INTRODUCTION

Epidemiological studies have shown that around 20% of the world’s population suffers from malocclusion and other maxillofacial deformities (1). Types of malocclusion are multi-factorial in origin and can be attributed to genetic, hereditary and acquired causes (2). Predicting a genetic pattern within a specific maxillofacial deformity is difficult due to the multi-factorial characteristics of facial development, but epidemiological evaluations can reveal the relationship between such deformities and some genetic characteristics- or accompanied diseases- which will help in recognition and treatment (2,3).

One of the most important human genetic characteristic is the relationship between the

ABSTRACT

Background: The authors sought to investigate the relationship between the blood groups and malocclusion in group from the Egyptian population.

Methods: A total of 300 students (172 females and 128 males) in the age ranges of 17 – 22 years participated in this study. A separate sheet was used as a record for each student providing complete information about their blood group type and malocclusion. The blood group of each student was first determined and then divided into four groups according to their ABO blood group into A, B, O and AB group. Inside each group we started to diagnose their type of occlusion, the presence or absence of any malocclusion followed by classifying this malocclusion.

Results: Using Chi-square (\(\chi^2\)) test with significance level was set at P ≤ 0.05, it was found that a correlation exists between the blood group and malocclusion indicating that the prevalence of malocclusions is highest in blood group A followed by O then B and the least prevalence in AB.

Conclusions: The estimation of the correlation between blood groups and malocclusions showed that blood groups have an association with malocclusions with highest prevalence in blood group A followed by O, B and AB in group of Egyptian population.

CORRELATION BETWEEN ABO BLOOD GROUPS AND MALOCLUSION IN A SAMPLE OF EGYPTIAN POPULATIONS: A CROSS SECTIONAL STUDY

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ABO blood group and some of those diseases and deformities. The ABO blood group system is the first and the most important system defined in 1901\(^{(2)}\). There are two main antigens: A and B in the ABO system that are either present on cell membranes or secreted into the plasma and other fluids of the body. The presence or absence of these antigens results in the four blood groups: A, B, AB, and O. These antigens are present on the 9\(^{th}\) chromosome and are inherited co-dominantly\(^{(3,4)}\).

On evaluating the literature, limited studies have been carried out to investigate the association between ABO blood groups and occurrence of oral diseases. Pinkston and Cole\(^{(5)}\) found that 38.5 percent of salivary gland tumors in cases with blood group A was similar to the 39.0 percent observed for controls. No differences were observed when benign and malignant tumors were considered separately, nor for any of the major histologic types of tumor. The distribution of Rh factor among cases and control also did not differ significantly.

Mortazavi \textit{et al}\(^{(6)}\), found that People with blood group B are at a greater risk of developing oral cancer, and female patients under 50 years of age with blood group B have the highest risk to develop non-squamous cell oral cancer.

Kaslick \textit{et al}\(^{(7)}\), studied the association of aggressive periodontitis and ABO blood group, they found significantly less patients with blood group O and more patients with blood group B. Roberts\(^{(8)}\), discussed the relationship between ABO blood group and susceptibility to chronic disease as an example of genetic basis for family predisposition. Koregol \textit{et al}\(^{(9)}\), in a study concluded that blood group A formed a significantly higher percentage in the gingivitis group, blood group O formed a higher Percentage in the periodontitis group and blood group AB showed the least percentage of periodontal diseases.

Vivek \textit{et al}\(^{(10)}\) found that subjects with blood group O and Rh positive had a greater propensity.

Gheisari \textit{et al}\(^{(1)}\), in their study showed that among different blood Groups; those with blood group B were found to have a greater likelihood of association with maxillofacial deformities and the Probability of the association of such. Deformities was found to be the least with blood group A.

On the other hand, only few studies investigated the relationship between ABO blood groups and the incidence of malocclusion\(^{(11-16)}\). For this reason, this study was conducted to investigate if there is a relationship between ABO blood group and the dental malocclusions in a group from the Egyptian population.

**MATERIALS AND METHODS**

**Subjects:**

Three hundreds of students (172 females and 128 males) at the faculty of Dentistry, Fayoum University. Their age ranges from 17-22 years. A separate sheet was used as a record for each individual including name of the student, age, sex, graduation level, identification number, blood group, and the malocclusion. While the exclusion criteria were: the presence of any systemic disease, craniofacial anomaly, previously orthodontic treatment, extracted teeth, congenitally missed teeth and retained deciduous teeth.

Sample size calculation was based upon the results of Gupta SP (2018)\(^{(17)}\). Using alpha ($\alpha$) level of (5%) and ($\beta$) level of 20% i.e. Power = 80\%. Calculation yielded a minimum of 68 Class I cases, 33 Class II cases and 32 Class III cases giving a total of 134 malocclusion cases. Sample size calculation was performed using G*Power Version 3.1.9.2.

The blood group of each student was first determined at the biochemistry Department, faculty of Medicine, Fayoum University then they were divided into four groups according to their ABO blood group into A, B, O and AB group. Inside each
group we started to diagnose their type of occlusion, the presence or absence of any malocclusion followed by classifying this malocclusion.

**Methods of blood testing:**

**B.1. Principle of blood grouping**

Immunology is usually defined as the study of resistance to infectious disease; its subdivision, serology, is the study of antisera, or more properly, the study of the anti-bodies elicited by the antigen of infectious disease process producing an antigen-antibody reaction. The red blood corpuscles of man may contain two distinct antigens, and the letters A and B were chosen to represent them Persons with type 0 blood possess neither of these antigens, and type AB persons possess both the reciprocal antibody is found in the plasma (8&9).

To determine the blood group of a person, his/her red cells are made to react with commercially available anti-serum containing known agglutinins. The slide is then examined by the naked eye to detect the presence or absence of clumping and hemolysis (agglutination) of red cells, which occurs as a result of antigen-antibody reaction (10&11).

**B.2. procedure of blood testing**

A dry microscope slide was divided into two proportions. The right half of the slide was marked anti-A (antisera A or alpha agglutinins) and the left half of the slide was marked anti-B (antisera B or beta agglutinins). Another slide was marked S for only red cell suspension in saline, No antiserum will be added to this. Then a finger-prick was done under aseptic conditions, and two drops of blood were added to the saline on the slide and mixed with toothpick and thus red cell suspension was prepared for each subject assigned in this study. (12,13)

One drop of antisera A and B was placed on the right and left halves of the slide. The antisera and red cell suspension were mixed with the help of two separate tooth picks and waited for 8-10 min. Then the two antisera - red cell mixtures on the slide were inspected, first with the naked eye to see whether agglutination (clumping or hemolysis) had taken place or not. It appeared as a coarse separation of red cells in isolated clumps (red precipitates of cells) and this agglutination was confirmed under low magnification microscope. (14,15)

Thus, the presence or absence of agglutination indicated individual’s blood group (blood type) as shown in Table (I).

**C. Diagnosis and classification of malocclusion**

The normal occlusion group inside each blood group showed bilateral Angles Class I molar relationship with acceptable overjet and overbite and well-aligned arches. While, the malocclusion group fulfilled the criteria according to Angles classification of malocclusion i.e. Class I, Class II and Class III malocclusions.

Class I Malocclusion group showed bilateral Angles Class I molar relationship with one or more of these characteristics: Crowded anteriors, spacing, protruded maxillary incisors, unilateral or bilateral posterior cross bite, anterior or posterior open bite, deep anterior overbite.

Class II Malocclusion group showed bilateral Angles Class II molar relationship with proclined maxillary incisors and increased overjet (Angles Class II div 1 malocclusion) or with retroclined maxillary central incisors and proclined lateral incisors (Angles Class II div 2 malocclusion).

Class III Malocclusion group showed bilateral Angles Class III molar relationship with end to end incisor relationship incisors or in cross bite relationship.

**Statistical analysis:**

Qualitative data were presented as frequencies and percentages. Chi-square \( (x^2) \) test was used for comparisons related to qualitative data.
The significance level was set at \( P \leq 0.05 \). Statistical analysis was performed with IBM® SPSS® Statistics Version 20 for Windows.

RESULTS

1- The distribution frequency of ABO blood groups in the sample:

The distribution of blood groups is presented in Figure (1). The most prevalent blood group was blood group (O) in 113/332 subjects (34%) followed by blood group (A) in 107/332 subjects (32.3%) then blood group (AB) in 58/332 subjects (17.5%). The least prevalent blood group was (B) in 54/332 subjects (16.3%).

![Blood groups](image)

Fig. (1): Pie chart representing distribution of blood groups in the study sample

2- The correlation between the blood groups and malocclusion:

There was a highly statistical significant correlation between the blood groups and malocclusion indicating that the prevalence of malocclusions is highest in blood group A followed by O then B and the least prevalence in blood group AB as presented in table (II) and figure (2).

![Distribution of malocclusion and normal occlusion with blood group types](image)

Fig. (2): Distribution of malocclusion and normal occlusion with blood group types.

3- Distributing the different types of malocclusion related to each blood group:

The statistical analysis also revealed that the prevalence of subjects with blood groups A, AB, B and O were distributed as 32.7, 10.9%, 15.5 % and 40.9% respectively among the Class I malocclusion patients while distributed as 35.8%, 14.9%, 19.4% and 29.9% respectively among the Class II malocclusion and distributed as 30.9%, 29.1%, 25.5% and 14.5% respectively among the Class III malocclusion as shown in table (III) and figure (3).

### TABLE (II): Frequencies, percentages and results of Chi-square test for the comparison between blood groups in subjects with normal occlusion and malocclusion:

<table>
<thead>
<tr>
<th>Blood group</th>
<th>Normal occlusion (n = 100)</th>
<th>Malocclusion (n = 232)</th>
<th>( p )-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>A</td>
<td>30</td>
<td>30</td>
<td>77</td>
</tr>
<tr>
<td>AB</td>
<td>20</td>
<td>20</td>
<td>38</td>
</tr>
<tr>
<td>B</td>
<td>10</td>
<td>10</td>
<td>44</td>
</tr>
<tr>
<td>O</td>
<td>40</td>
<td>40</td>
<td>73</td>
</tr>
</tbody>
</table>

*: Significant at \( P \leq 0.05 \)
TABLE (III): Frequencies, percentages and results of Chi-square test for the comparison between blood groups in subjects with normal occlusion and different classes of malocclusion:

<table>
<thead>
<tr>
<th>Blood group</th>
<th>Normal occlusion (n = 100)</th>
<th>Class I Malocclusion (n = 110)</th>
<th>Class II Malocclusion (n = 67)</th>
<th>Class III Malocclusion (n = 55)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>A</td>
<td>30</td>
<td>30</td>
<td>36</td>
<td>32.7</td>
</tr>
<tr>
<td>AB</td>
<td>20</td>
<td>20</td>
<td>12</td>
<td>10.9</td>
</tr>
<tr>
<td>B</td>
<td>10</td>
<td>10</td>
<td>17</td>
<td>15.5</td>
</tr>
<tr>
<td>O</td>
<td>40</td>
<td>40</td>
<td>45</td>
<td>40.9</td>
</tr>
</tbody>
</table>

*:* Significant at P ≤ 0.05

DISCUSSION

This study was conducted on 300 students at the faculty of Dentistry, Fayoum University. Students had overall good general health to have a proper evaluation and classification, of blood group. As the malocclusion and blood groups both are related to genetic components, it can be hypothesized that blood groups have an association with malocclusions. The aim of this study was to investigate if there is a relation between ABO blood group and the dental malocclusions.

It was reported that blood group ‘A’ has a wider distribution among Eskimos, ‘B’ in Chinese and Indians, the group ‘O’ in Americans, Canadian Indians, Czechoslovakians and Kenyans. In a large country like Egypt; a large variation in prevalence of malocclusion exists. The distribution of ABO blood groups also varies regionally, and from one population to another. The most common blood group representing this group of the Egyptian population was blood group O (34%) followed by group A, AB and B occurred at the lowest frequency (16.3%).

In our study, the results revealed that there was a statistically significant correlation (P ≤ 0.05) between malocclusion types and blood grouping system. The results of the current study agreed with the findings of Sharma et al, and disagreed with that of Mustafa et al, Sanjay Prasad Gupta and shokor et al who stated that there was no correlation between them. This disagreement may be due to the geographic, diversity of the population, and racial variation.

The prevalence of malocclusions in the current study was highest in blood group A (33.2%) followed by O (31.5%) then B (19%) and the least prevalence in blood group AB (16.4%). In this study, a high percentage of individuals with blood group O (40.9%) was observed in Class I malocclusion group, blood group A in Class II malocclusion (35.8) and Class III malocclusion group (30.9%). This result was in disagreement with Sanjay Prasad.
Gupta (15) who found that a relatively high percentage of individuals with blood group B (32.73%) was observed in Class I malocclusion group, blood group O in Class II malocclusion group (48.94%) and Class III malocclusion group (50%).

Thus, it has always been hypothesized that the presence of a certain kind of pathology may be associated with a specific type of blood group. The statement of Bakare et al (18), seems true that varieties of ABO may play an important role in immunology and in the prevention of diseases. For definitive establishment of their etiogenic role, multicenter collaborative studies, which include diverse population groups, are required to further explore this relation globally.

CONCLUSION

The estimation of the correlation between blood groups and malocclusions showed that blood groups have an association with malocclusions with highest prevalence in blood group A followed by O, B and AB in group of Egyptian population.

REFERENCES


