A correlation between human ABO phenotypes and periodontal status

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Abstract

Objectives: To investigate the frequency of periodontal diseases among ABO blood groups and the Rh factors.

Materials and Methods: the double-blind cross-sectional study was conducted on 200 systemically healthy subjects (90) males and (110) females, were examined at the Department of Periodontics – School of Dentistry – University of Sulaimani. The sample was divided into 3 groups – control (healthy) group, gingivitis group and periodontitis group according to plaque index, gingival index, probing pocket depth and clinical attachment loss, then participants examined for their blood phenotypes and a correlation among the obtained data was formulated using SPSS 17.0 software.

Results: Results of this study revealed high incidence of periodontitis and gingivitis among (O) and (A) group subjects compared to (B) and (AB) subjects, whereas no significant relation was detected between Rhesus (Rh) factors and periodontal lesions.

Conclusions: A positive correlation was detected between (A) and (O) blood groups and frequency of periodontal lesions, this correlation could be employed as a risk marker for early detection of susceptible subjects to periodontitis.

Keywords: *ABO Blood Groups, (Rh) factors, Periodontitis and Gingivitis.*

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Introduction:

Periodontitis in human is a multifactorial chronic inflammatory condition caused by bacterial aggregation in a biofilm formation on the teeth surfaces. This aggregation initiates a chronic inflammatory course in the gingival tissue that leads to the pathologic breakdown of the periodontal apparatus later in life[(1)]. Although periodontal lesions usually show diversity in a time of onset, bacterial strains severity and extension pathways, however, all forms of periodontitis involve a complex host-bacterial interaction. Disease onset and progression reflect a state of unstable balance between the host and periodontal pathogens, this may determine the active and non-active episodes throughout the disease course[(2)].

Although bacteria/products are considered the main etiologic factor for initiation and progression of inflammatory periodontal diseases, however modified host mechanism such as in smokers or diabetic patients prone few fold more to periodontal breakdown[(2)]. It is acknowledged that genetically modified host mechanism and genetic predisposition to specific periodontal pathogens that are responsible for the severity of periodontal breakdown have been stated by numerous studies[(3)]. Other suggested host factors might interrelate to the severity of periodontal lesions such as ABO blood grouping and Rhesus (Rh) factor, these factors are also determined genetically[(2)]. The ABO blood system and the (Rh) factor are the most frequently applied blood grouping systems today. However, the relation between blood type, (Rh) factor and dental diseases was investigated previously[(4)]. The ABO system's antigens compiling a fundamental part of the red blood cell membrane, these antigens acting as receptors for infectious agents[(5)]. Individual blood grouping is determined genetically and the relative susceptibility of a specific blood group phenotype to certain diseases has been investigated as well, for example reports showed that cardiovascular diseases are more common among subjects with (A) and (O) blood groups rather than other groups[(6-7)]. Diabetes mellitus also found to be at a higher rate among individual with blood groups (A) and (O)[(8)], and so on with diseases like gallstone and colitis[(9)], salivary gland tumour[(10)], pancreas and ovary tumours[(11)] were reported among blood group (A) individuals.

Although numerous studies have been conducted in the last few decades to inspect correlations between different ABO blood system and the frequency of specific systemic diseases and some medical conditions however, little effort was made to display the

relationships between ABO blood groups and the incidence of oral and dental diseases[12].

The relationship between blood type and dental caries has been scanned previously[28]. Studies revealed that blood type A subjects are less susceptible to dental caries, and they are at a lower risk of developing cavitations and caries in comparison with other blood phenotypes[29]. This relation reported to be significant particularly with secretor type of group A blood. It is well known that secretion of ABO antigens into saliva hampers bacterial aggregation and their potentials to attach and bond to the tooth surfaces, this is probably due to surface lectins that found on some bacterial cell walls which enable them to bond to the body surfaces[13,14].

The aim of the present study was to investigate the association between the incidence of periodontitis and ABO blood groups and the (Rh) factors.

Materials and Methods:

Design and Methodology

A cross-sectional double-blinded survey for the patient's blood phenotype and his/her periodontal condition by the laboratory technician and the periodontal examiner respectively was conducted on 200 systemically healthy subjects – their age ranged between 19 and 33 years, they were not complaining from any chronic systemic conditions or not under any source of systemic and local antimicrobial agents and/ or other medications that affect the study outcome over the last 3 months period. Furthermore, smokers were excluded from participation in the current study. Extensive medical and dental histories were recorded for each patient in order to determine the patient's general and dental condition.

The study sample included males and females, they were examined at the Department of Periodontics – School of Dentistry – University of Sulaimani after obtaining an ethical approval from the scientific committee of school of dentistry – Faculty of Medical Sciences – University of Sulaimani for conducting this study; all subjects were informed about their participation in this study and their role in the study was explained to them. Furthermore, all participants had signed a consent form after reading it carefully. The periodontal condition was assessed on all dentitions except third molars according to the classification system provided by the American Academy of Periodontology (AAP)[20].

The study sample was divided into three groups according to their periodontal status;

1. Group one (control - Healthy group) included 35 subjects with no clinical evidence of gingivitis and periodontitis, subjects not recorded any period-ontal pocket or increased normal sulcular depths, furthermore, there was no evidence of clinical attachment loss (CAL) within the examined sites.
2. Group two (gingivitis group) included 125 patients showed clinical features of different degrees of severity for gingivitis.
3. Group three (periodontitis group) included 40 patients showed clinical manifestation of different degree of severity for periodontitis recognized by different scores of CAL.

Clinical periodontal and blood grouping examinations

In this study four indices - Plaque index (PI) Silness and Loe (1964), gingival index (GI), Loe and Silness (1963) [20], probing depth (PPD) and clinical attachment level (CAL) were employed to assess the periodontal status at four sites on each tooth, the mesial, buccal, distal and lingual aspects. Control and test groups were exposed to a blood examination procedure for identification of their ABO blood groups and the Rh factors. A blood sample was collected from each participant by a sterile finger prick with a disposable needle and examination employed on a glass slide for investigation and detection of the blood grouping and Rh factor for each participant. Antisera (soluble antibody) used for blood grouping and Rh factor

Statistical analysis

Descriptive statistics – mean, standard deviation, tables and charts were employed to demonstrate and describe the results. Furthermore, analytic statistics – T-test was applied to display the level of significance between the groups. P-value of < 0.05 was considered significant.

Results:

Two hundred subjects, (90) males and (110) females were recruited to participate in this study, their age ranged between19 and 33 years, and the average sample age was 26.3± 6.7. ABO blood grouping and Rh factor test were performed for them. Figure 1 demonstrating the descriptive data about the study sample. Eighty-five (85) subjects were recorded under blood group O and (60) subjects with blood group A, whereas 35 subjects marked with blood group B and 20 subjects found to be of blood group AB. (175) Subjects were found to be of Rh positive and (25) subjects were found to be of Rh negative.

Table 1 describes the clinical manifestation of the periodontal status of the study sample; the table displays PI, GI, PPD and CAL for both control and test groups. A high mean of plaque index was recorded for gingivitis group followed by periodontitis and lesser followed by the control group (2.6, 2.2 and 0.9) respectively. The moreover gingival index recorded mean of (0.0, 2.8 and 2.9) for the control group, gingivitis and periodontitis groups respectively. Whereas. The distribution of the mean PPD values for the control group, gingivitis and periodontitis groups were (1.4 mm, 1.9 mm and 4.8 mm) respectively.

Furthermore, a high mean value of CAL was reported among the periodontitis group (5.76±1.98),

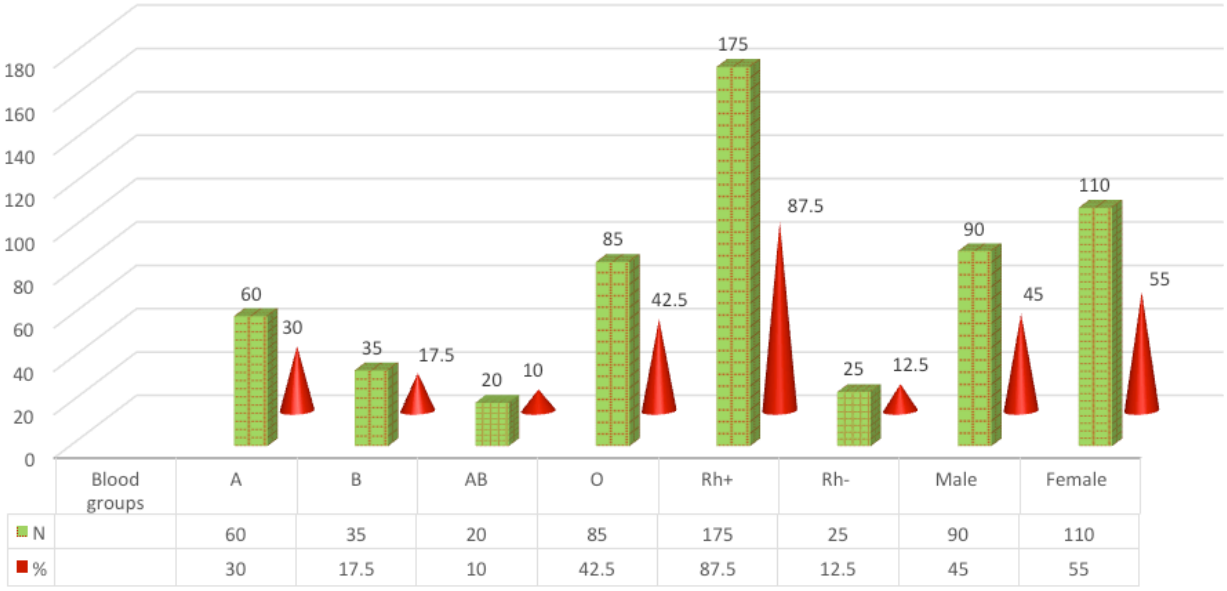


Figure 1: Descriptive distribution of the study Sample.

Table 1: Periodontal status by demonstrating means and standard deviation of the clinical indices.

Clinical indices	Healthy	Gingivitis	Periodontitis	T-Test	P value
	Mean and SD	Mean & SD	Mean and SD		
PI	0.9±0.6	2.6± 0.4	2.2±0.34	4.30	0.000
GI	0.0±0.0	2.8±0.7	2.9±1.0	2.55	0.000
PPD	1.4±0.4	1.9±1.0	4.8±1.5	3.33	0.000
CAL	0.0±0.0.0	0.0±0.0	5.76±2.0	5.7	0.000

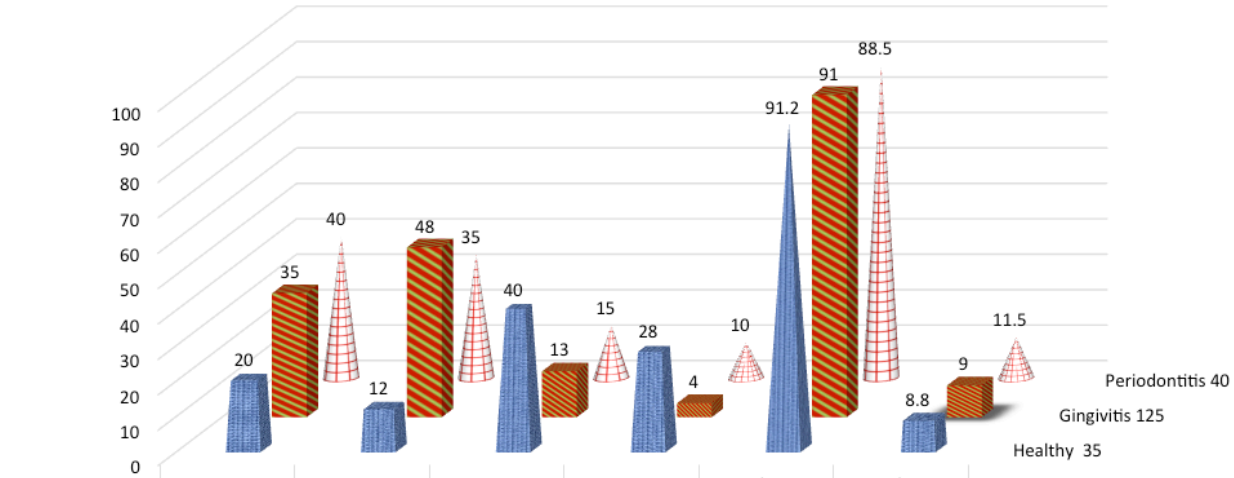
whereas no CAL was recorded for the gingivitis and control groups. Statistically, the differences between the control group and test groups were highly significant (Table 1).

Figure 2 showing the distribution of ABO blood groups among the test and control groups in regards to periodontal health and disease status. The histogram shows that the distribution of blood group O subjects among the control and two test groups (gingivitis and periodontitis) was as follow, 12%, 25% and 35% of the sample respectively. Statistically, the differences between the three groups were significant ($p<0.05$).

Similarly the majority of A - blood group subjects recorded different grades in gingivitis which was up to 48% of the total sample examined in this group, followed by 35% of the sample recorded in periodontitis, a smaller percentage 12% of A type recorded under normal control group respectively. Prevalence of gingivitis among blood group A subjects was significantly high (p-value <0.05) compared to control group. Whereas, group B showed a different distribution of the control and test groups, control healthy group highly comprised subjects with blood group B (40%) of the sample examined in this group, whereas only (13%) of subjects found to have gingivitis and (15%) were suffering from periodontitis, statistically the difference between control group and the test groups with blood type B was significant (p value <0.05).

Furthermore, a high number of AB group subjects dropped under normal control group when compared to gingivitis and periodontitis, records were 28 %, 4% and 10% respectively, (Figure 2).

Furthermore, distribution of Rh factors was formulated, the vast majority of the study sample found as being Rh positive. Percentage of subjects recorded as Rh positive was (91.2%) against (8.8%) for Rh negative. Statistically, the difference was significantly high ($p<0.05$). However, there was no significant difference between the control group and the two test groups among both (Rh) positive and (Rh) negative subjects ($p>0.05$).



	O	A	B	AB	Rh+	Rh-
Healthy 35	20	12	40	28	91.2	8.8
Gingivitis 125	35	48	13	4	91	9
Periodontitis 40	40	35	15	10	88.5	11.5

Figure 2: Distribution of blood groups and Rh factors among control and test groups.

Discussion:

This study was designed to identify the relationship between periodontal disease and ABO blood grouping and Rhesus factors, principally the study employed four clinical periodontal indices (PI, GI, PPD and CA). Based on the periodontal examination outcome, the study sample was divided into three main groups, a control group and two test groups (a group with gingivitis and the second group suffering from periodontitis). Furthermore, examination of blood groups and Rh factors was performed for all participants in a blind procedure by an expert laboratory technician. According to ABO blood groups and Rh factors, patients were distributed into subgroups. The incidence of gingivitis and periodontitis within each blood group was identified and compared to healthy control data. This study conducted to scope the frequency of gingivitis and periodontitis among subjects with different blood phenotypes rather than examining the level of severity for each condition. Therefore, the study looked at perhaps any existed relationship between the human blood grouping and Rh blood factor and frequency of periodontal diseases, this relationship if it exists could be employed as a risk predictor for early detection of periodontal diseases in life[15,21]. However, these relationships should be considered with caution taking into consideration the small sample size and the study designs that employed in the present study.

Genetics was found to play a major role in development and progression of periodontitis. It is acknowledged that any risk factor can be used as useful tool for determination of subjects who are expected to develop periodontitis in life, thus involving the susceptible subjects in a periodic screening protocol for early intervention and prevention of excessive damage to the periodontal apparatus.

It is well accepted that ABO blood types indicate differences in terms of their proportion among different racial groups[11], It is also acknowledged that periodontal diseases set up a variety of distribution and proportion of different racial groups. Therefore, according to these relationships the odds of identifying and formulating a source of the relationship between ABO subgroups and periodontal disease proportion among various populations might exist.

Researchers studied the relationship between blood grouping and dental caries[22]. However, only a few discussed this relationship between blood groups and incidence of periodontal diseases[30].

According to the results of the present study, a high proportion of blood group O sample found to be affected by periodontitis when compared to control and periodontally healthy subjects, furthermore the incidence of gingivitis among blood group (O) subjects was not trivial, statistically significant differences were reported between the two test groups and control group. This result is consistent with a similar study conducted by Vivek et.al. (2013) and revealed that subject's blood group O (65.8) and Rh positive (73.33%) had a greater propensity for periodontitis[15]. Our result is also supported by Pia et.al. (2012) studies that reported a higher susceptibility to periodontal diseases among blood group O in South Kanara district - India followed by group B then A[23]. However the present study didn't determine any significant correlation between Rh factors and frequency of periodontal lesions.

Furthermore, our results also showed that half of the sample marked as group A was significantly suffering from gingivitis, and a significant proportion of the participant was suffering from periodontitis when compared with normal subjects in the group.

These results agreed with the outcome of Demir et al. 2007[12] study, who recorded a relatively higher percentage of A group patients having gingivitis, and relatively higher percentage of O group patients was found in periodontitis group. It is also agreed with Koregol et.al. (2010) investigation; who proposed that genetic factors may alter the oral ecology and the process of periodontal disease when their results showed that blood group A showed a significantly higher percentage in gingivitis group and blood group O showed a higher percentage in periodontitis group. The blood group AB revealed the least percentage of periodontal diseases[21].

In the present study, the majority of group B subjects were under normal control group that was significantly higher than subjects with gingivitis and periodontitis in this group. Result of this study is in conflict with the results of Ali Ghamdi (2009)[24], who demonstrated that patients with blood group B appear to be at greater risk of developing more severe forms of periodontitis and ABO blood group may constitute a risk factor in the development of periodontal diseases. Furthermore, most of AB group subjects in this study recorded under normal control group that is almost consistent with the results of the most of previous studies[21,23], except our study showed no significant difference between the control group and the two test groups among both (Rh) positive and (Rh) negative subjects (P>0.05). This result is contradicting other published results which considered Rh positive (73.33%) had a greater propensity for periodontitis[15].

Our study and the majority of the studies conducted recently to investigate a correlation between ABO human blood groups and frequency and/or severity of periodontal lesions were conducted among small sample sizes, some controversial results were detect and this controversy could be the impact of racial or geographical variations of these studies that, or it might be result of variation in the methodologies or sample sizes. Some authors considered this correlation between blood phenotype and the periodontal status as a risk predictor for developing periodontal lesions early in life, however, further long-term studies are required on larger sample sizes and more detailed study designs in order to make a more comprehensive assessment of the effects of ABO group on periodontal diseases.

Conclusions:

A positive correlation was detected between some phenotypes of human ABO blood group and frequency of periodontitis that might be employed as a risk predictor for detection of susceptible subjects to periodontitis. It was concluded that subjects of blood group A and O are more prone to be involved with periodontal lesions in life than subjects of group B and AB. Whereas, no similar relationship was identified for Rh factors.

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