

ASSOCIATION OF ABO BLOOD GROUP AND RH FACTOR WITH PERIODONTAL
DISEASE IN IRAQI ORTHODONTIC PATIENTSSelma Merza Hasan¹, Heider Hemeed Abbas^{*2} and Lubna Makki Hussein³^{1,3}Department of Orthodontics, College of Dentistry, University of Kufa.²Department of Basic Medical Sciences, College of Dentistry, Babylon University.

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ABSTRACT

Introduction: Periodontitis is one of periodontal disease occur as a result to bacterial infection which associated with the accumulation of dental plaque. Gingival inflammation or Gingivitis is a non-destructive periodontal disease associated with redness, swelling and Most commonly, gingival inflammation is occurs in response to plaque accumulation on tooth surfaces. Gingival disease is multi factorial may relate to environmental and genetic factors, as blood groups is considered as a genetic factors. **Aim of study:** The aim of this study was to assess the effect of ABO blood grouping with type of Rh factor on plaque formation and gingivitis in orthodontic patient. **Material and methods:** The participant in this study were 100 patient, they were assessed after 3-4 months from the initiation of treatment to evaluate the reaction of different patient with different blood groups to the orthodontic treatment, all the patients wearing the same orthodontic appliance from the same company. The patients were subjected to two assessments to evaluate the plaque formation and gingival health (plaque formation and gingivitis). **Result and discussion:** The statistical analysis of the result regarding the gingival index show non-significant difference between the positive and negative blood group type, that's mean the Rh factor has no effect on plaque formation and gingival inflammation (gingivitis). But there was significant difference between some different blood groups. It was found that blood group O have associated with gingivitis more than other groups in addition that there was significant difference between O and all other types of blood groups. There was significant difference between A group and AB type of blood group but non-significant difference between A and B groups and also between B and AB. The difference between results of different studies may be attributed to the geographical area and the distribution of blood groups among different countries of the studies.

KEYWORDS: ABO system, Rh factor, Gingivitis and Plaque formation, Orthodontic patients.

INTRODUCTION

Periodontitis is one of periodontal disease occur as a result to bacterial infection which associated with the accumulation of dental plaque. Periodontal disease can result in destruction of the surrounding structures of the teeth if left untreated.^[1] The severity of periodontitis does not appear to be associated strongly with the amount of bacteria in plaque, and some researchers have suggested that the genetic factors may also associated with some periodontal disease.^[2] The etiology of periodontal disease is multifactorial, it has been associated with different host and environmental factors, including diabetes mellitus and smoking habit, increasing evidence of periodontitis suggests that may involve a chronic immune-inflammatory response. Periodontal diseases represent a group of conditions involving inflammation of the alveolar bone, periodontal ligament, and gingiva.^[1] The ABO blood group system is the most important system firstly defined in 1901 by Karl

Landsteiner and he also discovered Rh system in 1940. The presence of personal serologic differences among population classify them into 4 groups depending on whether their red cells contained agglutinin or not were described by Landsteiner.^[3,4,5,6] The presence or absence of specific antigens on the human red blood cell membrane results in the four blood groups: A, B, AB, and O which are present on the ninth chromosome and inherited co-dominantly.^[7] Blood group is very importante in organ transplantation and blood transfusion, Also it effect many physiological characteristics.^[8] For example, studies show that there was association between group A and increased risks of colitis, gallstones and certain tumor types.^[9,10,11,12] whereas O blood group it has been found to be associated with cardiovascular diseases^[13,14] including ischemic heart disease and atherosclerosis^[15,16,17,13], while other different studies have been show that there was significant association between blood groups and

many diseases like dental caries^[4], salivary gland tumors^[18], chicken pox^[19], malaria^[20], oral cancer^[21], hematological malignancies, ischemic heart disease^[22], cholera^[23] and others. The relation of ABO blood group with periodontal disease were first studied by Weber and Pastern.^[24] Study by Kaslick., et al.^[25] revealed that there was significantly less aggressive periodontitis in patients with blood group O and increased in patients have B blood group. Another study by Roberts^[26], explain the association between ABO blood group and chronic disease as family predisposition on genetic basis. Koregol., et al.^[27] study describe that blood group O appear to have a higher percentage in the periodontitis group blood group A appear to have a significantly higher percentage in the gingivitis group, and blood group AB appear to have the lowest percent of periodontal diseases.^[28] Few studies have investigated the association between ABO blood groups and oral diseases, specifically periodontal disease and there is no previous study investigate the association of blood group and Rh type with gingival health in patient wearing orthodontic appliances and if it is consider predisposing genetic factor for development of gingivitis. The aim of this study was to assess the relationship of ABO blood grouping with type of Rh factor on plaque formation and gingivitis in orthodontic patient.

Most commonly, gingival inflammation occurs in response to plaque accumulation on tooth surfaces. When good oral hygiene maintained, the gingivitis is reversible.^[29] Gingival disease is multi factorial may related to environmental and genetic factors, as blood groups is considered as a genetic factors, so we can hypothesized that there is a relation between blood group as a genetic factor with plaque formation and gingivitis in patient wearing orthodontic appliance and consider as predisposing factors for periodontal disease.

Different Plaque and gingival scoring systems used in many previous studies was the Löe and Silness plaque index^[30], the Navy index^[31,32] or the Turesky modification of the Quigley and Hein index^[33,29], these were used in non orthodontic patients, but it difficult to use in orthodontic patients due to focusing on plaque accumulation along the gum line reported a nonlinear scale; even after some modifications, it lack sensitivity when applied to orthodontic patients. So in this study we estimate the dental plaque by using the O'Leary plaque index^[34,29] and gingival inflammation by using Loe and Silness gingival index.^[35]

PATIENTS AND METHODS

The participants in this study were 100 patients attend to two specialized centers for orthodontics in Najaf area seeking about orthodontic treatment. The patients were receive Informed consent that contain all the information about the study. participant were selected according simple random sampling aged 16-35 years old with permanent dentition only, having at least 20 teeth excluding the third molars were included in the study.

Inclusion criteria of this study specify choosing of patients who having at least 20 teeth excluding the third molars, while the exclusion criteria involved the following

- 1- Patients with bad oral hygiene.
- 2- Smokers and alcoholics.
- 3- Patients free from any systemic diseases.
- 4- pregnant female.

Those patients were subjected to orthodontic treatment with fixed orthodontic appliance then after 3-4 months from the treatment the measurement were done, all patients were subjected to the same instruction regarding the oral hygiene.

In this study, the Participant were assessed after the determined periods from the initiation of treatment to evaluate the reaction of different patient with different blood groups to the orthodontic treatment, all the patients wearing the same orthodontic appliance from the same company. The intraoral examination was done after the participant had been interviewed about their socioeconomic and behavior background. Plaque formation and gingivitis were recorded using a dental mirror and William's periodontal probe under light of dental chair. Bacterial plaque, gingival bleeding, and signs of gingivitis, clinical attachment level, and probing pocket depth were examined for all subjects. The index scores were noted down. The type of blood group was determined on the basis of patients' himself. If the patient don't have information about it, they were referred to the laboratory for determination of ABO blood group. All individuals were evaluated by a single operator (author).

O'Leary Plaque Index (PI)

The examination were done after using special staining solution to stain the plaque then the surfaces which take the stain were recorded. The disclosing agent was used according to the instructions given by the manufacturer. The staining agent were used by direct application with a cotton pellet, tell the patient to rinse his mouth after minute.

All the tooth surfaces must be examined. The surfaces of the tooth which covered with plaque must be indicated on the diagram of tooth. Recording all the sites covered with plaque and calculate the percentage of plaque. This process achieved by participation of patient using a small mirror, to promoting patient awareness of his\her oral condition.

The O'Leary plaque index (PI) was assessed for all patients 3-4 months following fixed orthodontic appliances placement.

The Calculations involved:

Plaque index = No. of surfaces with plaque /No. of evaluated surfaces x 100

Gingival Index (GI): The Gingival Index according to Löe and Silness, the interproximal and marginal tissues

were scored separately based on the following scores from 0 to 3. The criteria are.

Zero: Indicate normal gingiva.

1: indicate mild gingival inflammation expressed simple color changes and slight oedema with no bleeding associated with probing.

2: indicate moderate gingival inflammation represented by redness, oedema and glazing associated with bleeding during probing.

3: indication of severe gingival inflammation represented by redness and oedema, ulceration associated with spontaneous bleeding.

By using periodontal probe the bleeding was assessed through gentle probing along the gingival sulcus. The

gingival index of each person was obtained by dividing the summation of each tooth on the number of teeth examined. The scoring were done for selected teeth or all surfaces of all teeth or for selected areas of all or selected teeth.

Statistical Analysis

SPSS (version 21) was used to analyze current data. Differences were obtained by applying one way ANOVA, Multiple Comparisons were done through Bonferroni's test. Differences between blood groups were setting as significant at at 1% ($P \leq 0.01$).

RESULTS

Table (1) show the relation between tooth parameters and blood groups of patients.

Tooth Parameters	Blood Groups						P value
	O+	O-	A+	A-	B	AB	
Plaque Index	69.21±7.305	65.25±2.986	35.00±6.272 Ab	34.33±3.055 ab	29.08±4.752 ab	55.13±4.764 Abcde	<0.0001**
Gingival Index	2.026±0.367	1.748±0.262 a	0.7200±0.180 Ab	0.6667±0.115 ab	0.5769±0.136 ab	1.013±0.285 Abce	<0.0001**

-Data represented as Mean ± SD. - **=significant at $P \leq 0.01$. -Small letters referred to multiple comparisons between blood groups

Table (2) Demonstrated the correlation between blood groups and plaque index.

Bonferroni's Multiple Comparison Test	Mean Diff.	t	Significant $P < 0.05$	Summary	95% CI of diff
O + vs O -	3.961	1.213	No	Ns	-5.884 to 13.80
O + vs A+	34.21	21.38	Yes	***	29.39 to 39.03
O + vs A -	34.88	9.359	Yes	***	23.65 to 46.11
O + vs B	40.13	20.1	Yes	***	34.12 to 46.15
O + vs AB	14.08	7.429	Yes	***	8.367 to 19.79
O - vs A+	30.25	9.04	Yes	***	20.17 to 40.33
O - vs A -	30.92	6.514	Yes	***	16.61 to 45.22
O - vs B	36.17	10.18	Yes	***	25.47 to 46.88
O - vs AB	10.12	2.893	No	Ns	-0.4218 to 20.66
A+ vs A -	0.6667	0.1756	No	Ns	-10.78 to 12.11
A+ vs B	5.923	2.788	No	Ns	-0.4805 to 12.33
A+ vs AB	-20.13	9.921	Yes	***	-26.25 to -14.02
A - vs B	5.256	1.321	No	Ns	-6.739 to 17.25
A - vs AB	-20.8	5.293	Yes	***	-32.64 to -8.956
B vs AB	-26.06	11.07	Yes	***	-33.15 to -18.96

The statistical analysis of the results regarding the plaque index show that grossly, there was significant difference among patients with different blood groups, while at the same time there was non significant correlation between the negative and positive Rh factor of patients with same blood group. It was found that blood group O have associated with more plaque formations than other groups and the was significant difference between O and all other types of Blood groups except O negative and AB positive there was non significant difference. There was significant difference between A group and AB type of blood group but non significant difference between A and B groups and also, it was significant between B and AB.

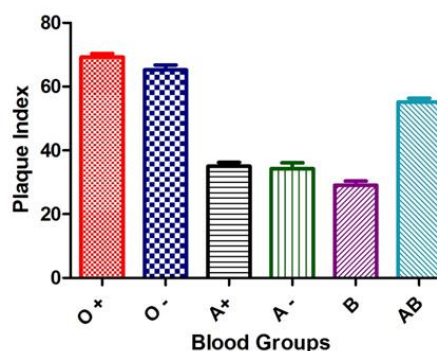
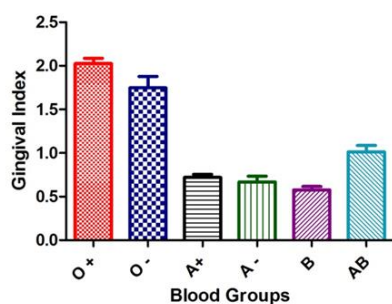


Fig. (1). Plaque Index at different blood groups.

Table (3). Statistical output of Bonferroni's Multiple Comparison Test for Gingival Index at different patient blood groups.

Bonferroni's Multiple Comparison Test	Mean Diff.	T	Significant? P < 0.05?	Summary	95% CI of diff
O + vs O -	0.2788	1.874	No	ns	-0.1695 to 0.7271
O + vs A+	1.306	17.93	Yes	***	1.087 to 1.526
O + vs A -	1.36	8.011	Yes	***	0.8482 to 1.871
O + vs B	1.449	15.94	Yes	***	1.175 to 1.723
O + vs AB	1.013	11.74	Yes	***	0.7529 to 1.273
O - vs A+	1.028	6.742	Yes	***	0.5682 to 1.487
O - vs A -	1.081	5.001	Yes	***	0.4294 to 1.732
O - vs B	1.171	7.234	Yes	***	0.6829 to 1.658
O - vs AB	0.7342	4.61	Yes	***	0.2542 to 1.214
A+ vs A -	0.05333	0.3084	No	ns	-0.4678 to 0.5744
A+ vs B	0.1431	1.479	No	ns	-0.1486 to 0.4347
A+ vs AB	-0.2933	3.174	Yes	*	-0.5719 to -0.01479
A - vs B	0.08974	0.4951	No	ns	-0.4565 to 0.6360
A - vs AB	-0.3467	1.937	No	ns	-0.8861 to 0.1927
B vs AB	-0.4364	4.07	Yes	**	-0.7596 to -0.1132

The statistical analysis of the results regarding the gingival index show that grossly, there was significant difference among patients with different blood groups, while at the same time there was non significant correlation between the negative and positive Rh factor of patients with same blood group. It was found that blood group O have associated with more plaque formations than other groups and the was significant difference between O and all other types of Blood groups. There was significant difference between A positive group and AB type of blood group and between B and AB. but non significant difference between A negative and B, AB groups As shown in table (3).

**Fig. (2).** Gingival Index at different blood groups.

DISCUSSION

This study was done to find out the possibility of the relationship between blood groups and plaque formation and gingivitis in orthodontic patient. All the measurement were done by the same operator to avoid bias. Plaque formation result from accumulation of different microorganism in addition to host tissue and bacterial product which result in biofilm formation and gingivitis will result, if it left untreated it will result in development of serious periodontal disease including sever periodontitis and may result in teeth loss.

The main cause of periodontal diseases is bacterial plaque. Poor oral hygiene and plaque were considered as the main etiological factors of periodontitis.^[4] Gingival inflammation or Gingivitis is a non-destructive periodontal disease associated with redness, swelling and irritation^[36], for this reason we assess the plaque formation and gingivitis which finally lead to periodontitis.

Our result found that blood group type O is the most common type of ABO system in our sample this in agree with previous study by^[37], followed by type A, B and the less distributed type was AB blood group. The distributions of ABO blood groups and Rh system vary around the world and the variation occur also in the different area of the same country. It has been found that the blood group type O is most common in Canadian and American populations while in Chinese and Indian population the B type is most common, and the A type in Eskimos. A little studies reported an association between ABO blood group and occurrence of chronic periodontal disease, while others reported no such association. In our study we found that plaque formation and gingivitis increase in subjects with O blood group then followed by A and B type and less scores with AB group. Koregol., et al.^[27] study described that blood group O appear to have a higher percentage in the periodontitis group blood group A appear to have a significantly higher percentage in the gingivitis group, and blood group AB appear to have the lowest percent of periodontal diseases.^[28] This controversy between studies may attributed to geographical diversity among populations.^[1] The identification of this particular association may open new arenas in the prevention of periodontal disease.^[5]

Very few studies have tried to elucidate the association between blood group, Rh factor and periodontal disease in the Iraqi population and in our study we found that

there was non-significant linking between Rh factor and plaque formation or gingivitis.

Gawrzewska^[38] stated that individuals with blood group O have larger severity of periodontal disease, whereas subjects with blood group A have less severity of periodontal disease Kaslick *et al.*^[26] show that patients with A or B blood groups have more periodontitis. Blood groups and Rh factor, both are hereditary. Gene for ABO antigens is present on the 9th chromosome and Rh antigen gene is on the 1st chromosome.^[39,28] Vivek, *et al.*^[5] stated that individuals with O type of blood group and positive Rh had a larger opportunity for periodontitis. It was found that there was significant relation between different blood groups in the rates of colonization of numbers of periodontal microbes that consider the main etiologic agents of periodontal diseases.^[40] Also it has been found that blood group A appear to have an association with oral pathologies such as dermatophytosis.^[41] Frias and Lopez^[42] found that there is no association between ABO blood group and juvenile periodontitis. Nevertheless, Arowojolu *et al.*^[43] concluded that patient with blood group B or AB have juvenile periodontitis patients and all were Rh-positive, whereas patients with blood groups B or O who were Rh-positive or Rh- negative and those with blood group AB who were Rh-positive more associated with non-juvenile periodontitis, but they use small size sample which make the study cannot be generalized and less reliability. Four studies.^[4,44,27,5] found that periodontitis was more common among patients with blood group O, whereas the fifth study Pai *et al.*^[45] found an association with blood group B. Pradhan *et al.*^[46] failed to show any significant association between blood group and PD. Differential secretion of blood group antigens ABO (H) in the tissues may be a factor influencing the development of systemic oral diseases.^[47,1]

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