

## Relationship between human ABO blood groups and periodontal diseases

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### Abstract

**Aims and objectives:** The relative liability of ABO blood groups to certain systemic diseases has been investigated. Gall bladder stones and salivary glands tumor are more common in blood group 'A', while blood groups with 'A' and blood groups with 'O' individually are more susceptible to cardiovascular diseases. However, scanty literature is available on relationship between ABO blood groups and periodontal diseases. The aim of present study was to determine association between human ABO blood groups and periodontal diseases.

**Materials and methods:** 272 patients aged between 18-59 years (mean age  $42 \pm 4$  years) were examined in the present study. This study was based on periodontal conditions, blood groups and medical history. The study population was divided into 3 groups as those with healthy gingiva, gingivitis, and periodontitis. The effects of blood subgroups on healthy gingiva, gingivitis and periodontitis were investigated separately.

**Result:** A relatively higher percentage 67.8% of 'A' blood group patients were found in gingivitis group, and 75% of 'O' group patients were found in periodontitis group. 'B' blood group patients 76.9% were found in relatively higher percentage in healthy gingiva. A significant relationship was also found between Rh factor and periodontitis.

**Conclusion:** These data are suggestive of broad correlation between periodontal diseases and blood groups which may act as risk predictors for periodontal diseases. This will make it possible to better understand the risk factors of periodontal diseases and to predict the effective methods of prevention and treatment of periodontal diseases.

**Keywords:** ABO blood grouping, periodontal disease, Rh factor, gingivitis

### Introduction

Landsteiner<sup>[1]</sup> first described ABO system in human blood and classified into four groups depending on whether their red cell contains agglutinin A's, B's, neither A nor B (O's) or both A and B (AB). The ABO system and the Rh system are the

most commonly used blood grouping system.

The relative liability of some blood group phenotypes to certain diseases has been investigated. Studies have demonstrated that blood group O was associated with duodenal ulcer diseases, while gastric ulcer

and gastric carcinoma are associated with blood group A<sup>[2]</sup>. Blood group A and O individuals have been reported to be more susceptible to diabetes mellitus<sup>[3]</sup>. During last few decades, several reports have suggested that ABO blood groups, in particular non-O blood groups are associated with the risk of ischemic heart disease and developing severe manifestations of atherosclerosis<sup>[4,5,6]</sup>. Results from the Farmingham study<sup>[7]</sup> and several other reports indicated that the incidence of ischemic heart diseases might be higher in subjects of blood group A.

Periodontal disease is a chronic inflammatory response associated with both alteration of host response and influence of microbial plaque. For the past few decades research has been focused on systemic conditions and its role in pathogenesis of periodontitis. Most studies showed positive correlation between periodontal disease and systemic conditions, especially cardiovascular diseases such as myocardial infarction and atherosclerosis, respiratory infections such as chronic obstructive pulmonary diseases and pneumonia as well as diabetes. They act individually in additive fashion or synergistically to contribute to periodontal disease<sup>[8, 9, 10]</sup>.

Although several studies have been carried out to investigate the relationship between ABO blood groups and the incidence of certain systemic diseases in the field of medicine very few researches have been conducted to explore the relationships between ABO Blood groups and periodontal status. The aim of present study was to determine association between human ABO blood groups and periodontal diseases.

## Materials and methods

**Study population:** The present investigation was carried out on 350 subjects, 180 males and 170 females, aged between 20 to 59 years. The subjects with at least 20 teeth, excluding 3<sup>rd</sup> molars. And

with similar socioeconomic status were recruited in this study. Subjects who were suffering from any diseases such diabetes, leukemia, metabolic bone diseases, epilepsy etc that could aggravate periodontal manifestations, subjects having any adverse habits such as smoking, alcohol consumption etc and subjects with any previous history of antibiotics and periodontal treatment within 6 months prior to examination were excluded from the study.

Prior to periodontal examination the following three groups were defined with regards to periodontal status- Healthy gingival group – papilla bleeding score <1 and no obvious changes in colour, contour, surface texture of gingiva. Gingivitis group - papilla bleeding score > 1, displaying clinical signs of gingivitis (change in colour, contour, and surface texture in gingiva) and sulcus depth < 3mm. Periodontitis group- exhibited mean clinical attachment loss (CAL) ≥ 5mm and periodontal pocket depth (PPD) in the range of 5-7 mm. Patients for healthy gingival group were randomly selected from patients who visited our faculty with reasons other than periodontal diseases, such as orthodontic purpose and dental caries.

Prior to initiating this study, the purpose and designs of the study was explained to patients and informed consent was signed by every patient. Information regarding dietary status, mouth cleansing habits, systemic background, gingival and periodontal status along with routine clinical details was recorded in a specially designed chart. The study protocol was approved by ethical committee of DMIMS University. All the clinical measures were made using Williams periodontal probe on all teeth in each patient. The clinical measurements recorded were papillary bleeding index, periodontal pocket depth (PPD), clinical attachment loss (CAL).

The venous blood samples were collected by sterile finger prick with a disposable needle. The blood grouping and Rh factor investigation was carried out by slide method<sup>[11]</sup>.

Based on periodontal status the subjects were divided into 3 groups; GROUP I consisted of 160 patients with healthy gingiva (86 males and 74 females); GROUP II consisted of 90 patients with gingivitis (42 males and 48 females) and GROUP III consisted of 100 patients with periodontitis (62 males and 38 females). The number of subjects in each study group and ABO Blood group were tabulated. The frequency of ABO blood group and Rh factor was calculated in study group. The data were analyzed with Chi-Square test. AP value of 0.5 was considered significant for all statistical test conducted.

**Results**

A total of 350 subjects (180 females and 170 males) were examined, of which 160 were healthy, 90 were with gingivitis and 100 were with periodontitis. The mean age in females subjects was  $33.85 \pm 3.48$  and males it was  $34.53 \pm 3.55$  (Table 1). The blood grouping and Rh factor investigation was carried out by slide method<sup>[11]</sup>.

A relatively higher percentage 67.8% of 'A' blood group patients were found in gingivitis group, and 75% of 'O' group patients were found in periodontitis group. 'B' blood group patients 76.9% were found in relatively higher percentage in healthy gingiva (Table 2). A significant relationship was also found between Rh factor and periodontitis (Table 3).

**Table 1: Number of subjects, age, and sex per periodontal status category.**

PERIODONTAL STATUS	NUMBER AND PERCENTAGE OF SUBJECTS		MEAN AGE IN YEARS	SEX	
	N	%	YEARS	M	F
HEALTHY	160	45.15	24.3	86	74
GINGIVITIS	90	25.71	26.8	42	48
PERIODONTITIS	100	28.57	50	62	38

**Table2: Percentage distribution of ABO blood groups in study group.**

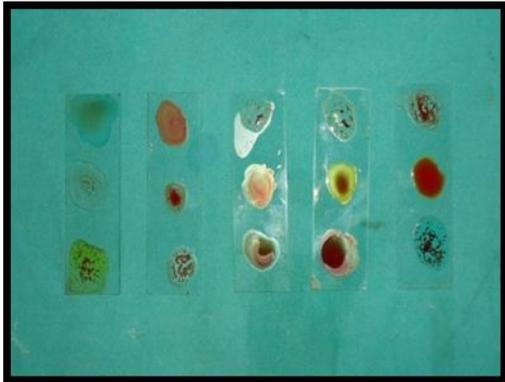
GROUP	A	B	AB	O
HEALTHY (n=160)	6 (3.8%)	123 (76.9%)	21 (13.1%)	10(6.3%)
GINGIVITIS (n=90)	61(67.8%)	10(11.1%)	7(7.8%)	12(13.3%)
PERIODONTITIS(n=100)	12(12%)	10(10%)	3(3%)	75(75%)
TOTAL (n=350)	79 (22.6%)	143 (40.9%)	31 (8.9%)	97(27.7%)

**Table 3: Percentage distribution of Rhesus factor in the study groups.**

GROUP	TOTAL SUBJECTS	Rh positive	Rh Negative
Healthy	160	136 (85%)	24 (15%)
GINGIVITIS	90	80 (89%)	10(11%)
PERIODONTITIS	100	97 (97%)	3(3%)
TOTAL	350	313 (89.4%)	37 (10.6%)



**Figure 1: Antisera Kit.**



**Figure 2: ABO Blood Grouping.**

### Discussion

Periodontal diseases including gingivitis and periodontitis are serious infections that, if left untreated, may lead to tooth loss<sup>[12]</sup>. The principal cause of periodontal diseases is bacterial plaque. The presence of microorganisms is a crucial factor in inflammatory periodontal disease, but the progression of disease is related to host – based risk factor in which the individual host response determines the nature of disease susceptibility. Indeed, the periodontal diseases are now recognized to be the ecogenetic diseases, which highlight their multifactorial nature<sup>[13]</sup>. Scanty literature is available to infer the association between blood groups and prevalence of periodontal diseases. Therefore, the present study was undertaken to determine the effect of blood group phenotypes and Rh factor on periodontal tissues.

The relative liability of some blood group phenotypes to certain oral diseases has been investigated. It is suggested that particular blood group and a tendency towards caries might be constitutional characters that were not particularly related to race, although blood group O and good teeth were less common in civilized people than in primitive races,<sup>[14]</sup> but high percentage of blood group O and low percentage of blood group 'A' in caries immune group is observed<sup>[15, 16]</sup>. Denture wearers of blood group O were also found to be more susceptible to denture stomatitis. Maxillofacial deformities were the least with blood group 'A' and were greater with blood group 'B' suggestive of ABO blood groups as one of the etiological factors for these deformities<sup>[17,18]</sup>.

In the present study, it was determined that there was a relatively higher percentage of A blood group in patients with gingivitis and a relatively higher percentage of O blood group in patients with periodontitis. These findings point towards a possible genetic basis<sup>[19]</sup>. Similar observations have been made by Demir et al 2007<sup>[20]</sup>. They reported gingivitis in 61.5% of blood group A population and periodontitis in 41.4% of blood group O population. Similarly, Gawrzewska<sup>[21]</sup> also found individuals of blood groups O to have greater severity of periodontal diseases, but individuals of blood groups A to have greater resistance to periodontal diseases. Pradhan et al (1971)<sup>[22]</sup> also found significant differences when ABO blood groups were related to four grades of periodontal involvement. However, Barros and Witkop (1963)<sup>[23]</sup> stated that there were no significant differences between subjects with or without periodontal diseases regarding ABO blood group.

Rh systems have a major clinical significance and they are determined by nature of different amino acid substitutes present on the surface of Red Blood Cells.

On comparison of percentage distribution of Rh factor in all study groups, there was significantly higher distribution of Rh positive factor than Rh negative factor. This may be due to variation in substitutes of cell membrane protein, which is determined by a series of allelic genes at a single locus.

The genetic factors may alter oral ecology and the process of periodontal diseases. The recent technical advances have provided us with fuller insight into the infectious agents, the characteristics of host immune response in periodontal diseases. Demir et al (2009)<sup>[24]</sup> found that different ABO blood groups may show significant differences in the rates of colonization of number of periodontal pathogens that are the main etiologic agents of periodontal disease. Finding in the present study are suggestive of a correlation between periodontal diseases and blood groups, which may act as risk predictors for periodontal diseases. Genetic difference in immune cell development and antigen presentation may contribute to the susceptibility of infectious diseases. For definitive establishment of such an etiogenic role, further studies using diverse population groups with exploration towards genetic basis are required to elucidate this relationship.

**Conclusion**

From the analysis of the result, it was concluded that the prevalence of gingivitis was found to be greater in blood group A and in periodontitis in blood group O. The blood group AB showed the least prevalence of periodontal diseases. These data are suggestive of a broad correlation between periodontal diseases and blood groups, which may constitute a risk factor for development of periodontal diseases.

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