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MINI-REVIEW **OPEN ACCESS**

Relationship between ABO Blood Groups and Susceptibility to Dental Caries and Periodontitis: A Narrative Review

Majed AbuKhader[1,*], Amal Abdulbaqi[1], Polyxeni Petropoulou[2] and Abubaker Qutieshat[2]

[1]*Department of Pharmacology and Biological Sciences, College of Pharmacy, National University of Science and Technology, Muscat, Oman*
[2]*Oman Dental College, Muscat, Oman*

Abstract:

Introduction: Oral health significantly impacts overall well-being. Emerging research has focused on systemic factors, including ABO blood groups, as potential influencers of oral disease susceptibility. The purpose is to understand the potential physiological and/or immunological association between the ABO blood groups and susceptibility to periodontal diseases and dental caries. This might aid in developing early diagnostic and treatment strategies for these conditions based on the individual ABO blood group.

Methods: This review synthesizes findings from cross-sectional studies published between 2015-2025, exploring the association between ABO blood types and susceptibility to dental caries and periodontitis, and examining immunological and physiological mechanisms underpinning these relationships. A set of inclusion and exclusion criteria was adopted to ensure proper search, sound evaluation, and conclusions.

Results: A systematic search of the major databases identified 29 relevant cross-sectional studies involving diverse populations, of which 21 studies discussed the ABO blood group association with periodontitis.

Discussion: Findings indicated that individuals with blood group AB exhibited an increased risk of developing dental caries, while those with blood group O were at higher risk of developing periodontitis. Possible explanations include the presence of salivary immunoglobulins (IgA, IgM, IgG), the ABO antigen secretion status, or the combination of both. Although these associations were significant, blood groups alone do not conclusively determine disease development. Additional factors, such as oral hygiene, dietary habits, ethnicity, and genetics, play critical roles.

Conclusion: In-depth research including various confounders is needed to provide a comprehensive conclusion. Findings reported here can have practical implications in dental practice by incorporating blood group data into the patient assessment profile in dental screenings.

Keywords: ABO blood group, Immunoglobulins, Salivary antigens, Periodontitis, Dental caries, Oral health, Salivary immunoglobulins.

*Address correspondence to this author at the Department of Pharmacology and Biological Sciences, College of Pharmacy, National University of Science and Technology, Muscat, Oman; E-mail: majedabukhader@nu.edu.om

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1. INTRODUCTION

Oral health plays an important role in maintaining general personal satisfaction and quality of life. Therefore, oral diseases pose a major public health concern, with dental caries and periodontal diseases being among the most common avoidable oral diseases worldwide. Dental caries are one of the most prevalent oral diseases and are characterized by enamel demineralization. They can be arrested and potentially reversed in their early stages but are often not self-limiting, and without proper care, caries can progress until the tooth is destroyed [1]. Periodontitis is the main cause of tooth loss, which occurs due to inflammatory disruption of periodontal tissues. It is caused by excessive immune responses to bacteria in subgingival dental plaque, leading to loss of periodontal integrity, impaired tooth function, and eventually tooth loss [1, 2]. These oral disorders are associated with many factors, such as aging, orthodontic needs, exposure to fluoride, and exposure to preventive measures [1].

The ABO blood grouping system was discovered by Austrian scientist Karl Landsteiner, who observed that the red blood cells of some individuals agglutinated with serum from others. He documented agglutination patterns in which he created the ABO blood grouping and divided individuals into three blood type groups: ‘A’, ‘B’, and ‘O’. Later, another blood type group, ‘AB’, was identified [3, 4]. Landsteiner, along with his colleague Alexander Wiener, also developed the Rh system in 1937, based on the presence or absence of the Rh (Rhesus factor) antigen (D antigen) [5]. The blood type has importance in transfusion medicine, paternity suits, forensic science, and the study of different populations by anthropologists. The ABO system, comprising blood groups A, B, AB, and O, is determined by antigens that are found on the red blood cell surface and usually referred to as ABO antigens. These antigens are represented by terminal sugar moieties added to the oligosaccharide chain structure, so that fucose represents the H antigen, N-acetylgalactosamine (GalNAc) represents the A antigen, and galactose represents the B antigen. Thus, individuals with blood group O express the H antigen, individuals with blood group A express the A antigen, those with blood group B express the B antigen, and those with blood group AB express both A and B antigens [6, 7]. The ABO antigens are associated with the blood cell structure, but many individuals secrete these antigens freely in their body fluids, such as saliva, mucus, and semen. These individuals are called secretors, as they release their antigens into their bodily fluids. Those who do not secrete their antigens in different liquids other than blood are non-secretors. Research has shown that the presence or absence of the ABO antigens in the saliva may affect the capacity of microscopic organisms residing in the oral cavity to adhere to tooth surfaces, potentially affecting the development of oral diseases [8, 9]. In addition to the fact that saliva plays an important role in optimal oral health, new research suggests that salivary pH is more significant in the development and progression of oral diseases than previously thought [10].

The global distribution of the ABO system indicates that blood group O is the most common worldwide, followed by blood groups A, B, and AB. Certain varieties have been associated with specific regions/countries: blood group O has been reported in European, American, and Canadian populations, blood group B in the people of the Indian subcontinent, and blood group A in Chinese and Japanese populations [3, 8]. The Rhesus factor (Rh), which is always associated with the ABO system, was reported to be Rh-positive (Rh+) in about 85% of the global population, with varying percentages reported across countries (Kenya: 96%; India: 99%; Iran: 90%; and Turkey: 87%) [11].

Several systemic health conditions have been found to be associated with blood type differences [12]. For example, individuals with blood group A have been reported to be more prone to gallstones, colitis, and tumors of the salivary glands, pancreas, and ovary. Meanwhile, it was suggested that blood group B and non-O blood groups are at risk of ischemic heart disease and might be prone to coronary atherosclerosis [1, 13]. Investigation into the relationship between blood groups, the Rhesus (Rh) factor, and dental diseases started in 1930. Richard Thompson was the first to investigate blood groups and susceptibility to dental caries in 1931, while Weber and Pastern were the first to study the association of ABO blood groups with periodontal disease [14-17]. There was a decent number of research studies reporting the association between ABO blood grouping and oral health, which investigated various aspects of this relationship, including periodontal diseases, dental caries, malocclusion, oral infections, and oral cancer [18]. This review is intended to summarize the research done in relation to periodontal diseases and dental caries in the past 10 years, from 2015 to 2025. The outcome of this review will provide a collective view on the factors that may influence the relationship between ABO blood grouping and oral health, periodontal diseases, and dental caries in particular. Knowledge of the ABO blood groups of patients and their association with periodontal diseases and dental caries is very important, and this can help in the development of early diagnosis and treatment strategies for such diseases.

2. METHODS

The search strategy was adopted from a similar work done by Ghani Ur Rehman, and it was modified and outlined in this section [19]. The literature search was conducted in March 2025 using online databases, including Google Scholar, PubMed/Medline, ScienceDirect, and EBSCO, to explore the association between ABO blood grouping and periodontal diseases and dental caries. The publication period of articles was set from 2015 to 2025. Databases were searched by using Boolean operators (*i.e.*, and/or/not) in combination with a group of keywords, such as periodontal diseases, dental caries, ABO blood groups, oral health, and periodontitis. English versions of papers describing clinical studies, cross-sectional studies, case reports, and retrospective studies on the subject were considered for inclusion. Historical reviews, meta-analyses, articles with unpublished data, and letters to the

editors were excluded. Studies investigating the association between ABO blood group and other oral conditions, such as oral cancer, oral infections, oral ulcers, and malocclusion, were also excluded. Moreover, the Rhesus factor was not considered in this review analysis. Titles and abstracts were screened for relevance. Initial screening yielded 45 articles, but with critical analysis of the full text of the articles and applying exclusion criteria based on low sample size (*i.e.*, less than 100 participants) and lack of significant association between ABO blood group and oral health, 29 articles were included. These articles were summarized into two tables: one table lists the articles investigating the association between ABO blood group and periodontal diseases, and the other table lists the articles investigating the association between ABO blood group and dental caries. Reference lists in all full-text articles were hand-screened to identify additional relevant original research articles.

3. REVIEW AND DISCUSSION

The search retrieved twenty-nine articles, summarized in Tables **1** and **2**. The following sections review and discuss the information presented in these tables.

Table 1. Studies investigating the association between ABO blood groups and dental caries.

No.	Author and Year of Publication	Ref.	Location	Methods	Sample Size	ABO Group	Strength of Correlation
1	Almalki *et al*. (2024)	[15]	Saudi Arabia	Dental caries were assessed using the WHO-modified criteria on the DMF-Index (Decayed, Missing, Filled Teeth) and the DMFS (Decayed, Missing, Filled Surfaces) index.	300	AB	Significant
2	Kadhum, *et al*. (2015)	[20]	Iraq	Decayed (D), missing (M), and filled (F) teeth were detected following the criteria described by the WHO.	250	AB	Significant
3	Alkhayoun *et al*. (2019)	[21]	Iraq	Oral examination was done under standardized conditions according to the basic methods of oral health surveys of WHO using DMFS.	209	AB	Significant
4	Singla *et al*. (2015)	[22]	India	DMFT index was recorded and calculated.	150	A and B	Significant
5	Govindaraju *et al*. (2018)	[23]	India	The decayed, extracted, and filled deciduous tooth status of the children was assessed by a pediatric dentist.	500	AB	Significant
6	Yadav *et al*. (2018)	[24]	India	Dental caries were recorded using the DMFT Index.	315	B	Significant
7	Mazumdar *et al*. (2022)	[25]	India	DMFT index was used. DMFT scores were categorized into 3 sets depending on the severity of dental caries: DMFT = 1-5, DMFT = 6-10, DMFT = above 10.	198	O	Significant
8	Jogi *et al*. (2024)	[26]	India	Data for the dental caries status were recorded by measuring the number of decayed permanent teeth as per the WHO 1997 criteria.	335	O	Significant

Table 2. Studies investigating the association between ABO blood groups and periodontal diseases.

No.	Author and Year of Publication	Ref.	Location	Methods	Sample Size	ABO Group	Strength of Correlation
1	Azab and Aljefari (2022)	[29]	Libya	A manual periodontal probe (Williams periodontal probe) was used. The presence of plaque, gingival bleeding, clinical attachment level (CAL), and probing pocket depth (PPD) were clinically assessed.	200	O	Significant
2	Kouki *et al*. (2019)	[30]	Syria	Clinical attachment loss ≥4 mm and periodontal pocket depth ≥4 mm were set as indicators for periodontitis. Radiographic bone loss was also used as an indicator in the assessment.	1009	O	Significant
3	Mostafa *et al*. (2019)	[31]	Saudi Arabia	Probing pocket depth (PPD) and clinical attachment loss (CAL) were measured using a periodontal probe (UNC-15). CAL was categorized as: mild = 1-2 mm, moderate = 3-4 mm, and severe = ≥5 mm.	205	O	Significant
4	Farshori *et al*. (2020)	[32]	Saudi Arabia	Oral cavities were thoroughly examined for the presence of dental caries, gingivitis, periodontitis, and tooth decay or tooth loss.	860	O	Significant
5	Al-Bahrani (2021)	[33]	Iraq	Patients were divided into localized and generalized chronic periodontitis. Clinical indicators used were: alveolar crest level >2 mm below the CEJ and periodontal pocket depth >4 mm.	200	O	Significant
6	Ramamoorthy *et al*. (2015)	[34]	India	Patients already diagnosed with chronic periodontitis, who had at least 20 teeth excluding third molars, with blood grouping records.	410	O, B	Significant
7	Dhalkari *et al*. (2016)	[35]	India	Ramfjord's periodontal index (PDI) was used. At least one site with attachment loss >3 mm and periodontal pocket depth >4 mm were used as indicators for periodontitis	200	O	Significant

(Table 2) contd.....

No.	Author and Year of Publication	Ref.	Location	Methods	Sample Size	ABO Group	Strength of Correlation
8	Anup *et al*. (2016)	[36]	India	Periodontitis subjects exhibited CAL = 3 mm in two or more nonadjacent teeth or CAL = 5 mm in ≥30% of teeth.	684	O	Significant
9	Bhuse *et al*. (2017)	[37]	India	Clinical attachment loss >1-2 mm and periodontal pocket depth >4 mm were used as indicators for periodontitis	300	O	Significant
10	Kaul *et al*. (2017)	[38]	India	Ramfjord's Periodontal Index was used with 4 grades: Grade 0: 0-0.16, Grade I: 0.17-0.5, Grade II: 0.6-1.5, Grade III: 1.6-3.0, Grade IV: ≥3.1.	875	A	Significant
11	Kokane *et al*. (2018)	[39]	India	Clinical attachment loss >3 mm and periodontal pocket depth >4 mm were used as indicators for periodontitis.	288	B	Significant
12	Puri *et al*. (2018)	[40]	India	Mean clinical attachment loss ≥5 mm and periodontal pocket depth 5–7 mm were used as indicators for periodontitis	272	O	Significant
13	Chawan *et al*. (2018)	[41]	India	Clinical attachment loss ≥3 mm and periodontal pocket depth ≥5 mm were used as indicators for periodontitis.	300	O	Significant
14	Mahantesha *et al*. (2018)	[16]	India	PPD and CAL were measured using UNC-15 periodontal probe. Subjects were divided into 2 groups: Group 1: CAL and PPD <3 mm and no radiographic bone loss; Group 2: CAL ≥3 mm and PPD ≥4 mm.	100	B	Significant
15	Bhardwaj and Chopra (2019)	[42]	India	William's periodontal probe was used. PPD ≥5 mm in >30% of sites was used as an indicator for chronic periodontitis.	500	B	Significant
16	Singhal *et al*. (2023)	[43]	India	William's periodontal probe was used to examine the periodontal status (PPD).	1425	O	Significant
17	Changela *et al*. (2023)	[44]	India	Community Periodontal Scores (CPI) were recorded using the CPI probe (Hu-Freidy) with a 0.5 mm ball tip. Healthy gingival group (CPI score 0), Gingivitis group (CPI scores 1 & 2), and Periodontitis group (CPI scores 3 & 4).	350	O	Significant
18	Aamir Khan *et al*. (2024)	[3]	India	PPD and CAL were measured using UNC-15 periodontal probe. Criteria: CAL 1-2 mm = Mild chronic periodontitis; CAL 3-4 mm = Moderate chronic periodontitis; CAL ≥5 mm = Severe chronic periodontitis.	100	B	Significant
19	Saito *et al*. (2024)	[6]	Japan	The Community Periodontal Index (CPI) was used to evaluate periodontal status using gingival bleeding and pocket depth scores.	2374	AB	Significant
20	Moghadam *et al*. (2025)	[45]	Iran	Assessments included evaluation of GI, PPD, CAL, and bleeding on probing.	368	B	Significant
21	Chrysanthakopoulos (2021)	[46]	Greece	Clinical attachment loss ≥6 mm in at least 2 teeth and periodontal pocket depth ≥5 mm in more than one site were used as indicators for periodontitis.	854	A	Significant

3.1. Association of ABO Blood Group with Dental Caries

There were 8 articles that investigated the association of ABO blood groups with dental caries in different populations in India, Iraq, and Saudi Arabia, as shown in Table **1**. These cross-sectional studies were conducted in various settings, including dental clinics, dental colleges, and schools. The research methodology followed in these studies was based on the DMFT (Decayed, Missing, and Filled Teeth) index, which has been used as a reference to assess oral health. It is widely used by the World Health Organization (WHO) for comparing and measuring dental caries in individuals. The index expresses the mean number of DMFT in individuals whose DMFT index is taken. The outcome reported in all 8 articles suggests that individuals with blood group AB are at high risk of developing dental caries.

In the five studies conducted in India, the sample size ranged from 150 to 500 participants, and the following reported outcomes in these studies were as follows: Two studies reported a significant association between blood group O and dental caries; one study reported a significant association between blood group B and dental caries; one study reported a significant association between blood group AB and dental caries; and one study reported a significant association between blood group A and B and dental caries. In the Indian population studied, the common ABO blood groups reported were O and B. This is consistent with what was reported in India, where blood group O is common, although studies have found that blood group B is common in Northern India, while blood group O is more prevalent in South India [27].

Three studies were conducted in the Arabian Peninsula: two studies in Iraq and one study in Saudi Arabia. The sample size ranged from 209 to 300 participants, and they reported a significant association between blood group AB and dental caries. In both Iraqi and Saudi populations, the common ABO blood group reported was O. This suggests that participants with blood group O may be less susceptible to dental caries but potentially more susceptible to other types of oral diseases.

Looking into the reported outcomes presented in the above studies, the association between ABO blood grouping and dental caries appears to be influenced by ethnicity. Arabs and Indians have different physiological attributes, which could be linked to their blood group type and susceptibility to dental caries. In the Arab population, individuals with blood group AB are more at risk of

developing dental caries, despite being the least represented in the studied sample. There are several possible explanations for the above outcome: 1- Decreased salivary flow rate in individuals with blood group AB. The salivary flow rate plays an important role in relation to dental caries because the washing action of saliva, as well as its protective constituents, increases with a high flow rate. 2- Increased concentration of salivary alkaline phosphatase among individuals with blood group AB, as variations in alkaline phosphatase levels cause changes in phosphate levels, which lead to the initiation and progression of caries. 3- Total protein in the oral cavity, as increased concentration may have a protective role. 4- The absence of AB antigens (non-secretor) and/or antibodies in the saliva, which may lead to the development of dental caries [25]. In the Indian population, individuals with blood groups O and B are more at risk of developing dental caries, possibly due to the antigenic or carbohydrate structure of blood groups expressed in individuals' saliva in the oral cavity. It was reported that blood group-specific sugars and several other sugars have a complex connection with the blood group antigens and the inhibition of bacterial aggregation. Salivary inhibition of bacterial aggregation was observed with GalNAc (A antigen), which is specific for blood group A, whereas it was not observed in the case of galactose (B antigen), which is specific for blood group B, and fucose (H antigen), which is specific for blood group O. This, as a result, explains the findings above that blood groups O and B have higher dental caries prevalence [21, 28].

3.2. Association of ABO Blood Group with Periodontal Diseases

There were 21 articles that investigated the association of ABO blood groups with periodontal diseases in different populations in India, Iraq, Saudi Arabia, Syria, Iran, Japan, and Greece, as shown in Table **2**. These cross-sectional studies were done in various settings, including dental clinics, dental colleges, and schools. The research methodology followed in these studies was based on appropriate clinical measurements using a manual periodontal probe. Plaque, gingival bleeding, Clinical Attachment Level (CAL), and Probing Pocket Depth (PPD) were examined and assessed clinically for each participant. As only 8 studies examined multiple parameters beyond the periodontal index, such as plaque and gingival indices, this review focused on data related to the association of ABO blood groups with periodontitis. Various probing methods were used to assess periodontitis, including William's probing, Ramfjord's periodontal index, and UNC-15. In most of the above studies, PPD was set at ≥ 5 mm, and CAL was set at > 3 mm.

The number of studies conducted in India to investigate the association of ABO blood groups with periodontitis was almost 61.9% (13 studies) of the total number of related studies (see Table **2**). This is possibly because periodontitis is considered a pandemic in some states in India, with a prevalence rate reaching 85% of the population [47]. The outcomes reported in these 13 studies indicate that individuals with blood group O are at risk of developing periodontitis, and the reported association was strong. Studies done in Indian and Arab populations (Saudis, Syrians, Libyans, and Iraqis) indicated that individuals with blood group O are at risk of developing periodontitis. Studies involving Asians (Japanese and Iranians) and other populations (Europeans) reported an association of various blood groups with the risk of developing periodontitis.

The outcome of these studies does not emphasize, although a strong association was detected, that blood groups are conclusive evidence as an etiological factor for causing dental caries and/or periodontal disease. There are other proven etiological factors, like poor oral hygiene, frequent consumption of sugary or acidic foods and drinks, and insufficient fluoride exposure [48, 49]. Additionally, factors like inadequate saliva flow and genetic predispositions can increase susceptibility to oral health diseases and carry more weight than blood groups in assessing cases [50].

3.3. Salivary ABO Antibodies, ABO Antigens and Oral Health

Periodontitis and dental caries were often regarded as two independent diseases and studied separately based on the pathogenic bacteria involved and their clinical manifestations. However, there were studies that investigated the association between periodontitis and dental caries, with some showing an inverse association and others showing a positive association between these two diseases [51]. A systematic review done by Li *et al*., which covered literature until 2023, aimed to conduct a robust critical appraisal of the evidence on the relationship between periodontitis and dental caries. The authors concluded that periodontitis and dental caries are not independent variables and both have a positive and significant correlation. The pooled results of all the included studies indicated that patients with periodontitis had a higher risk of developing dental caries. At the bacterial level, however, the main bacterial species associated with each disease have a distinct pathological profile: Mutans streptococci (especially Streptococcus mutans) and Lactobacillus have long been recognized as pathogens that are associated with dental caries, while Porphyromonas gingivalis, Fusobacterium nucleatum, Actinobacillus actinomycetemcomitans, and others are associated with periodontitis progression [51, 52]. These bacteria are found in the oral cavity, where saliva is one of the main elements of the oral cavity environment. Saliva is an extracellular fluid produced and secreted by salivary glands in the mouth. As a vital fluid of the oral cavity, it plays an important and beneficial role in balancing the mouth and its components, which may affect personal health status. ABO antigens and ABO antibodies are present in the saliva through certain mechanisms, and they are essential contributors to the immunity of the oral cavity by preventing the adherence of bacteria (such as those causing dental caries and periodontitis), neutralizing viruses, enzymes, and toxins, or by acting in synergy with other factors such as lactoferrin and lysozyme [53, 54].

Individuals are classified as 'secretors' and 'non-secretors' based on their ability to secrete water-soluble ABO antigens (ABH) in saliva.

Table 3. Summary of ABO antibodies, antigens, and associated risks for dental caries and periodontitis.

Blood Group	ABO Antibodies in Saliva	ABO Antigen in Saliva	Risk of Dental Caries	Risk of Periodontitis
O	Anti A Antibody Anti B Antibody	H antigen (D-Fucose)	Low risk	High risk
AB	No antibodies	Antigen A (N-acetyl Galactosamine) Antigen B (D-galactose)	High risk	Low risk
B	Anti A Antibody	Antigen B (D-galactose)	High risk	High risk
A	Anti B Antibody	Antigen A (N-acetyl Galactosamine)	Low risk	Low risk

The secretion of these antigens is controlled by the fucosyltransferase (FUT) secretor gene, located on the short arm of chromosome number 19, in the form of two alleles denoted as dominant "Se" and recessive "se." In their pattern of inheritance, SeSe and Sese produce a dominant secretor phenotype, while sese produces a recessive non-secretor phenotype. Therefore, individuals of blood group O secrete only the H antigen; those with blood group A secrete A and H antigens, while those with blood group B secrete B and H antigens in their saliva. It is generally known that about 80% of the world's population are secretors (Se gene) of ABH antigens, and only 20% are non-secretors [10, 55].

Immunoglobulins IgA, IgM, and IgG class-specific ABO antibodies, also referred to as anti-A antibodies and anti-B antibodies, are detected in saliva and serve as major immunological defense on mucous membranes and are produced locally. According to Schönbacher *et al*. (2023), in a cohort of healthy individuals, IgA was the most abundant ABO antibody class in saliva, followed by IgM and IgG [54]. Alkhayoun *et al*. detected the levels of IgA, IgM, and IgG in saliva samples collected from individuals of blood groups O, A, B, and AB. They found that the level of salivary IgA varies among the blood groups, which was significant, with the highest level found in blood group O, followed by blood group A, blood group B, and the lowest level in blood group AB [21].

Taking into account all the information discussed above, the following findings can be listed and summarized in Table **3**:

1- Healthy individuals with blood group O are at low risk of developing dental caries and at high risk of developing periodontitis. One explanation could be that a high amount of IgA in the saliva of these individuals is effective in preventing S. mutans from causing dental caries. On the other hand, the H antigen increases the risk of P. gingivalis and P. intermedia causing periodontitis.

2- Healthy individuals with blood group AB are at high risk of developing dental caries and at low risk of developing periodontitis. One explanation could be that a negligible amount of IgA in the saliva of these individuals is not effective against S. mutans in causing dental caries. On the other hand, the A antigen and B antigen in the saliva promote the clearance of P. gingivalis and P. intermedia from the oral cavity, preventing periodontitis development.

3- Healthy individuals with blood group B are at high risk of developing dental caries and periodontitis. One explanation could be that both the low amount of IgA in the saliva of these individuals and the presence of the B antigen are not effective against S. mutans, P. gingivalis, and P. intermedia in causing dental caries and periodontitis.

4- Healthy individuals with blood group A are at low risk of developing dental caries and at low risk of developing periodontitis. One explanation could be that there is a high amount of IgA in the saliva of these individuals, which is effective in preventing S. mutans from causing dental caries. On the other hand, the A antigen in the saliva promotes clearance of P. gingivalis and P. intermedia from the oral cavity, preventing periodontitis development.

4. REVIEW LIMITATIONS AND FUTURE DIRECTIONS

Due to the fact that this current review is narrative in nature and provides a preliminary overview of the literature, implementing a quality assessment framework such as ROBINS-I or the Newcastle-Ottawa Scale would be useful to evaluate the risk of bias in included studies. This narrative review can be used as a platform to conduct a future systematic review study adopting the PRISMA approach on this topic to systematically validate the quality and reliability of the work findings and conclusions.

CONCLUSION

The findings presented in this review were based on 29 research articles and were confined to a specific population in a specific geographical area. Therefore, more studies are warranted to support the findings of this review and to address the effects of oral health practices, gender, age, geographical location, and race on the association between ABO blood grouping and oral diseases such as dental caries and periodontitis. These findings can be used as a preliminary guide in dental practice to develop and introduce risk stratification based on a patient's blood group in dental screenings.

AUTHORS' CONTRIBUTIONS

The authors confirm contribution to the paper as follows: M.A.: Concept; M.A., A.Q., A.A., P.P.: Data Collection and/or Processing; M.A., A.Q.: Analysis and/or Interpretation; M.A., A.Q.: Literature Search; M.A, A.Q.: Writing Manuscript; A.Q., A.A., P.P.: Critical Review. All authors reviewed the results and approved the final version of the manuscript.

LIST OF ABBREVIATIONS

DMFT	=	Decayed, Missing, and Filled Teeth
WHO	=	World Health Organization

CONSENT FOR PUBLICATION

Not applicable.

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None.

CONFLICT OF INTEREST

The authors declar no conflict of interest, financial or otherwise.

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