

## Association of Periodontal Disease and ABO blood groups: A cross-sectional study

C.D. Dhalkari<sup>1</sup>, Maya Indurkar<sup>1</sup>, Kantilal Ingle<sup>1</sup>, Abhishek Singh Nayyar<sup>2</sup>

<sup>1</sup>Department of Periodontology, Government Dental College, Aurangabad, Maharashtra, India

<sup>2</sup>Department of Oral Medicine and Radiology, Saraswati-Dhanwantari Dental College and Hospital and Post-Graduate Research Institute, Parbhani, Maharashtra, India

### \*Corresponding Author:

Dr. Abhishek Singh Nayyar

Email: [singhabhishek.rims@gmail.com](mailto:singhabhishek.rims@gmail.com)

**Abstract:** Association between certain systemic diseases and ABO blood group is a well known fact. The purpose of this study was to determine whether there is any association between periodontal disease and ABO blood groups. A cross sectional study was carried-out on 200 subjects who were randomly selected from individuals referred for periodontal treatment. The study subjects were segregated into healthy gingiva/mild gingivitis (Group I), moderate/severe gingivitis (Group II) and varying grades of periodontitis groups (Group III), based on Loe and Silness index and clinical attachment loss as the criteria. The study groups were further categorized and graded using Ramfjord's periodontal disease index. Blood samples were collected to identify ABO blood groups. A non-parametric test, Chi-square test, was used for statistical analysis. Patients with blood group O and B were more pre-disposed to develop periodontitis with at least one side with attachment loss of more than 3 mm and with periodontal pocket depth of more than 4 mm with statistically significant results ( $p < 0.001$ ). There is a correlation existing between periodontal disease and ABO blood groups as far as this region was concerned. This association could be explained by the various blood group antigens acting as receptors for infectious agents associated with periodontal diseases. This broad correlation between periodontal disease and ABO blood groups pointed towards susceptibility of the subjects with certain blood groups to periodontal diseases.

**Keywords:** periodontitis, ABO antigens, ABO blood groups.

### INTRODUCTION

Periodontal disease is the most prevalent disease with a multifactorial etiology affecting a large population worldwide. Plaque, being a constitutional factor, probably of genetic origin and modifiable, is the primary etiologic agent. Hence, it is interesting to emphasize the significance of genetic factors in patients with periodontal disease and to find out whether any innate and non-modifiable, factor is also associated with it. However, if such a relationship between blood groups and periodontal disease can be established beyond a reasonable doubt, it can be concluded that the presence of a particular blood group antigen has somehow increased the susceptibility to the disease and will be of great significance in decreasing the risk as well as preventing the further progression and destruction of the tissues. Karl Landsteiner was the first to describe the ABO blood grouping system. He discovered the fundamental principles of blood grouping in 1900s. He described the blood groups according to "ABO" blood typing system. Since then, we have been able to categorize individuals based on their blood groups [1]. Also, the history of investigations regarding the relationship between blood

groups and dental diseases goes back to 1930 [2]. Faser Roberts discussed the relationship between ABO blood groups and susceptibility to chronic diseases as an example of genetic basis for family predisposition [3]. Since then, many workers have tried to find out the relationship between ABO blood groups and the various systemic diseases. A plethora of studies have been conducted in the field of medicine proving association between the blood group antigens and incidence of the various infectious and non-infectious diseases. Surprisingly, very less number of studies have been conducted to determine the relationship between blood groups and the various oral and dental diseases. Some researchers have claimed that there is a relationship whereas some others could not find any, which could be attributed to the geographic diversity in the population groups. The purpose of the present study was to explore such a possibility to determine the prevalence of periodontal diseases amongst different blood groups using ABO system and to correlate periodontal disease severity with different blood groups. It is expected that performing investigations in this research area will make it possible to better understand the risk factors for periodontal diseases and to predict the effective

methods of prevention and treatment of periodontal diseases.

## SUBJECTS AND METHODS

### Materials and Methods:

A total of 200 patients were included in the study. The subjects who fulfilled the following criteria were considered for the present study:

- Individuals who had at least 20 teeth and had no periodontal or antibiotic treatment for dental or medical reasons 3 month prior to their inclusion into the study;
- Individuals who had no history of systemic illness such as diabetes mellitus, leukemia, epilepsy, and metabolic bone disease etc.;
- Individuals who were non-smokers;
- Individuals who were in the similar socio-economic strata;
- Individuals with periodontitis who exhibited at least one site with attachment loss of more than 3 mm and periodontal pocket depth of more than 4 mm.

Healthy subjects who displayed less than 3 mm of attachment loss and periodontal pocket depth of less than 3 mm and with no signs of gingivitis were excluded from the study. Using a proforma, the details of each subject, including name, age, sex, past medical and dental history, Plaque index (Silness and Loe), gingival index (Loe and Silness), and Ramfjord's periodontal index (PDI), were recorded using mouth mirror and Michigan "O" probe and a detailed oral examination was carried-out using mouth mirror and explorer. The PDI score for each individual was obtained by totaling the scores of each tooth examined and then, dividing by the number of teeth examined. In the present study, all the cases were first segregated into groups based on Loe and Silness index as: Group I (healthy gingiva/mild gingivitis), Group II (moderate/severe gingivitis), and Group III (with

varying grades of periodontitis; subjects who exhibited at least one site with attachment loss of more than 3 mm and periodontal pocket depth of more than 4 mm).

### Investigations

Blood samples were collected using sterile disposable lancets and by finger prick method. The blood grouping was done using slide agglutination method (visual method) after obtaining the consent form from each subject.

### Statistical analysis

Percentage distribution of subjects with their ABO blood grouping was tabulated in each group with various grades of periodontal involvement. A non-parametric test, Chi-square test, was used for statistical analysis.

## RESULTS

Majority of the patients with blood groups O and B were found to be in Group III although the variations were found to be more marked in patients with blood group O than with blood group B wherein almost an equal number of patients were seen in either Group II or Group III. The distribution of patients with blood group A was not found to be statistically significant with equal number of patients found in all the three groups. Patients with blood group B were found to have the least chances to have a healthy gingiva and/or mild gingivitis. As far as Group 3 patients, where varying grades of periodontitis were seen, patients were found to have either blood group O or B with statistically significant results. (Table.1) From the results, it could be concluded that patients with blood group O and B were more pre-disposed to develop periodontitis with at least one side with attachment loss of more than 3 mm and with periodontal pocket depth of more than 4 mm with statistically significant results ( $p < 0.001$ ).

**Table-1: Distribution of patients**

Blood Group	No. of subjects with different Blood Groups (n)	Group I	Group II	Group III
O	71	22	07	42
A	61	20	16	25
B	35	03	14	18
AB	33	19	02	12
Total no. of subjects (n)	200	64	39	97

## DISCUSSION

Numerous studies conducted in the past have shown a significant correlation between the ABO blood groups and systemic diseases. Few such studies showed that some diseases like dental caries [4], salivary gland tumors [5], chicken pox [6], malaria [7], oral cancer [8],

hematological malignancies [9], ischemic heart disease [10], cholera [11], etc., had significant association with the ABO blood groups. Blood group A individuals have been reported to be more susceptible to gall stones and cholangitis [12], and tumors of pancreas as well as ovary [13]. As per a study among Bangladeshi people, blood

group phenotype O was associated with a substantially increased risk for coronary artery disease (CAD) [14]. In one study, Diabetes mellitus was seen to be more prevalent in subjects with blood groups A and O [15]. For several decades, the ABO blood groups have been suspected of contributing to infertility and fetal loss, though reports have often been conflicting and speculative [16]. The antigens of the ABO system are an integral part of the red cell membrane and are also found in the plasma and other body fluids. It has also been hypothesized that the presence or absence of certain antigens has been associated with various diseases and anomalies with these antigens acting as receptors for agents responsible for the causation of numerous infectious diseases. Immuno-histochemical studies have also demonstrated the presence of A/B antigens on spinous cells in the non-keratinized oral epithelium in individuals with of blood groups A and B wherein the basal cells express precursor structures and the more-differentiated spinous cells express the A or B antigens. Individuals with blood group O who do not have the A and B gene-coded glycosyl transferases express a fucosylated variant (Ley) of these precursor structures [17]. Weber and Pastern were the first to study the association of ABO blood groups with periodontal diseases. Kaslick *et al.* [18] studied the association of aggressive periodontitis and ABO blood groups and found significantly less patients with blood group O and more patients with blood group B to have aggressive periodontitis. Koregol *et al.*, [19] in a study on 1220 subjects in South India, concluded that individuals with blood group A formed a significantly higher percentage in the gingivitis group and blood group O in the periodontitis group. The blood group AB showed the least percentage of individuals who contracted periodontal diseases [20]. The distribution of Rh factor in all groups also revealed a significantly higher distribution of Rh-positive individuals with periodontal diseases [21]. The tissue localization of the histo-blood group antigens has shown that the antigens in the tissues correspond to the erythrocyte blood group but the tissue expression is dependent on the secretor status of the individual. Secretor status is secretion of blood group antigens ABO (H) which may be a factor influencing the development of systemic oral diseases in the stratified epithelium. The expression of histo-blood group antigens depends on the state of cellular differentiation and maturation and there is a sequential elongation of the terminal carbohydrate chain during the life span of the cell. Basal cells express short carbohydrate chains that are A/B precursors, whereas A or B antigens may be seen in the spinous cell layer. Variation in the differentiation patterns between keratinized versus non-keratinized epithelium influences the expression of blood group antigens. Keratinized squamous epithelium may express A or B antigens in only few and highly differentiated cells leaving the precursor H antigen expressed on most spinous cell layer cells. In contrast, in the non-

keratinized epithelium of the buccal mucosa, the precursor structure H is expressed only on a few parabasal cells, whereas expression of A and B antigens is seen in most spinous cells. The expression of A/B antigens in oral tissues is thus regulated by the expression of the A/B transferases and the availability of a substrate for the transferase [22]. Demir *et al.* found that different ABO blood groups may show significant differences in the rates of colonization of a number of periodontal pathogens that are the main etiologic agents of periodontal diseases [23]. A significant correlation between periodontal diseases and ABO blood groups was also suggested in a similar other study [24]. However, seeing at the literature search, it could never be clearly concluded whether a definitive correlation existed between the blood grouping systems and the periodontal diseases. The results, largely inconclusive, have always been substantiated by the ethnical and geographical variations and the smaller sample sizes without adequate representation from the age and gender and the control of compounding and modifiable factors including smoking and other risk factors that play a significant role in the onset as well as progression of established periodontal diseases. The study thus paves way for further studies with a larger sample size, adequate representation from the different age groups and gender, socio-economic background and with the control of important risk factors and a meticulous follow-up to predict the reliability of outcomes. However, if such a correlation gets established, it will be a boon in the management of this ubiquitous set of more often, age-related, morbidity increasing diseases.

## CONCLUSION

There was a correlation existing between periodontal disease and ABO blood groups in this region. The prevalence of blood group O was more in this geographic location followed by blood groups A, then, B while the least prevalent was blood group AB. Also, from the results, it could be concluded that patients with blood group O and B were more pre-disposed to develop periodontitis with at least one side with attachment loss of more than 3 mm and with periodontal pocket depth of more than 4 mm with statistically significant results ( $p < 0.001$ ). This association could be due to various blood group antigens acting as receptors for the infectious agents associated with periodontal disease. This broad correlation between periodontal disease and ABO blood groups points towards an increased susceptibility of subjects with certain blood groups to periodontal diseases however further studies with larger sample sizes and adequate representation from different age groups and genders are required to prove this association so that preventive measures could be taken to prevent the onset and if present, to treat such cases aggressively to rule-out the possibility of excessive

damage to the diseased periodontium in such individuals for a better prognosis.

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