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The Association of ABO blood group and Rh factor with periodontal disease

A Project Submitted to
The College of Dentistry, University of Misan, Department of Dentistry in Partial Fulfillment for the Bachelor in Dentistry

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Certification of the Supervisor

I certify that this project entitled "The Association of ABO blood group and Rh factor with periodontal disease" was prepared by *Zahraa Kareem Qasim* and *noor mohammed hassan* under my Supervision at the College of Dentistry/University of Misan in partial fulfillment of the graduation requirements for the Bachelor Degree in Dentistry

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Dedication

With deepest gratitude, I dedicate this research project to the extraordinary souls who have been my unwavering pillars of strength and inspiration.

To my incredible parents—thank you for your boundless love, countless sacrifices, and steadfast belief in me, even when I doubted myself. From late-night encouragement to quiet acts of support, you've been the bedrock of this journey, and this achievement is as much yours as it is mine.

To my family and friends—your laughter, patience, and unshakable presence have carried me through every storm. Thank you for celebrating my victories, however small, and for lifting me up when the weight of this work felt too heavy to bear.

To my mentors and lecturers—your wisdom, tireless guidance, and passion for knowledge have shaped not only this project but also the person I am today. Your lessons extend far beyond these pages, and I am forever grateful for your influence.

And to every student chasing a dream—may this work stand as proof that with grit, perseverance, and a spark of faith, no goal is out of reach. Your aspirations matter, and I hope this inspires you to keep pushing forward.

In heartfelt thanks to all who've walked this path with me, I offer this dedication as a testament to your impact.

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Introduction

Understanding the structure and function of the mouth, including its tissues and secretions, is highly significant to physiologists, cell biologists, immunologists, microbiologists, and dental professionals. This knowledge helps in understanding abnormal processes linked to oral diseases and applying effective clinical treatments. Periodontology exemplifies a multidisciplinary approach, encompassing molecular and cellular biology, clinical dentistry, epidemiology, and behavioral science.

The oral cavity is no longer viewed as a separate entity, but rather as an integral part of the body's overall physiological system, This shift in perspective highlights the crucial role of oral health in maintaining systemic well-being and its potential to reflect underlying systemic diseases, As a result, periodontology has emerged as a vital component of general medicine, emphasizing the interconnectedness of oral and systemic health. **(Taylor& Preshaw,2016).**

Aim of Study

The purposes of this report is to assess the association between ABO blood groups and Rh factor with periodontal status and if they are possible risk factors or not according to many studies that were done throughout the world.

1. Periodontal diseases

Periodontal diseases are serious chronic infections that involve destruction of the tooth-supporting apparatus, including the gingiva, periodontal ligament, and alveolar bone, include a variety of infectious conditions caused by the interaction between plaque bacteria and the host, This interaction leads to the destruction of the alveolar bone and connective tissue that support the teeth, The progression and onset of periodontal disease vary due to factors like bacterial causes, host response, and clinical development of the disease, These diseases are initiated by a local accumulation of bacteria (dental plaque) adjacent to the tooth in susceptible persons, Periodontal diseases, including gingivitis and periodontitis, can affect one tooth or many teeth and, if left untreated, can lead to tooth loss, particularly in adults. **(Robert& Ray, 2014)**. In early form called gingivitis while in its more serious form called periodontitis.(Gasner & Schure,2023).

1.A Gingivitis

Gingivitis is the mildest form of periodontal disease and can be found in up to 90% of the population. It is a term used to describe the inflammation of the gingiva due to the accumulation of bacteria and debris between the gum line and tooth, Gingivitis may or may not progress to periodontitis .(.(Gasner & Schure,2023).

1.B **Periodontitis**

Defined as an inflammatory disease of the supporting tissues of teeth caused by specific microorganisms or groups of specific microorganisms, resulting in progressive destruction of the periodontal ligament and alveolar bone with increased probing depth formation, recession, or both. (Newman *et al*. ,2018)

1.1. Classification of periodontal diseases and conditions

1.1.A Gingival diseases

1 -Plaque-induced gingival diseases

2- Non-plaque-induced Gingiva

1.1.B. Chronic periodontitis

May be further sub classified into:

*Localized form: >30% of teeth involved

*Generalized form: < 30% of teeth involved

and can classified as mild, moderate, severe

1.1.C. Aggressive periodontitis Classified into:

1.1.C.I. Localized form

*Circumpubertal onset of disease.

*Localized first molar or incisor disease with proximal attachment loss on at least two permanent teeth , one of which is a first molar

1.1.C. II. Generalized form

*Usually affecting persons under 30 years of age

*Generalized proximal attachment loss affecting at least three teeth other than first molar and incisor

1.1.D. Periodontitis as manifestation of systemic diseases

1.1.D.I-Hematologic

1.1.D.II-Genetic disorder

1.1.D. III-Not otherwise specified

1.1.E. Necrotizing Periodontal Diseases

Has two forms:

1.1.E.I Necrotizing ulcerative gingivitis

1.1.E.II Necrotizing ulcerative periodontitis

1.1.F. Abscesses of the periodontium

1.1.F.I. Gingival abscesses

1.1.F. II. Periodontal abscesses

1.1.F. III. Peri coronal abscesses

1.1.G. Periodontitis associated with endodontic lesions

The classification of lesions that affect the periodontium and the pulp is based on the sequence of the disease process.

1.1.G.I. Endodontic-periodontal lesions:

periapical lesion that originates with pulpal infection and necrosis may drain to the oral cavity through periodontal ligament, destruction of periodontal ligament and adjacent alveolar bone.

1.1.G. II. Periodontal -endodontic lesions:

The bacterial infection from periodontal pocket leads to loss of attachment and root exposure then spread to the pulp, resulting pulpal necrosis.

1.1.G.III. Combined lesions

1.1.H. Developmental or acquired deformities and conditions

1.1.H.I. Localized tooth-related factors that modify or predispose to plaque Induced gingival diseases or periodontitis

1.1.H. II. Mucogingival deformities and conditions around teeth

1.1.H. III. Mucogingival deformities and conditions on edentulous edge

1.1.I Occlusal trauma

1.1.I.I. Primary occlusal trauma

1.1.I.I Secondary occlusal trauma (Newman *et al.* ,2018)

1.2. Periodontal diseases risk factors

Risk factor is defined as an environmental, behavioral, or biologic factor confirmed by temporal sequence, usually in longitudinal studies, which if present, directly increases the probability of a disease occurring, and if absent or removed, reduces the probability.

They can be both modifiable or non-modifiable. (Mehta, 2015)

1.2.1 Modifiable risk factors Are improvable or changeable factors

1.2.1.A Microorganisms and Periodontal Disease

The subgingival microflora in periodontitis can harbor hundreds of bacterial species but only a small number has been associated with the progression of disease and considered etiologically important. Three microorganisms

(*porphyromonoas gingivalis*, Bacteroides for thus and *Actinobacillus actinomycetecomitans*) and all gram negative which have been implicated as etiologic agents in periodontitis. (Mehta, 2015)

1.2.1.B Tobacco Smoking

Tobacco smoking exerts a substantial destructive effect on the periodontal tissues and increases the rate of periodontal disease progression **(Zini *et al.* 2011).** Risk factors including tobacco smoking modify the host response to the challenge of bacteriain microbial dental plaque **(Ozçaka *et al.* 2011).** Smokers with periodontal disease seem to show less signs of clinical inflammation and gingival bleeding compared to nonsmokers **(**Mehta, 2015**)**.

1.2.1.C Diabetes Mellitus

One of the important oral signs of diabetes is gingivitis and periodontitis. Patients with undiagnosed or poorly controlled diabetes mellitus type 1 or type 2 are at higher risk for periodontal disease. There are many studies that demonstrate an association between diabetes and an increased susceptibility to oral infections including periodontal disease (Campus *et al.*, 2005). Periodontitis also progresses more rapidly in poorly controlled diabetics (Seppala *et al.* ,1993), Conversely, most well-controlled diabetic patients can maintain periodontal health and will respond favorably to periodontal therapy (Pucher & Stewart ,2004).

1.2.1.D Cardiovascular Disease

Periodontitis is associated with the increase in the level of C-reactive protein and fibrinogen there is evidence that suggests that the increase in the levels of systemic markers of inflammation, such as the C-reactive protein (CRP) and interleukin-6 (IL- 6), is associated with cardiovascular diseases (Zhu *et al.* ,2000). Bacteremia from periodontitis and dental disease is known to be the primary cause of infective endocarditis (Nakamura *et al*.,2011). In particular, patients who have undergone heart valve surgery have a significant risk of life-threatening infective endocarditis. Epidemiological and microbiological studies have lent credence to the concept that periodontal disease may be a separate risk factor for cardiovascular disease, cerebrovascular disease (Stein *et al*. ,2009),

1.2.1.E Medication :

Periodontal tissue is susceptible to a range of adverse effects of several medications used in daily medical practice. Phenytoin, cyclosporine, and calcium-blockers are the most commonly used drugs related to gingival disease. Gingival overgrowth is probably the mostly widely recognized and investigate type of adverse drug reaction in the periodontal tissues. (Anil *et al*.,2020)

1.2.1.F Stress

Patients with inadequate stress behavior strategies (defensive coping) are at greater risk for severe periodontal disease **(Akhter *et al.* ,2005].** Stress is associated with poor oral hygiene, increased glucocorticoid secretion that can depress immune function, increased insulin resistance, and potentially increased risk of periodontitis. Men who reported being angry on a daily basis had a 43% higher risk of developing periodontitis compared with men who reported being angry seldom **(Merchant *et al*.,2003).** Studies have found some periodontal disease indicators such as tooth loss and gingival bleeding to be associated with work stress **(Marcenes & Sheiham,1992)** and financial strains **(Moss *et al.*,1996).**

1.2.1.G Psychological factors:

A hypothesis of an increased risk for destructive periodontal disease due to psychological distort has long been promoted. There is an increased focus on study of the cellular and molecular basis for an increased risk for periodontal tissue loss due to stress and other psychological factors , Interaction between immune system and central nervous system, which mediates the effects of these factors in maintaining the host response to infection (Mehta, 2015)

1.2.1.F. Nutrition:

Can influence the growth, development and metabolic activities of the periodontium, the high rate of cell turnover in the periodontal tissues requires that essential nutrients are readily available. (Mehta, 2015)

1.2.1.G Poor self-care:

Improper oral hygiene techniques can lead to the build-up of bacteria and plaque on the teeth, initiating gingivitis and potentially progressing to periodontitis (Gasner, & Schure, 2023).

1.2.1.H. Pregnancy:

Pregnancy is associated with fluctuations in hormone levels, changes that have been shown to promote an inflammatory response that is linked to gingivitis and periodontitis. (Gasner, & Schure, 2023).

1.2.2 Nonmodifiable risk factors

1.2.2. A. Aging:

Older individuals have been shown to have a more severe inflammatory response to plaque deposition. This individuals at greater risk of experiencing destruction of the periodontium. Furthermore, research has demonstrated increased clinical attachment loss (CAL) in individuals aged 60 to 90 as compared to those below the age of 50(Gasner, & Schure, 2023).

1.2.2.B. Genetic factors:

Studies of identical twins suggests 50% of the susceptibility to periodontal disease is due to host factors Interluekin-1(IL-1) gene polymorphisms have been linked to periodontal disease(Mehta, 2015)

1.2.2.C Osteoporosis. Many of the studies indicate a significant association between Osteoporosis with severe alveolar crestal bone loss and the prevalence of periodontitis cases **(**Mehta, 2015). The review **Tayeb (2003)** indicated a direct association between skeletal and mandibular osteopenia and loss of alveolar crestal height and tooth loss in postmenopausal women.

1.2.2.D. Gender :

periodontitis has a documented higher prevalence in men (~57%) compared to women (~39%). (Ioannidou,2017).

1.2.2.E. Other systemic diseases:

Several deficiencies of neutrophil function have been related to periodontal disease. These include Down syndrome. (Mehta, 2015)

1.2.2.F. Female Hormonal Alterations

female hormonal alterations hormonal fluctuations in the female patient may alter the status of periodontal health (López,2005). Such changes may occur during puberty, the menstrual cycle, pregnancy, or menopause. Changes may also be associated with the use of oral contraceptives, Women on hormonal replacement therapy (HRT) and oral contraceptives experience increased

gingival inflammation, is mainly related to the duration of use (Tilakaratne,2000).

1.3 periodontal pathogenesis:

Periodontitis is a complex, chronic disease characterized by inflammation of periodontal tissues, driven by dysbiotic plaque biofilms and the host's immune response. This inflammation triggers bacterial biofilm formation, leading to gingivitis. Progression to periodontitis involves ecological shifts in the microbiome, fueled by nutrients from tissue breakdown and inflammatory responses. Key molecular pathways are activated, releasing proteinases that degrade periodontal ligament fibers and junctional epithelium. This results in clinical features including:

Key Characteristics

1. Periodontal tissue loss

2. Clinical attachment loss

3. Alveolar bone loss (visible on radiographs)

4. Periodontal pocketing

5. Gingival bleeding .(Muñoz-Carrillo *et al*. ,2019)

2. ABO blood group

The term “blood group” refers to the entire blood group system comprising red blood cell (RBC) antigens whose specificity is controlled by a series of genes which can be allelic or linked very closely on the same chromosome. “Blood type” refers to a specific pattern of reaction to testing antisera within a given system. Over a period of time, our understanding on blood groups has evolved to encompass not only transfusion-related problems but also specific disease association with RBC surface antigens.(Owen& Landsteiner,2000)

2.1. History:

The discovery of the ABO blood groups by Austrian scientist Karl Landsteiner in 1900 was the greatest achievement in the history of blood transfusion medicine. He found three different blood types and he described them as A, B

and O blood groups. Alfred Von DE Castello and Adrian Sturli discovered the fourth type AB in 1902 (Eweidah & Rahiman, 2011)) Forty years later, both Landsteiner and Weiner discovered Rhesus (D) antigen Landsteiner's discovery was a breakthrough in the history of blood transfusion medicine, as it opened the door to the birth of a wide spectrum of discoveries in the field of Immuno-hematology. (Garratty *et al.* ,2000) . To date about 700 red cell antigens have been recognized by International Society of Blood Transfusion. These antigens are organized into 30 human blood group systems and each person has a unique spectrum of blood groups with the exception of identical twins or triplets whose blood groups are exactly the same (Reid ,2012)

2.2.The Rh blood group system

is one of 36 known human blood group systems. It is the second most important blood group system, after the ABO blood group system. The Rh blood group system consists of 49 defined blood group antigens among which the five antigens D, C, c, E and e are the most important (Dean, 2005). There is no D antigen. Rh(D) status of an individual is normally described with a positive or negative suffix after the ABO type (e.g., someone who is A Positive has the A antigen and the Rh(D) antigen, whereas someone who is A Negative lack the Rh(D) antigen). The terms Rh factor, Rh positive, and Rh negative refer to the Rh(D) antigen only. Antibodies to Rh antigens can be involved in hemolytic transfusion reactions and antibodies to the Rh(D) and Rh(c) antigens confer significant risk of hemolytic disease of the fetus and newborn. (Dean,2005).

2.2.I History

Rhesus (Rh) antigen was discovered in 1940 by Karl Landsteiner and Wiener. Due to its immunogenicity along with A, B antigens, Rh D antigen testing was made 2.2 Rh blood group system 16 mandatory in pre-transfusion testing. Presently there are more than 50 antigens in Rh blood group system but major ones are D, C, E, c, and e. Very few reports are available regarding their prevalence in India and no reports are available from Andhra Pradesh (Gundra *et al.*,2016) Terms Rh positive and Rh negative refer only to the presence or absence of one antigen i.e. Rh D. Till now about 400 red cells antigen has been identified, the majority of which are inherited by Mendelian fashion. The ABO blood group system was 1 st and Rh blood group system was the 4th one to be identified. Both of these are most important for blood transfusion

purposes(Campbell, *et al.* ,2008). After ABO blood group system, Rh blood group system is the important blood group system. In 1940 Levine and Stenson in a separate study also discovered the Rh system and they divided the system into Rh positive & Rh Negative depending on presence or absence of agglutination of RBCs with Rh D antisera. Rh is the most complex and polymorphic blood group system and has major importance in transfusion medicine. (Reddy & Malini,2019).

2.2.II.Antigens

Blood group antigens are specific molecules, often proteins or carbohydrates, located on the surface of red blood cells. These antigens are inherited and are crucial in determining an individual's blood group. The two most well-known blood group systems are the ABO system and the Rh system. In the ABO system, the antigens are the A and B antigens. In the Rh system, the presence of the Rh factor (D antigen) determines whether someone is Rh-positive or Rh-negative. These antigens play a key role in blood transfusions, organ transplants, and immune responses. **(Daniels,2013)**. All human populations share the same ABO and Rhesus blood group systems; although they differ in the frequencies and distributions of specific types in different races, ethnic groups, and socio-economic groups or amongst different populations(Sidhu ,2003).

3.Association between ABO blood groups and periodontal disease

Over the past few decades, many studies have been examining the possible relationship between ABO blood groups and systemic conditions. In addition to its importance in blood transfusion and organ transplantation, ABO blood grouping influences other physiological characteristics(Skripal ,1996) , for example a study done by Whincup and his team in London has demonstrated that individuals with blood group A have a higher risk of ischemic heart disease compared to individuals of other blood groups (Whincup *et al.*,1990). As well as the people with the same blood group are more susceptible to get gallstone and colitis (Roberts 1957). Mortazavi and his team in Iran also reported that people with blood group B are more prone to cancer (Mortazavi *et al.*,2014) , While another study by Meo and his team in 2016 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. Several

studies were done throughout the world have focused on the potential relationship between ABO blood groups and periodontal diseases. However, results obtained from these studies showed a lot of discrepancies. (KouKi, *et al.*,2019). A study of 684 subjects done by Patil Anup and his team in India showed that there was an increased predominance of healthy periodontium in subjects with blood group 'B'. Whereas, an increased in gingivitis prevalence of gingivitis in people with A blood group and periodontitis in O blood group and there is more predominance of subjects with Rh positive group than those with Rh negative group and the prevalence of gingivitis was higher in Rh positive group, another 3. The association of ABO blood group & Rh factor with periodontal diseases 19 study in India by Koregol and his team in 2010 showed the same result about blood group but found no relationship between Rh factor and periodontal diseases, In contrast, A study included 1009 subjects, their ages between 20-65 years and visited the Faculty of Dental Medicine, Damascus 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 Rh factor seems to play a significant role in the incidence of both periodontitis and gingivitis. The level of response to scaling and root planning does not differ among patients based on their blood groups. (KouKi *et al*.,2019) Regarding aggressive periodontitis, Kaslick and his team in 1971 studied the association of aggressive periodontitis and ABO blood group in 1971. They found significantly less patients with blood group O and more patients with blood group B. Another study by Patel and his team in 2006 showed that individuals with blood group B and O and those who are Rh positive have a higher tendency to develop periodontitis. In contrast, a study carried out by Francis and his team in 2018 reported that there is no significant relationship between ABO blood groups and Rh factor with periodontal diseases. In 2017 Al-Askar collected databases from articles published from 1977 to August 2016, using the following search terms in different combinations: "ABO blood group," "periodontitis," "gingivitis," "aggressive periodontitis (AP)," "dental health," "risk factor," and "Rhesus factor and found differences between studies attributed to geographical diversity between populations, four studies showed that chronic periodontitis was more common among patients with blood group O.

A cross-sectional study explored this relationship by examining 205 patients from a pool of 1,126 individuals diagnosed with generalized chronic periodontitis (GCP). These patients were divided into three categories: Group I

(mild), Group II (moderate), and Group III (severe). The findings revealed that those with blood group O faced a notably higher likelihood of developing GCP, regardless of its intensity, followed by individuals with blood groups A, B, and AB, in that order. Across all groups, the presence of the Rh factor showed a striking predominance of Rh-positive individuals**. (Mostafa *et al.* ,2019)**

The association between blood groups and periodontal disease also attracted researchers in Iraq to study this relationship. In Baghdad, college of dentistry, 150 participants were enrolled in the study of an age ranged between (30-45) in 2018. This study showed the percentage of each blood group in participants with healthy periodontium, gingivitis and chronic periodontitis and they found that both of gingivitis and chronic periodontitis are highly in prevalence in people with O blood group. While the B blood group represent the higher percentage in the group with the healthy periodontium. (Salman, *et al*., 2018) Another study in Najaf collected from 129 subjects, 59 male and 70 females, aged 20 to 23 were the subjects were selected from students in the second stage of the Faculty of Dentistry in University of Kufa found that the incidence of gingivitis was higher in subjects with blood group O and Rh- Positive (Alaa *et al.*,2014) ,While in Duhok a study carried on 303 patients, found that there was no significant difference in distribution of ABO blood group, Rh factor with presence of periodontal diseases. (Salih,2015).

3.**1The role of antigens in the association between ABO blood groups and periodontal disease**

The antigens of the ABO system are an integral part of the red cell membrane, which are also found in plasma and other body fluids. The presence or absence of certain antigens has been associated with various diseases and anomalies, antigens also acting as receptors for infectious agents. Immunohistochemical studies have demonstrated the presence of A/B antigens on spinous cells in the non-keratinized oral epithelium of blood group A and B persons, where basal cells express precursor structures and the more-differentiated spinous cells express the A or B antigens. Blood group O persons who do not have the A and B gene-coded glycosyltransferase express a fucosylated variant (Ley) of the precursor structure. (Pai *et al*.,2012) . The secretion of antigens of ABO blood groups in the saliva prohibits the ability of micro-organisms to adhere to the surface of a tooth; this is because many of these micro-organisms have surface lectins, which they use to adhere to surfaces of the body. The genetic factors may alter the oral ecology as genetic dissimilarities in the immune response and

presentation of antigens may indicate the susceptibility to virulent and periodontal diseases. (Mostafa *et al.*,2019).

individuals with blood type O exhibit an immune system predisposed to heightened reactivity against bacterial infections, including those driving periodontal disease, this blood type elicits a more robust inflammatory response to pathogens such as Porphyromonas gingivalis, a key contributor to gum pathology; while inflammation constitutes a vital immune defense, evidence indicates that its chronic or excessive manifestation accelerates gingival tissue degradation, paving the way for disease progression. Investigations propose that these individuals harbor a distinct oral microbiome, potentially increasing vulnerability to pathogenic bacteria, as emerging data suggest blood type O creates an oral environment where gum disease-causing microbes flourish more readily, Blood type O, characterized by the absence of A and B antigens on red blood cells, alters the immune system's ability to detect and neutralize oral pathogens, with studies indicating that this antigenic void permits harmful bacteria to evade clearance more effectively, enabling their colonization of gingival tissues and intensifying inflammation. Furthermore, evidence suggests that blood type O individuals possess genetic traits that render their gums more prone to inflammation and infection, with research showing they demonstrate an increased likelihood of developing periodontal pockets and gingival recession, driven by hereditary factors that exacerbate responses to oral bacteria. , studies have established a link between blood type O and elevated risks of systemic conditions, such as gastrointestinal disorders, which compromise overall health, undermining oral defenses and amplifying the probability of periodontal disease progression as a weakened immune response struggles to counter microbial challenges. (Dean ,2005) .while individuals with blood type AB, distinguished by the expression of A and B antigens on their red blood cells, exhibit a uniquely balanced immune response, with studies suggesting that this dual antigenic profile fosters a more finely tuned immune system capable of regulating inflammation with greater precision; this regulation proves critical, as evidence indicates that periodontal disease arises from chronic inflammation spurred by excessive immune reactions to oral bacterial pathogens. Investigations reveal that blood type AB individuals experience a tempered inflammatory response to key gum disease pathogens like Porphyromonas gingivalis, contrasting with the more aggressive reactions observed in blood types O and A, which studies show intensify gingival tissue damage and accelerate periodontal deterioration. The presence of both A and B

glycoproteins in blood type AB alters interactions with oral bacteria, with research proposing that this molecular configuration restricts the adhesion of harmful microbes to gingival surfaces, thereby diminishing the risk of disease onset. Furthermore, evidence suggests that genetic factors linked to blood type AB influence immune cell production and pathogen response in the oral cavity, with studies indicating that these inherited traits enhance the body's capacity to manage bacterial colonization and infection, offering a protective edge against the microbial agents driving gum disease. (Dean ,2005

Conclusion:

Limited investigations have been revealed to explore the association between the ABO blood group and the diseases of periodontal tissues. The majority of the authors showed a positive correlation between periodontal diseases and ABO blood groups and claimed that the different ABO group could be a risk factor for periodontal diseases. In contrast, others did not find any associations between patients who have periodontal disease and ABO blood groups. In our report we found that most studies indicate that periodontitis is common with people of blood group (O), while gingivitis is common in blood group (A) and healthy gingiva commonly associated with blood group (B) Regarding Rh factor, most periodontal diseases found to be associated with Rh Positive.

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