) as also reported by Thakral B et al [37]. In our study phenotype frequency secretor and non-secretor was .724 and .276 respectively, gene frequency of Se/se gene was .475/.525 and genotype frequency of SeSe, Sese and sese alleles were .226, .498 and .276 respectively, which is almost similar with the frequencies reported in the study of Liverpool mentioned in textbook of human blood groups by Geoff Daniels, 3rd edition[38]. Table no.8

Table no.5 - Comparative Study of Phenotype, Genotype and Gene Frequency

Phenotype			Gene		Genotype	
	No.	Frequency	Calculated Frequency		Calculated Frequency	
Study from Liverpool						
Secretors	864	.772	Se	.523	SeSe	.273
					Sese	.498
Non-secretors	254	.227	se	.476	sese	.227
Present study						
Secretors	725	.724	Se	.475	SeSe	.226
					Sese	.498
Non-secretors	276	.276	se	.525	sese	.276

It is hypothesized that ability to secrete A, B and H substances in saliva, mucus and other glandular secretions was, perhaps, of paramount adaptive significance at a stage in the early history of man when human ancestors subsisted on raw food [39]. The non-human primates who feed mostly on wild plants (fruits, leaves, tubers etc.), and consume un-tempered lectins in bulk, are invariably secretors [39]. The hunter-gatherers, with a high content of lectin-rich raw food in their diet, likewise, are mostly secretors and the non-secretors are rare (zero to 3%) in these human isolates [32]. The modern human societies, on the other hand, show a sustained high frequency of non-secretors (over 20%) [32]. A frequent occurrence of non-secretors in modern human societies is perceived as the consequence of '**relaxation of selection'** pressure on the secretor gene (Se) which has a selective advantage in a lectin-rich dietary environment [40].

V. Conclusion

From the study we conclude that secretors are more prevalent in our region and have an added degree of protection against the environment, particularly with respect to microorganisms and lectins. Non secretors are more prone to TTIs infections. Alcohol is useful for non secretors. Secretor status is also helpful to identify weaker variants of ABO group.

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Consent

The authors declare that written informed consent was obtained from the Donors before being recruited for this research.

Ethical Approval

All author(s) hereby declare that all procedure have been examined and approved by the appropriate ethics committee of Gajra Raja Medical College, Gwalior, India and research have therefore been performed in accordance with the ethical standards laid down in the 1964 declaration of Helsinki.

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Competing Interests

Authors have declared that no competing interests exist.

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