



Distribution of Secretor Status in a Sample of Iraqi Population Based on Their Gender, Blood Groups and Body Mass Index / Original article

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تصنيف حالة الإفراز في عينة من السكان العراقيين
حسب الجنس وفصيلة الدم ومؤشر كتلة الجسم

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Abstract

The ABO blood group system was divided into four phenotypes i.e., A, B, AB, and O following its discovery by Karl Landsteiner in 1990. Antigens of the ABO blood group can be found in bodily fluids such as the salivary and digestive fluids. Furthermore, People are classified as "secretors" or "non-secretors" based on their ability to secrete (ABO blood group) antigens in body fluids. The control-based study was conducted on 342 Iraqi adults who were presented at educational institutions. The study lasted from October 2022 to February 2023 and aimed to determine the relationship between secretor status with (gender, blood groups, and body mass index). The results showed that the females are non-secretors which are lower than in males but this difference is not significant. While, non-secretors are those who have non-O blood groups (A, B, and AB), which is significantly higher than of those in the secretors' group. In contrast, about half of secretors have O blood group, which is significantly higher than only a quarter of non-secretors. Furthermore, there is no significant difference in the distribution of blood groups based on the Rh system. In addition, there are no significant differences in the frequency of normal, overweight, and obese cases between secretors and non-secretors.

Keywords: Blood groups, Body mass index, Saliva, Secretor



المستخلص

تم تصنيف نظام فصائل الدم ABO إلى أربعة أنماط ظاهرية وهي A و B و AB و O بعد اكتشافه من قبل كارل لاندشتاينر في عام 1990. حيث يمكن العثور على مستضدات فصيلة الدم ABO في سوائل الجسم مثل السوائل اللعابية والهضمية. علاوة على ذلك، يتم تصنيف الأشخاص إلى "مفرزين" أو "غير مفرزين" بناءً على قدرتهم على إفراز مستضدات (فصيلة الدم ABO) في سوائل الجسم. أجريت الدراسة القائمة على الضبط على 342 بالغاً عراقياً تم تقديمهم في المؤسسات التعليمية. استمرت الدراسة من أكتوبر 2022 إلى فبراير 2023 وهدفت إلى تحديد العلاقة بين حالة الإفراز و (الجنس وفصائل الدم ومؤشر كتلة الجسم). أظهرت النتائج أن الإناث غير مفرزات وهي أقل من الذكور ولكن هذا الفرق ليس ذا دلالة إحصائية. بينما غير المفرزين هم أولئك الذين لديهم فصائل دم غير O (A و B و AB)، وهي أعلى بكثير من أولئك في مجموعة المفرزين. في المقابل، يمتلك حوالي نصف مفرزي الدم فصيلة دم O، وهي نسبة أعلى بكثير من ربع غير المفرزين. علاوة على ذلك، لا يوجد فرق جوهري في توزيع فصائل الدم بناءً على نظام Rh. كما لا توجد فروق جوهريّة في تواتر الحالات الطبيعية، وزيادة الوزن، والسمنة بين مفرزي الدم وغير المفرزين.

الكلمات المفتاحية: فصائل الدم، مؤشر كتلة الجسم، اللعاب، المفرزين



Introduction

Depending on their ability to secrete ABO blood group antigens in body fluids, people are classified as "secretors" or "non-secretors" [10]. In 1930 Putkonen reported that a person's hereditary proclivity to emit ABH blood group chemicals in secretions could be a non-secretor or secretor [3]. Karl Landsteiner, an Austrian, discovered the ABH blood group system in 1901 [5, 14]. The Blood group (ABH) antigens (B, A, and H) have been found on lymphocytes, red blood cells, platelets, secretions, body tissue cells, and body fluids (except cerebrospinal fluid) [14]. In 1926, it was discovered that antigens A and B were present not only on red cells but also in saliva in the form of soluble antigens [3]. The ABO system categorizes blood types as A, B, AB, and O based on the presence or absence of A, B, and H antigens on the surface of RBCs [17]. In fluids, blood group "O" secretes only H element, blood group "A" secretes both A and H substances, and blood group "B" secretes both B and H substances [10, 17]. The qualitative and quantitative aspects of secretors' mucus, saliva, and other secretion bodies are the primary distinctions between secretors and non-secretors [2]. Approximately 80% of the population secretes H-substance regardless of ABO blood group [13]. The fucosyltransferase-2 secretor gene, which is located on the short arm of chromosome 19, has two alleles: dominant "Se" and recessive "se." In their inheritance pattern, (Se Se) and (Se se) have a dominant secretor phenotype, whereas (se se) has a recessive non-secretor phenotype. As a result, blood group "O" secretes only material H in fluids, while blood group "A" secretes both substances A and H, and blood group "B" secretes both substances B and H [16, 9]. Saliva research is now rapidly progressing. Because of the use of novel methods such as metabolomics, genomics,



proteomics, and bioinformatics, saliva contains hundreds of components that can be used to diagnose systemic disorders, as proof of exposure to numerous dangerous agents, and as health and disease biomarkers [15, 12].

Materials and Methods

A case-control study was conducted on 342 Iraqi adults over the course of five months, from October 2022 to February 2023. Individuals (both males and females) were recruited from educational institutions. Several data were recorded for all individuals including: gender, age and Body mass index (BMI). BMI was calculated by dividing body weight (in kg) by square height (in meters), with kg/m^2 as the unit. All subjects have saliva samples taken to determine their secretor status. In addition, blood groups based on the ABO and Rh systems were determined using the hemagglutination slide method.

Results

Three hundred and forty-two Iraqi adults were enrolled in this study at average age of 27.5 ± 9.1 years ranging from 18 to 63 years, 163 (47.9%) of them are males and the rest 179 (52.1%) are females (Table-1). This table shows that 250 (73.1%) of them are secretors and only 92 (26.9%) of them are non-secretors. According to ABO system, 143 (41.8%) of those people are presented with blood group "O", 85 (24.9%) and 80 (23.4%) of them have group A and B respectively, while only 34 (9.9%) have blood group AB. However, 306 (89.5%) of individuals have positive Rh blood group, and only 36 (10.5%) of them have negative Rh group. Moreover, this table reveals that the average body mass index in those people is $26.1 \pm 4.7 \text{ kg}/\text{m}^2$, 161 (47.1%) of them with normal BMI, 122 (35.7%) with overweight BMI, and only 59 (17.2%) of them are obese.



Table-1: Characterization of individuals enrolled in this study

Character		Values
Gender (n, %)	Male	163 (47.9%)
	Female	179 (52.1%)
	Total	342 (100%)
Age (years)	Range	18 – 63
	M ± SD	27.5 ± 9.1
Secretor status (n, %)	Secretors	250 (73.1%)
	Non-secretors	92 (26.9%)
ABO blood group (n, %)	A	85 (24.9%)
	B	80 (23.4%)
	AB	34 (9.9%)
	O	143 (41.8%)
Rh blood group (n, %)	+ve	306 (89.5%)
	-ve	36 (10.5%)
BMI (kg/m ²)	M ± SD	26.1 ± 4.7
BMI category	Normal	161 (47.1%)
	Overweight	122 (35.7%)
	Obese	59 (17.2%)
(M ± SD: mean ± standard deviation; BMI: body mass index)		

To estimate the frequency of non-secretors among those people based on their gender, Figure-1 shows that 25.7% of females are non-secretors which is lower than 28.2% in males but this difference is not significant (P= 0.599).

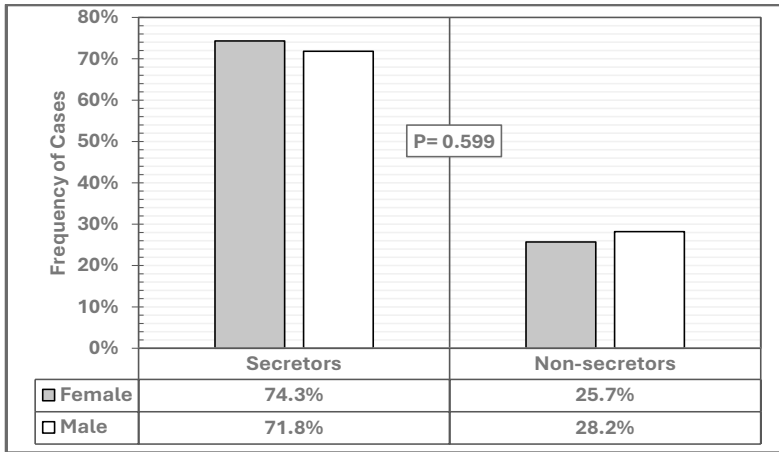


Figure-1: Frequency of secretors and non-secretors in male and female individuals

However, Figure-2 reveals that about three quarter (73.9%) of non-secretors are those who have non-O blood groups (A, B, and AB), which is significantly ($P= 0.0003$) higher than 52.4% of those in secretors' group. In contrast, about half (47.6%) of secretors have O blood group, which is significantly higher than only quarter (26.1%) of non-secretors.

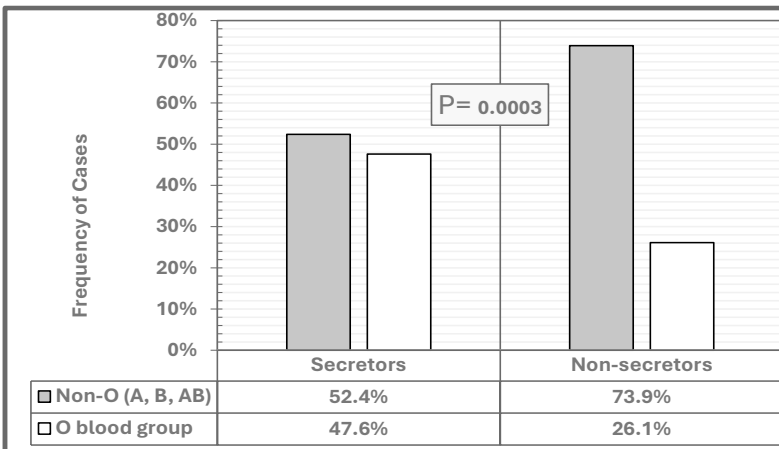


Figure-2: Distribution of O and non-O blood groups in secretors and non-secretors



Furthermore, there is no significant difference ($P= 0.785$) in the distribution of blood groups based on Rh system. Figure-3 shows that the majority of secretors and non-secretors have Rh positive blood group (89.2% and 90.2% respectively), and the minority of them have Rh negative group (10.8% and 9.8% respectively).

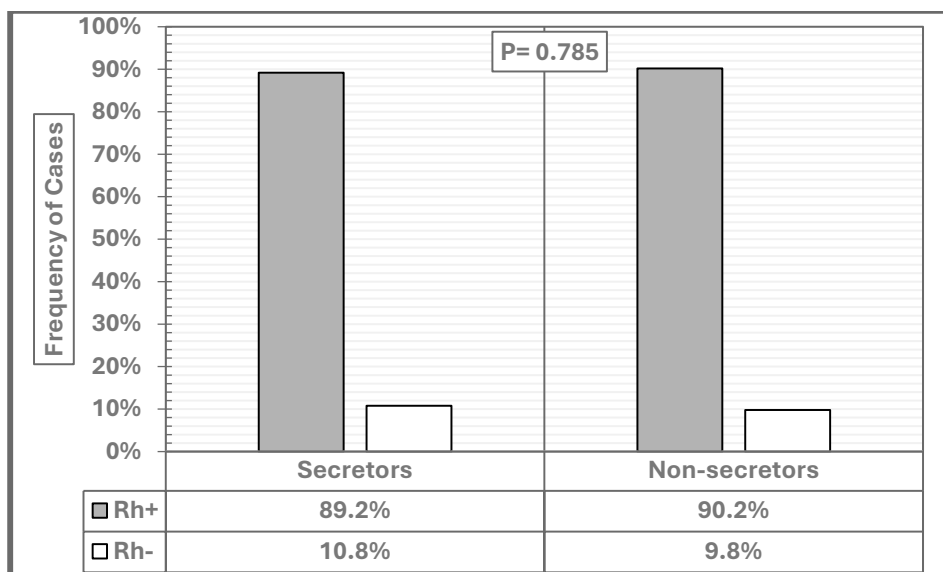


Figure-3: Distribution of Rh blood groups in secretors and non-secretors

To identify whether secretors have different BMI from non-secretors, Table-2 reveals non-significant difference ($P= 0.920$) between two groups (26 ± 4.9 vs 26.1 ± 4.3 kg/m² respectively). Also, this table shows no significant difference ($P= 0.845$) in the frequency of normal, overweight, and obese cases between secretors (48%, 35.2%, and 16.8% respectively) and non-secretors (44.5%, 37%, and 18.5% respectively).

**Table-2: Comparison between secretors and non-secretors according to their BMI categories**

BMI		Secretors (n=128)	Non-secretors (n=39)	P value
M ± SD (kg/m ²)		26 ± 4.9	26.1 ± 4.3	0.920
Category (n, %)	Normal	120 (48%)	41 (44.5%)	0.845
	Overweight	88 (35.2%)	34 (37%)	
	Obese	42 (16.8%)	17 (18.5%)	

Discussion

Comparing these findings with those attained by other researchers, the majority of previous studies found no link between gender and secretor status [8, 7, 11].

On the other hand, Figure-2 shows non-secretor status is far more common in individuals who are not in the O blood type; in contrast, secretor status is higher in O blood group individuals. These findings are consistent with those of Jaffa [7] research refers to Secretor status is substantially more common in blood group O persons than in non-O blood group individuals. This could account for the low prevalence of some diseases in people with blood group O.

In contrast, Saboor [14] discovered that B blood group has highest secretor frequency, while has the lowest in AB blood group. Secretor positivity is found in blood groups A and O, respectively. While, Imoru [6] discovered that the differences in the frequencies of secretors and non-secretors in the ABO blood group system were not statistically significant. Furthermore, Fakorede [4] found an incidence of secretor status was more prevalent among blood group A individuals compared to any other blood group but the difference was not statistically significant.

Secretor status and (ABO) blood types have an impact on clinical and forensic medicine as well as specific disorders. (Leukemia's and non-Hodgkin



lymphomas) are examples of cancers that change red cell antigens, which reduces their reactivity when cells gather together. The patient's true blood group may be confirmed through saliva testing if the patient is a secretor. Saliva and other secretions containing ABH compounds have some advantages. Additionally, non-secretors are more likely to suffer some disorders [1, 14].

The nature of different amino acid substitutes present on the surface of red blood cells determines the nature of Rh systems, which have significant clinical significance. The percentage distribution of the Rh factor in all study groups revealed that the majority of secretors and non-secretors have Rh-positive blood groups, while the minority has Rh-negative blood groups and this agrees with Jaffa [7] and Saboor [14]. Additionally, there is no link between BMI and secretor status as a show in table-2 and the BMI is not affected.

Conclusion

According to these findings, it can be concluded that secretor status as genetic trait is not gender-specific, and BMI is not affected by this trait. However, individuals who have non-O blood groups (A, B, and AB) are more likely to be non-secretors than those with O blood group, which may indicate an association in the expression of these two genetic traits that needs further investigation.

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