Original Article

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Investigation of ABO Blood Groups in Periodontal Status and its Effect on Level of Response to Nonsurgical Periodontal Treatment

Dentistry Section

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ABSTRACT

Introduction: ABO blood groups have been associated with several systemic diseases. Various studies have investigated the relationship between ABO blood groups and periodontal diseases.

Aim: The purposes of this study were to assess the possible association between ABO blood groups and Rh factor with periodontal status, and to determine whether the level of response to scaling and root planing would vary based on the patient's blood phenotype.

Materials and Methods: A total of 1009 subjects participated in this cross-sectional study and were allocated into three groups, healthy participants, with gingivitis and with periodontitis. Furthermore, sixty patients from the periodontitis group with generalised chronic periodontitis were further divided into four groups according to their blood phenotypes to participate in the second stage of the study. Blood sample were collected using the finger prick technique and the direct agglutination method was used to determine the blood group. Chi-square test was used to investigate the association between ABO blood groups and Rh factor with periodontal status, and One-Way ANOVA was chosen to assess the level of response to scaling and root planing based on the participant's blood group.

Results: A higher incidence of gingivitis was found in patients with blood group A whereas a higher incidence of periodontitis was found in patients with blood group O. In addition, a higher incidence of periodontitis followed by gingivitis was found in Rh positive patients. Regarding the effect of ABO blood groups on nonsurgical periodontal therapy, there was no significant difference between the four groups.

Conclusion: A and O blood groups and Rh positive are possible risk factors for periodontal disease, and the level of response to scaling and root planing does not differ according the blood group.

Keywords: Blood phenotypes, Periodontal disease, Rh factor, Root planing, Scaling

INTRODUCTION

Periodontitis is characterised by a rapid tissue destruction that includes both soft and hard tissues. It is a prevalent disease that affects a huge proportion of populations all over the world [1]. Although bacteria is considered the main cause of periodontal diseases, studies have elucidated its multifaceted nature [2]. Factors such as smoking, diabetes and genetics play a role in the progress of the disease [3]. Chronic Periodontitis (CP) is the most common form of periodontitis, it mainly affects those who are over the age of 35, but can be seen in children. The main characteristics of chronic periodontitis are plaque accumulation, inflammation of the periodontium and loss of attachment and alveolar bone. It might be localised (less than 30% of the teeth) or generalised (more than 30% of the teeth), and can be described based on the severity of the disease as mild, moderate or severe [4].

In year 1901, Karl Landsteiner introduced the ABO blood groups, segregating people into three groups A, B and O based on the possibility of the red blood cells to be clustered when they are mixed with serum from other people. Later, a fourth group was discovered, which is AB. This blood group system is dependent on whether an erythrocyte expresses on its surface (one, two, or neither antigens). Erythrocytes that carry the antigen A, or B, or both, fall into the blood groups of A, B, AB respectively, while the lack of manifesting either antigens results in O phenotype. Individuals who do not carry A or B antigens on their erythrocytes have antibodies to the antigens they lack in their serum. In addition to being expressed on the surface of red blood cells, these antigens can be distributed in the body of most people in the form of glycoproteins dissolved in the secretors of the body like saliva [5].

Although the four phenotypes of the ABO blood group system can be observed in all human populations, the frequency of each type varies considerably among people based on their geographical region. It was established that the percentage of individuals with blood group O exceeds 60% in Africa, Australia and among native Americans, and this percentage may rise to 100% among individuals from South and Central America. Conversely, the phenotype A is the most prevalent in Europe with 40-60%, whereas phenotype B is the least common with 8-12% [6].

Another important blood group system is the Rhesus (Rh) system. According to this system, erythrocytes could be either positive (Rh-D+) if they present the Rh antigen, or negative (Rh-D-) if they lack this antigen [7]. It was reported that 85% of European and 99% of Asians are (Rh-D+) [6].

Over the past few decades, studies have been examining the possible relationship between ABO blood groups and systemic conditions. A study by Whincup P et al., has demonstrated that individuals with blood group A have a higher risk of ischemic heart disease compared to individuals of other groups [8]. Similarly, Roberts JF found that individuals with blood group A are more susceptible to gallstones and colitis [9]. On a parallel note, Mortazavi H et al., reported that people with blood group B are more prone to cancer [10]. Another study has shown that subjects with blood group B have a higher chance of developing type 2 diabetes, and those with blood group O have a lower chance to develop this condition [11].

Nonetheless, several studies have focused on the potential relationship between ABO blood groups and periodontal diseases. However, results obtained from these studies showed a lot of discrepancies. Some studies indicated that gingivitis was more prevalent in subjects with blood group A and periodontitis was more prevalent in subjects with blood group O, these studies also concluded that there was a relationship between gingivitis and Rh positive patients [12,13]. Moreover, Koregol AC et al., also reported similar findings, but they found no relationship between Rh factor and periodontal diseases [14]. A study by Patel R et al., showed that

individuals with blood group B and O and those who are Rh positive have a higher tendency to develop periodontitis [15]. In contrast, a study carried out by Francis DL et al., reported that there is no significant relationship between ABO blood groups and Rh factor with periodontal diseases [16].

As aforementioned, the possible relationship between ABO blood groups and periodontal status has been under the scope of many researchers, and in present study, it was decided to take it a step further and investigate whether ABO blood groups have a role in the response to the conventional periodontal therapy. Recently, some studies in medicine have examined the response to treatment and prognosis of cancer patients according to their blood phenotypes. A study by Cihan YB, has concluded that breast cancer patients with A and O blood phenotypes who underwent radiotherapy and chemotherapy had higher overall survival and disease-free survival compared to patients with other blood phenotypes [17]. Besides, Li Q et al., reported that ABO blood groups have a prognostic role in patients with unresectable hepatocellular carcinoma who were treated by trans arterial chemoembolization. Their findings were that non-O blood phenotypes patients, especially patients with AB phenotype, had worse overall survival compared with blood phenotype O [18]. Notwithstanding, Unal D et al., found that ABO blood groups had no effect on prognosis and response to chemoradiotherapy in patients with local advanced non-small cell lung cancer [19].

The purpose of this study was to analyse the potential association between ABO blood groups and Rh factor with the periodontal status, and to determine whether the level of response to scaling and root planing would vary based on the patient's blood phenotype.

The null hypothesis: there is no statistically significant association between ABO blood groups and Rh factor with the periodontal status, and there is no statistically significant difference between level of response to scaling and root planing and ABO blood groups.

MATERIALS AND METHODS

This cross-sectional study lasted 10 months, between January 2018 and October 2018, and it was carried out to determine if there is an association between ABO blood groups and Rh factor with periodontitis. Convenience Sampling was done and the study included 1009 subjects, 566 males and 443 females who aged between 20-65 years and visited the Faculty of Dental Medicine, Damascus University seeking either periodontal therapy or other treatments after acquiring ethical clearance from Damascus University and the patients' written consents were taken to participate in the study.

The selection criteria were that the subjects had at least 20 teeth excluding the third molars, similar socio-economic backgrounds, no systemic disease, such as leukaemia, diabetes, metallic bone disease, whereas those who were smokers, alcoholics, pregnant females, individuals who underwent periodontal treatment or antibiotic therapy within the past six months and individuals who cannot perform routine oral hygiene were excluded. After obtaining complete dental and medical histories, participants were divided into three groups; group I (healthy), group II (gingivitis), group III (periodontitis). Healthy participants showed attachment loss ≤3 mm, periodontal pocket depth ≤3 mm and no clinical sign of gingivitis [1]. Those with gingivitis displayed a attachment loss ≤3 mm, periodontal pocket depth ≤3 mm and sign of gingivitis according to Löe H et al., index (redness, bleeding, change in gingival contour, absence of the stippling texture) [20]. Periodontitis group included participants who showed attachment loss ≥4 mm, periodontal pocket depth ≥4 mm and radiographic bone loss. The following clinical periodontal parameters were recorded using William's periodontal probe: plaque index PI [21], gingival index GI [20], gingival bleeding index GBI [22] probing depth PD [23] (the distance between the gingival margin and the bottom of the pocket) and Clinical Attachment Loss CAL [23] (the distance between the cementoenamel junction and the bottom of the pocket).

- Group I comprised 276 participants (78 males, 198 females).
- Group II comprised 324 participants (206 males, 118 females).
- Group III comprised 409 (282 males, 127 females).

Among group III patients, 60 of the participants who were classified as generalised chronic periodontitis patients were randomly selected to participate in the second stage of the study. However, patients included in this part of the study were only Rh-positive. In addition, the study was registered at clinical trials with registration number (NCT03644901).

The patients were allocated into the following four groups, 15 in each:

- Group (III A) patients with blood group A and possessed the Rh factor.
- Group (III O) patients with blood group O and possessed the Rh factor.
- Group (III B) patients with blood group B and possessed the Rh factor.
- Group (III AB) patients with blood group AB and possessed the Rh factor.

The inclusion criteria for participants were those who demonstrated the generalized form of chronic periodontitis (more than 30% of the teeth showed attachment loss ≥4 mm and periodontal pocket depth 4-6 mm).

The following clinical periodontal parameter were recorded at baseline and three months after treatment using William's periodontal probe: Plaque Index (PI), Gingival Index (GI), Gingival Bleeding Index (GBI), Probing Depth (PD), Relative Attachment Level (RAL) [23] (distance between a prefabricated acrylic stent and the bottom of the pocket). All patients received supragingival plaque and calculus removal at the first visit, followed by scaling and root planing using manual scalers and curettes, CK6, U15 and Standard Gracey Curettes 5-6, 7-8, 11-12, 13-14 (Medesy, Italy), at the second visit. Also, chlorhexidine gluconate 0.12% mouthwash was prescribed twice a day for all patients and instructions of Modified Bass Brushing Technique were given. The above mentioned treatments were performed by the same practitioner at all time.

Blood samples were collected by finger prick technique using a disposable lancet, and blood samples were mixed with monoclonal antibodies, Anti A, Anti B, Anti D (G. Sanguineo, Spinreact, Spain) to determine the blood group based on the direct agglutination method. Forming a clump with Anti A denotes the presence of antigen A on the erythrocytes; thus blood group A and forming a clump with Anti B denotes the presence of antigen B on the erythrocytes; thus blood group B, while forming a clump with both antigens A and B denotes the presence of both antigens on the erythrocytes; thus blood group AB and the absence of a clump with both antibodies indicates that the erythrocytes present no antigen; thus, blood group O. Moreover, forming a clump with Anti D suggests that the erythrocytes are Rh positive.

STATISTICAL ANALYSIS

Data was analysed using statistical software (IBM SPSS Statistics version 22). Chi-square test was used to assess the data to determine whether there is an association between ABO blood groups and Rh factor with the periodontal status, and Z-score with Bonferroni adjustment were used to eradicate type 1 error and determine which percentage is significant. Paired t-test was used to compare the differences in clinical parameters at baseline and three months after the treatment in each group. One-Way ANOVA with Tukey test were the chosen tests to assess the response to scaling and root planing among individuals with different blood phenotypes. The level of significance was set at 0.05.

RESULTS

This cross-sectional study lasted for 10 months, during which 1009 participants were examined to determine whether there exists a

relationship between ABO blood groups and Rh factor with the periodontal status. Blood group A was the most prevalent (42.1%), among the participant population, followed by blood group O (33.9%), blood group B (15.7%) and blood group AB (8.3%). Rh positive participants constituted the majority of the study population (91.4%) and Rh negative accounted for the minority of the study population (8.6%) [Table/Fig-1].

	Blood groups				Total
	A	O	B	AB	
n	425	342	158	84	1009
%	42.10%	33.90%	15.70%	8.30%	100.0%
	Rh factor				
	Rh positive		Rh negative		
n	922		87		1009
%	91.4%		8.6%		100%

[Table/Fig-1]: Frequency of ABO blood group and Rh factor in study population.

The study population was made up of (27.3%) healthy subjects, (32.1%) with gingivitis and (40.6%) with periodontitis [Table/Fig-2]. It is evident from [Table/Fig-2] that there is an association between ABO blood groups and periodontal diseases, ($p<0.05$). Subjects with blood group A exhibited a higher percentage of gingivitis (45.9%) with a significant difference compared to those with periodontitis and healthy periodontium. Likewise, a higher percentage of periodontitis was found in blood group O subjects (57.9%) with a significant difference compared to subjects with gingivitis and healthy periodontium. Subjects with blood group B showed a higher percentage of healthy periodontium (46.2%) with a significant difference compared to periodontitis and gingivitis groups. Furthermore, subjects with blood group AB demonstrated a relatively high percentage of healthy patients (40.5%) with significant difference compared to gingivitis patients and no significant difference compared to periodontitis patients.

			Periodontal status		
			Healthy	Gingivitis	Periodontitis
Blood groups	A	n	98_a	195_b	132_a
		%	23.1%	45.9%	31.1%
	O	n	71_a	73_a	198_b
		%	20.8%	21.3%	57.9%
	B	n	73_a	36_b	49_b
		%	46.2%	22.8%	31.0%
	AB	n	34_a	20_b	$30_{a,b}$
		%	40.5%	23.8%	35.7%
Total		n	276	324	409
		%	27.3%	32.1%	40.6%
χ^2=116.496 p<0.001					

[Table/Fig-2]: Frequency of ABO blood groups in healthy, gingivitis and periodontitis participants.
Each similar subscript letter denotes a subset of periodontal status categories whose column proportions do not differ significantly from each other at 0.05 level (Bonferroni adjustment). Chi-square test.

As for Rh factor, [Table/Fig-3] shows that there is an association between Rh factor and the periodontal status ($p<0.05$). Rh positive subjects showed a higher prevalence of periodontitis (40.3%) with a significant difference compared to healthy and gingivitis subjects, followed by gingivitis (34.3%) with a significant difference compared to healthy subjects.

For determining the level of response to scaling and root planing and the blood groups, 60 patients with generalised chronic periodontitis participated in this study to investigate if ABO blood groups play a role in the response to scaling and root planing. The study population was composed of (56.7%) males and (43.3%) females [Table/Fig-4]. The mean of the age was 51±7 years.

			Periodontal status		
			Healthy	Gingivitis	Periodontitis
Rh factor	Rh+	n	234_a	316_b	372_c
		%	25.4%	34.3%	40.3%
	Rh-	n	42_a	8_b	37_c
		%	48.3%	9.2%	42.5%
χ^2=30.899 p<0.001					

[Table/Fig-3]: Frequency of Rh factor in healthy, gingivitis, periodontitis participants.
Each similar subscript letter denotes a subset of periodontal status categories whose column proportions do not differ significantly from each other at 0.05 level (Bonferroni adjustment). Chi-square test.

Blood groups	n	Age (years)	Sex (% males)
A	15	47±7	66.7%
O	15	50±7	66.7%
B	15	52±8	40.0%
AB	15	54±6	53.3%
Total	60	51±7	56.7%

[Table/Fig-4]: Demographic characteristic of the study population.

Scaling and root planing resulted in statistically significant improvements in all the clinical parameters three months after scaling and root planing in each blood group ($p<0.05$) [Table/Fig-5].

Clinical parameter	Blood group	Mean±SD baseline	Mean±SD 3 months	T value	Difference in means±SD	p-value
Probing depth	A	4.53±0.48	2.49±0.56	16.672	2.03±0.47	<0.001
	O	4.64±0.53	2.50±0.49	32.287	2.15±0.26	<0.001
	B	4.85±0.64	2.56±0.44	22.426	2.30±0.40	<0.001
	AB	4.79±0.61	2.44±0.46	38.543	2.35±0.24	<0.001
Relative attachment level	A	8.54±0.47	6.40±0.46	31.136	2.15±0.27	<0.001
	O	8.68±0.53	6.55±0.50	34.489	2.13±0.24	<0.001
	B	8.91±0.67	6.65±0.47	24.072	2.26±0.36	<0.001
	AB	8.88±0.60	6.54±0.43	39.010	2.34±0.23	<0.001
Plaque index	A	1.89±0.18	0.90±0.22	23.302	0.99±0.16	<.001
	O	1.86±0.20	0.92±0.18	32.119	0.94±0.11	<0.001
	B	1.88±0.22	0.91±0.19	29.062	0.97±0.13	<0.001
	AB	1.88±0.20	0.92±0.18	28.126	0.96±0.13	<0.001
Gingival index	A	1.87±0.21	0.90±0.21	23.760	0.97±0.16	<0.001
	O	1.82±0.18	0.92±0.18	21.884	0.89±0.16	<0.001
	B	1.86±0.21	0.84±0.15	21.642	1.02±0.17	<0.001
	AB	1.83±0.22	0.91±0.20	21.383	0.92±0.18	<0.001
Gingival bleeding index	A	0.69±0.06	0.16±0.01	43.483	0.52±0.50	<0.001
	O	0.69±0.05	0.17±0.01	51.534	0.53±0.50	<.001
	B	0.70±0.04	0.16±0.01	68.025	0.53±0.52	<.001
	AB	0.69±0.03	0.17±0.01	76.087	0.52±0.51	<0.001

[Table/Fig-5]: Mean±SD (standard deviation) for each group at baseline and at the follow-up visit.
Paired t-test

[Table/Fig-6] Illustrates that there was no statistically significant difference between the study groups in terms of responding to the nonsurgical periodontal treatment ($p>0.05$).

[Table/Fig-7] shows that there was no statistically significant difference between the study groups in terms of responding to the nonsurgical periodontal treatment ($p>0.05$).

DISCUSSION

Despite bacteria being the main cause of the periodontal diseases, various factors such as geographical location, race, age, smoking, diabetes and genetics play a role in the development of periodontal diseases, including gingivitis and periodontitis [3]. It is established that ABO blood phenotypes and rhesus factor frequencies vary among the human population according to location and race [6].

Clinical parameters		Sum of squares	Mean square	F value	p-value
Probing depth	Between groups	0.922	0.307	2.449	0.073
	Within groups	7.032	0.126		
	Total	7.954			
Relative attachment level	Between groups	0.429	0.143	1.816	0.155
	Within groups	4.407	0.079		
	Total	4.836			
Plaque index	Between groups	0.020	0.007	0.352	0.788
	Within groups	1.038	0.019		
	Total	1.058			
Gingival index	Between groups	0.144	0.048	1.731	0.171
	Within groups	1.550	0.028		
	Total	1.694			
Gingival bleeding index	Between groups	0.001	0.000	0.268	0.848
	Within groups	0.075	0.001		
	Total	0.077			

[Table/Fig-6]: One-Way ANOVA test to study the responses to scaling and root planing between blood groups.

Clinical parameters	Blood group	Blood group	Mean difference	Std. error	p-value
Probing depth	A	O	-0.11267	0.12939	0.820
		B	-0.26267	0.12939	0.189
		AB	-0.31400	0.12939	0.084
	O	A	0.11267	0.12939	0.820
		B	-0.15000	0.12939	0.655
		AB	-0.20133	0.12939	0.412
	B	A	0.26267	0.12939	0.189
		O	0.15000	0.12939	0.655
		AB	-0.05133	0.12939	0.979
	AB	A	0.31400	0.12939	0.084
		O	0.20133	0.12939	0.412
		B	0.05133	0.12939	0.979
Relative attachment level	A	O	0.01733	0.10243	0.998
		B	-0.11267	0.10243	0.691
		AB	-0.18933	0.10243	0.262
	O	A	-0.01733	0.10243	0.998
		B	-0.13000	0.10243	0.586
		AB	-0.20667	0.10243	0.194
	B	A	0.11267	0.10243	0.691
		O	0.13000	0.10243	0.586
		AB	-0.07667	0.10243	0.877
	AB	A	0.18933	0.10243	0.262
		O	0.20667	0.10243	0.194
		B	0.07667	0.10243	0.877
Plaque index	A	O	0.05000	0.04972	0.747
		B	0.02600	0.04972	0.953
		AB	0.03400	0.04972	0.903
	O	A	-0.05000	0.04972	0.747
		B	-0.02400	0.04972	0.963
		AB	-0.01600	0.04972	0.988
	B	A	-0.02600	0.04972	0.953
		O	0.02400	0.04972	0.963
		AB	0.00800	0.04972	0.998
	AB	A	-0.03400	0.04972	0.903
		O	0.01600	0.04972	0.988
		B	-0.00800	0.04972	0.998
Gingival index	A	O	0.08000	0.06076	0.556
		B	-0.04667	0.06076	0.868
		AB	0.05400	0.06076	0.811
	O	A	-0.08000	0.06076	0.556
		B	-0.12667	0.06076	0.171
		AB	-0.02600	0.06076	0.973
	B	A	0.04667	0.06076	0.868
		O	0.12667	0.06076	0.171
		AB	0.10067	0.06076	0.356
	AB	A	-0.05400	0.06076	0.811
		O	0.02600	0.06076	0.973
		B	-0.10067	0.06076	0.356
Gingival bleeding index	A	O	-0.00200	0.01340	0.999
		B	-0.01000	0.01340	0.878
		AB	0.00067	0.01340	1.000
	O	A	0.00200	0.01340	0.999
		B	-0.00800	0.01340	0.933
		AB	0.00267	0.01340	0.997
	B	A	0.01000	0.01340	0.878
		O	0.00800	0.01340	0.933
		AB	0.01067	0.01340	0.856
	AB	A	-0.00067	0.01340	1.000
		O	-0.00267	0.01340	0.997
		B	-0.01067	0.01340	0.856

[Table/Fig-7]: Tukey test for multi comparison between groups to study the level of response to scaling and root planing.

Similarly, the distribution of periodontal diseases varies according to these two factors as well. These facts may suggest an association between ABO blood groups with the incidence of periodontal diseases.

The present cross-sectional study showed that blood group A is the most prevalent followed by blood groups O, B and AB. These findings were in accordance with Demir T et al., and Koregol AC et al., while Agarwal V et al., who reported that blood group A was the most common followed by B, O and AB [12,14,24]. Those findings were in contrast with Francis TL et al., who reported that blood group O was the most predominant [16].

This study showed that the incidence of gingivitis was significantly higher in individuals with blood group A, and periodontitis was higher in individuals with blood group O. The results of our study match with the already conducted studies [12-14]. Likewise, Patel R et al., found that subjects with blood group B and O showed a significantly higher tendency towards periodontitis [15]. However, our findings were in conflict with Francis DL et al., who reported that there was no statistically significant difference between ABO blood groups with periodontal diseases [16]. This could be attributed to the fact that subjects in that study were divided into two groups only, with no periodontitis and with periodontitis, and our study had a larger sample size. Additionally, our observations contradict with those of Pai GP et al., [25]. They reported that a significantly higher percentage of participants with blood group O and AB were healthy compared to those with blood group B and A who had periodontal disease. This could be due to the patients' classification system applied in each study. To illustrate, in present study, healthy participants and those with gingivitis were separated into two different groups, while in the Pai et al. study, participants with healthy periodontium and mild gingivitis were kept in the same sample group.

Regarding the association between Rh factor and periodontal status, data acquired from this research revealed a significant association between Rh positive and periodontitis followed by gingivitis. These observations were reflected in the findings of Demir

T et al., and Anup P et al., both reported a significant relationship between Rh positive and gingivitis [12,13]. Furthermore, our results were compatible with Patel R et al., who demonstrated a significant relationship between Rh positive and periodontitis [15].

The findings of this research could be explained in the light of notion that antigens (A and B) of the ABO blood groups, which can be found in body fluids such as saliva, affect the periodontal status by acting as receptors for infectious agents that are concomitant with periodontal diseases. Another explanation is that these substances A, B and H, which is the precursor of antigen A and B, can also be found in tissues and correspond to the erythrocyte However, the expression of these antigens in tissues varies from individual to individual based on the secretor status. As a result, These substances may be modulators that contribute to the development of oral diseases in the stratified epithelium [26]. Moreover, the ABO antigens that are secreted to the saliva might prevent bacteria from being attached to the surface of the tooth. This could be attributed to the fact that bacteria use the lectins on their surfaces to attach to the surface of the tooth, and these lectins are often ABO antigens specific [27].

On a different note, the present study showed that there was no significant association between the level of response in patients with generalised chronic periodontitis to scaling and root planing based on their blood group. In our opinion, this could be because of the treatment that we provided to the patients included only scaling and root planing without applying any medication, such as topical antibiotics, which might have different results as the applied materials may interact with the ABO antigens that exist in saliva. To the best of our knowledge, this is the first research in literature that discusses whether individuals respond differently to the nonsurgical periodontal therapy based on their blood group.

LIMITATION

In the cross-sectional study, the participants were recruited on the basis of Convenience Sampling (first arrived first included into a suitable group was followed), which resulted in the number of cases outnumbering the controls. Additionally, only Rh-positive patients were included in the second stage of the study, and Rh-negative patients might respond in a different way to scaling and root planing compared to Rh positive ones.

CONCLUSION

This study demonstrated that subjects with blood group A had a higher incidence of developing gingivitis and subjects with blood group O had a higher incidence of developing periodontitis. Moreover, according to present data, the Rh factor seems to play a significant role in the incidence of both periodontitis and gingivitis. A and O blood groups and Rh factor are possible risk factors for periodontal disease. The level of response to scaling and root planing does not differ among patients based on their blood groups. These findings expand our understanding of periodontal diseases as ABO blood groups and Rh factor might constitute a risk factor and explain why a periodontal disease might be more prevalent in some individuals than the others.

Future recommendation: In future, more studies are required to determine whether the level of response to scaling and root planing would differ based on blood phenotypes and when topical antibiotics are applied.

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