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Association of ABO Blood Group and Rhesus Factor with Dental Malocclusion in a Population of Baghdad, Iraq

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ABSTRACT

Background: *The purpose of this study was to investigate if there was an association between ABO blood group and Rhesus factor (Rh) with dental malocclusion.* ***Patients and methods:*** *The sample of the current study consisted from 200 subjects (100 males and 100 females) collected at the College of Dentistry, University of Baghdad, Iraq. The antero-posterior relationships of the maxillary and mandibular first molars in maximum intercuspation by Angle's classification were evaluated, the blood samples were collected. The examinations of blood grouping and Rh factor were done using slide agglutination method.* ***Results:*** *In Class I, the blood group O Rh+ve (55%), had a greater propensity for dental malocclusion. In Class II Division 1, also the blood group O Rh+ve (33%), had a greater susceptibility for dental malocclusion. While in Class II Division 2, the blood group O Rh+ve showed the predominant percentage of occurrence (41%). The Class III showed that the blood group O Rh+ve was the highest percentage (38%). There was no significant correlation (P>0.05) found between males and females in all malocclusions types. Also, there was no significant correlation (P>0.05) between all malocclusions types, blood grouping system, and Rhesus factor.* ***Conclusion:*** *The percentage of occurrence of total malocclusion was highest in blood group O Rh+ve, followed by A Rh+ve, B Rh+ve, B Rh−ve, AB Rh+ve, A Rh−ve, O Rh−ve respectively, and the AB Rh−ve was the least percentage (O Rh+ve>A Rh+ve > B Rh+veB Rh−ve > AB Rh+ve >A Rh−ve>O Rh−ve >AB Rh−ve). There was no significant association (P>0.05) between all malocclusion types, blood grouping system, and Rh factor.*

Keywords: ABO blood groups, Rhesus factor, Association, Malocclusion, Baghdad population

INTRODUCTION

Occlusion is defined as the contact between dentitions or the relationship of the maxillary and mandibular teeth as they approximate each other into functional contact during chewing or at rest, while malocclusion is the condition of any deviation from the normal or ideal occlusion [1]. Malocclusion is a misalignment or incorrect relation between the teeth of the two different dental arches when they approximate each other as the jaws close, thus it considered as un acceptable deviation from the ideal occlusion that may be regarded as aesthetically unsatisfactory, thus implying a state of disharmony in the relative sizes and position of teeth, jaws, facial bones, and soft tissues (tongue, lip, and cheek) [2].

Malocclusion is a common form in the modern community owing to the fact of assumption of soft diet and deficiency of inducement that is important for the jaw growth, and the proximal attrition of teeth, which otherwise aids to adjustment of teeth in dental arches in aligned form [3]. Dental malocclusion is a morphologic deviation of the biophysical environment from an accepted norm for human species. While skeletal type refers to the inherited bony size, and shape of the upper and lower jaw to each other, So the malocclusion is usually an inherited condition, this means it can be delivered from one generation to the next [4].

In 1901, Landsteiner [5] first explained the presence of serologic variation between individuals (who received a Nobel Prize in 1930 and together with Weiner; he discovered Rhesus system in 1940), and classified people into four groups depending on whether their RBC cell membrane composed of agglutinogen (antigens). The most crucial blood-typing system, the ABO system, that consists of four blood variants: A, B, AB, and O. Blood group O erythrocytes have no true antigen, but blood serum of O-type individuals bears antibodies to both A and B antigens. Type A and B

erythrocytes carry the A and B antigens, respectively, and produce antibodies to the others. Type AB erythrocytes do not fabricate antibodies to other blood types due to that they have both A and B antigens [6]. The distribution forms of ABO system are compound around the world. Some difference may even happen in various regions within one small country [7]. The blood group distribution also manifests difference according to races. In previous Iraqi studies [8,9], they detected that the O blood type was more common followed by blood type B and A, and the least dominant was AB. The biological role often does not correlate to the red cell, but to the existence of chemical moieties on other cells that were initially recognized as red cell antigens. Antigens, first recognized on RBCs, are now known to be important as receptors and binders for bacteria, parasites and immunologically important proteins and differences in ABO blood groups are marked by antigens in the outer carbohydrate coating (glycocalyx) of erythrocytes [10].

In the last 20 years, there has been increasing evidence that blood groups have a function and perform a biological role, they have been used as genetic markers in studies of their correlations with various diseases, epidemiological evaluations can indicate relationships between oral disease and some genetic features or associated diseases, which will help to identify and treat them. One of the most important human genetic traits is the relationship between the ABO blood group system and some oral diseases. Weber and Pastern [11] first investigated the association of ABO blood group with periodontal disease [11,12].

The aims of this study are to investigate if there is an association between ABO blood group and Rhesus factor (Rh), with dental malocclusions.

MATERIALS AND METHODS

The sample of the current study consisted from 200 subjects were selected using simple random sampling (100 males and 100 females), and carried out at the College of Dentistry, University of Baghdad, aged 18-25 years old with permanent dentition only. A separate sheet or proforma was used as a record for each individual including patient's name, age, sex, blood group, and the malocclusion, after taking the ethical approval.

After obtaining the consent form from each subject, clinical examination of the oral health status was done. Selection criteria are none of the subjects revealed acute or chronic inflammatory or autoimmune diseases as well as medication, previous orthodontic treatment, previous trauma of the primary or permanent dentition, smoking, or the use of steroidal and non-steroidal anti-inflammatory drugs. They did not show clinical signs of periodontal disease, periapical lesions, or root resorption. Patients with active caries or oral mucosa lesions were excluded. Only 118 individuals (55 males and 63 females) were involved in the current study and they followed the inclusion criteria.

The antero-posterior relationships of the maxillary and mandibular first molars in maximum intercuspation by Angle's classification [13] were evaluated (Angle's Class I, Angle's Class II, and Angle's Class III), the sample was divided into the following:

- **Class I malocclusion (Angle's class 1):** 38 subjects were included (15 males and 23 females).
- **Class II Division 1 malocclusion (Angle's Class II Div 1):** 27 subjects were included (14 males and 13 females).
- **Class II Division 2 malocclusion (Angle's Class II Div 2):** 27 subjects were included (14 males and 13 females).
- **Class III malocclusion (Angle's class III):** 26 subjects were included (12 males and 14 females).

Blood Samples

The blood samples were collected using sterile disposable lancet and finger prick method. The examinations of blood grouping and Rh factor were done using slide agglutination method [10] by Anti-A *(Vitro),* anti-B *(Vitro),* anti-D *(Vitro)*.

Statistical Analysis

The collected data were treated using the Statistical Package of Social Sciences version 17. Descriptive statistics included statistical tables of numbers and percentages. While the inferential statistics included correlation test (Chi-square) was done to examine the level of significance: If probability >0.05 is a non-significant, while $0.05 \geq P > 0.01$ is a significant.

RESULTS

Among the 118 participants, the statistical distribution of the orthodontics students in term of ABO blood grouping and Rhesus factor, gender, and malocclusion type were demonstrated in Table 1, the percentage of occurrence of total malocclusion was highest in blood group O Rh+ve, followed by A Rh+ve, B Rh+ve, B Rh−ve, AB Rh+ve, A Rh−ve, O Rh−ve respectively, and the AB Rh−ve was the least percentage (O Rh+ve > A Rh+ve > B Rh+ve >B Rh−ve > AB Rh+ve >A Rh−ve > O Rh−ve >AB Rh−ve).

Table 1 Statistical distribution (number and percentage) of the orthodontics students in term of ABO blood grouping and Rhesus factor, gender, and malocclusion type

Malocclusion	Gender		Blood group and Rh factor							
			A Rh+	A Rh-	B Rh+	B Rh-	AB Rh+	AB Rh-	O Rh+	O Rh-
			N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Class I	Male	15	3 (20%)	0 (0%)	1 (7%)	3 (20%)	0 (0%)	0 (0%)	7 (47%)	1 (7%)
	Female	23	4 (17%)	1 (4%)	4 (17%)	0 (0%)	0 (0%)	0 (0%)	14 (61%)	0 (0%)
	Total	38	7 (18%)	1 (3%)	5 (13%)	3 (8%)	0 (0%)	0 (0%)	21 (55%)	1 (3%)
Class II Div 1	Male	14	5 (36%)	0 (0%)	4 (29%)	0 (0%)	1 (7%)	0 (0%)	4 (29%)	0 (0%)
	Female	13	3 (23%)	0 (0%)	4 (31%)	0 (0%)	1 (8%)	0 (0%)	5 (38%)	0 (0%)
	Total	27	8 (30%)	0 (0%)	8 (30%)	0 (0%)	2 (7%)	0 (0%)	9 (33%)	0 (0%)
Class II Div 2	Male	14	1 (7%)	0 (0%)	6 (43%)	0 (0%)	0 (0%)	0 (0%)	7 (50%)	0 (0%)
	Female	13	4 (31%)	1 (8%)	2 (15%)	1 (8%)	1 (8%)	0 (0%)	4 (31%)	0 (0%)
	Total	27	5 (19%)	1 (4%)	8 (30%)	1 (4%)	1 (4%)	0 (0%)	11 (41%)	0 (0%)
Class III	Male	12	3 (25%)	0 (0%)	2 (17%)	1 (8%)	0 (0%)	0 (0%)	6 (50%)	0 (0%)
	Female	14	5 (36%)	0 (0%)	5 (36%)	0 (0%)	0 (0%)	0 (0%)	4 (29%)	0 (0%)
	Total	26	8 (31%)	0 (0%)	7 (27%)	1 (4%)	0 (0%)	0 (0%)	10 (38%)	0 (0%)
Total Classes	Male	55	12 (22%)	0 (0%)	13 (24%)	4 (7%)	1 (2%)	0 (0%)	24 (44%)	1 (2%)
	Female	63	16 (25%)	2 (3%)	15 (24%)	1 (2%)	2 (3%)	0 (0%)	27 (43%)	0 (0%)
	Total	118	28 (24%)	2 (2%)	28 (24%)	5 (4%)	3 (3%)	0 (0%)	51 (43%)	1 (1%)

In Class I malocclusion, the blood group O Rh+ve was the highest percentage (55%), followed by A Rh+ve, B Rh+ve, B Rh−ve, A Rh−ve, O Rh−ve, AB Rh+ve, and AB Rh−ve respectively.

In Class II Division 1 malocclusion, also the blood group O Rh+ve was the highest percentage of occurrence (33%), followed by A Rh+ve, B Rh+ve, AB Rh+ve, A Rh−ve, B Rh−ve, AB Rh−ve, and O Rh−ve respectively. While in Class II Division 2 malocclusion, the blood group O+ was the predominant percentage of occurrence (41%), followed by B Rh+ve, A Rh+ve, A Rh−ve, B Rh−ve, AB+, AB Rh−ve, and O Rh−ve respectively.

The class III malocclusion showed that the blood group O Rh+ve was the highest percentage (38%), followed by A Rh+ve, B Rh+ve, B Rh−ve, A Rh−ve, AB Rh+ve, AB Rh−ve, and O Rh−ve respectively.

In regard to gender, there was no significant correlation (P>0.05) found between males and females in all malocclusions types (X^2=5.51, df=7, P=0.598, Yate's Chi-square=1.57, and Yate's probability=0.979) (Table 2).

In regard to total classes of malocclusions, there was also no significant correlation (P>0.05) between all malocclusions types, blood grouping system, and Rhesus factor (X^2=16.95, df=21, P=0.714, Yate's Chi-square=7.61, and Yate's probability=0.996).

Table 2 Correlation between gender, total classes, and blood groups with Rhesus factor

Variables	Chi- square	df	Probability	Yate's Chi-square	Yate's probability
Gender (Males versus Females)	5.51	7	0.598	1.57	0.979
Total classes	16.95	21	0.714	7.61	0.996

DISCUSSION

Participants included in the current study, all over with good general health for the purpose of assessment the blood grouping and Rhesus factor.

ABO and Rhesus blood grouping are so beneficial, especially if are related to malocclusion in any community, genetic researches, and studies on population migrations pattern.

The multifactorial properties of malocclusion make it difficult to make a relation with blood grouping, yet with the hereditary factors, probably playing a role.

Several researches have been done to investigate the relation between ABO blood grouping and incidence of a disease, but limited studies have been made to investigate the association between ABO blood grouping and occurrence of oral diseases [14-16].

A study has been determined the relationship between the malocclusion and blood grouping system [17], the current study was designed to identify if there is a correlation between malocclusion types, and ABO blood grouping system and Rhesus factor in an Iraqi sample subjects.

In the current study, the evaluation of an association between malocclusion types, blood grouping system and Rh factor reveals that there was no correlation between them (X^2=16.95, df=21, and P=0.714), the results of the current study disagreed with the findings of Sharma, et al. [17], in which, they evaluate the association between blood grouping and occlusion in Indian population, this disagreement may be due to different in sampling, methodology, geographic diversity of the population, and racial variation, furthermore, the lack of information about the correlation between variables.

On the other hand, the differences arisen in the percentage of occurrence of blood grouping and Rhesus factor in different types of malocclusions is due to that the ABO gene is an autosomal, and because of this fact, every subject has two genes coding for their ABO blood group. The antigens of the ABO system are an integral part of the red cell membrane, which are also found in plasma and other body fluids, the presence or absence of certain antigens has been associated with various diseases and deformities [18,19].

It has always been established a hypothesis that the occurrence of a certain kind of a disease may be associated with a specific blood group type.

CONCLUSION

According to current research findings, further differentiations and other factors should also be considered. For accurate achievement of the aetiogenic role of malocclusion, multicenter collaboration studies, which involves different populations diversity, are needed to further investigate this relation worldwide. In further studies, by increasing the sample size, it can be established, whether there is a relation between different occlusal abnormalities, and the blood grouping system and Rh factor.

DECLARATIONS

Conflict of Interest

The authors and planners have disclosed no potential conflicts of interest, financial or otherwise.

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