Review Article

JRAD Journal of Research and Advancement in Dentistry

J Res Adv Dent 2021;11:2s:283-289.

Evidence Based Analysis for ABO Blood Group and Periodontitis

Veena Kalburgi[1*] Shweta R. Rachalwar[2] N. Sai Sri Harsha[3] Neha Awadhiya[4] Shreya Modi[5] Yash Chakkarwar[6]

[1]Professor and Head, Department of Periodontics, PCDS & RC, Bhopal, Madhya Pradesh, India.
[2]PG Student, Department of Periodontics, PCDS & RC, Bhopal, Madhya Pradesh, India.
[3]PG Student, Department of Periodontics, PCDS & RC, Bhopal, Madhya Pradesh, India.
[4]PG Student, Department of Periodontics, PCDS & RC, Bhopal, Madhya Pradesh, India.
[5]PG Student, Department of Periodontics, PCDS & RC, Bhopal, Madhya Pradesh, India.
[6]PG Student, Department of Periodontics, PCDS & RC, Bhopal, Madhya Pradesh, India.

ABSTRACT

Background: Periodontal disease is a chronic disease that leads to pathologic destruction of the periodontium. The main aetiology of it is bacteria, host response and the clinical progression of the disease. Various studies manifest a 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 and diabetes. Surprisingly, very few researches have been conducted to determine the relationship between the ABO blood group and the incidence of oral or dental diseases. Thus, this is a meta-analysis to determine the association of the ABO blood group and the Rh factor with periodontitis, to know whether they can be predictors of periodontal diseases. The articles were searched from PubMed and Journal of the web, which was published from 2000 to 2019 and reviewed for the determined outcomes. The review showed a positive response for the ABO blood group with periodontitis in terms of population relating to a specific blood group. The review results proved to conclude over the results as AB blood group showing the major inclination on periodontitis subjects followed by blood group A and blood group O. Healthy subjects were categorized majorly in blood group B.

Keywords: ABO blood group, periodontitis, Rh factor.

INTRODUCTION

Periodontal disease incorporates a varied group of infectious disease, which leads to pathologic destruction of the periodontium. It is a known fact that the main aetiology of it is bacteria, host response and the clinical progression of the disease. Although periodontal diseases depend upon complex host- bacterial interaction but the effect on the periodontal tissues is the reflection of the disease onset and its progression.[1]

Though bacterial influence is the main cause of inflammatory periodontal disease, many new pieces of evidence note that it is a chronic immune-inflammatory response associated with environmental influence, various host factors such as diabetes, smoking and genetic predisposition.[3] Landsteiner(1900) discovered the first human blood group, that is, the ABO blood group system.[2] It is the most commonly used blood group system amongst being identified so far. Other important blood group systems are the Rhesus (Rh) and the MN system. ABO and Rh systems carry a major role in clinical significance, and they are determined by the nature of different proteins present on the surface of red blood cells. The antigens of the ABO system are an integral part of the red cell membrane, which are majorly found in plasma and other body fluids. The presence or absence of few antigens are found to be associated with various

Received: Jan. 9, 2021**: Accepted**: Feb. 12, 2021
***Correspondence Dr. Veena Kalburgi.**
Department of Periodontics, PCDS & RC, Bhopal, Madhya Pradesh, India.
Email: drveenakalburgi@rediffmail.com

pISSN 2278-0076
eISSN 2321-9270

diseases and anomalies, which are antigens, and they act as receptors for infectious agents.[4,5,6]

The relative accountability of some blood group phenotypes for certain diseases has been investigated. For instance, Blood group A individuals have been reported to be more susceptible to gall stones, cholitis[7]and tumours of salivary glands,[8]pancreas as well as ovary.[9]Non-O is common with people having cardiovascular diseases. Blood groups A and O are common for patients having Diabetes Mellitus.[10,6]

Maximal studies manifest a 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 and diabetes.[6]Surprisingly, very few researches have been conducted to determine the relationship between the ABO blood group and the incidence of gingivitis and periodontitis. Thus, this is a meta-analysis to determine the association of the ABO blood group and the Rh factor with periodontitis, to know whether they can be predictors of periodontal diseases.

METHODOLOGY

Literature was searched with the help of search engines like Pubmed, Web of Science, Cochrane, Alerts, Lilacs, Open grey, Clinical Trials, Google Scholar and Journal on web databases. The authors seek articles published in the English language only. The search terms used by the authors were: "ABO Blood grouping" OR "Periodontitis." No year limitation of publication was set.

Inclusion and exclusion criteria

Only those studies were included, which were initially conducted on patients who are either healthy or with periodontitis. Unpublished conference proceedings and state of the art reports were excluded as they could not be accessed.

Data Extraction

All the extracts and the titles were solitarily put out by the reviewer. The full-text articles which were scrutinized for being eligible were screened for their eligibility. Data extraction included variables such as authors, year of the study, intervention, information, duration, sample size and outcome.

Quality Assessment

The selected articles were reviewed for their quality according to the quality assessment tool designed by the Effective Public health Practice Project[11], which consists of six components like selection bias, study design, confounders, blinding, data collection method, withdrawal and dropouts. All the components were set on a scale of being the weak, moderate and strong criterion.

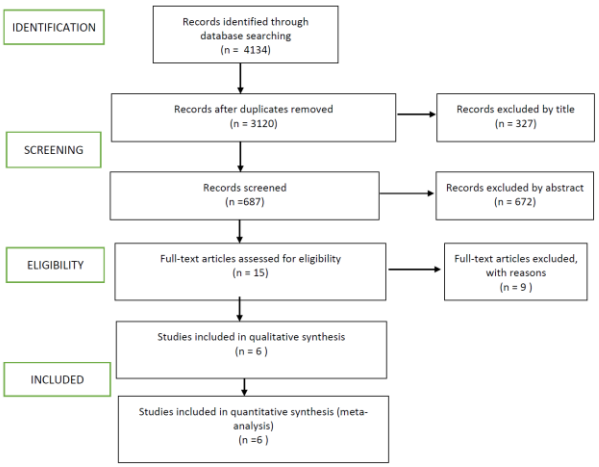
Outcome Assessed

The principal outcome of ABO blood grouping, healthy, and periodontitis was assessed.

Data Synthesis

For the meta-analysis, only the ABO blood group and periodontitis were evaluated. Effect size estimates were calculated as per Gene Glass's Formula.

Chart 1: PRISMA 2009 Flow Diagram (ABO & PERIODONTITIS)



RESULTS

In total, 4134 articles were assessed on Databases and hand searches, of which 3120 articles were removed as duplicates, and 327 articles were excluded over titles. A total of 687 articles were screened, and 672 were excluded by abstracts. In total, 15 full-text articles were assessed for eligibility, and six articles were included in the

qualitative synthesis. The characteristics of these articles are presented in Table 1.

This review included six articles; all of them were randomized, parallel design controlled trial used both for systematic review and meta-analysis. All studies included participants of both genders.

All the studies were conducted in a hospital, private set-up or in an institutional set-up. The observation established the homogeneity and unbiased nature of the study group as well as pointing to the natural distribution that is likely to exist in a population. Outcomes evaluated by the studies were Healthy and Periodontitis in the patients with variant blood groups. Other subjective outcomes, such as the Rh factor, were also validated.

The quality assessment of the studies included is presented in Table 2. All the studies were assessed for risk of selection bias, the bias in study design, confounding, blinding, data collection, and withdrawal risk. Comprehensively, all the studies had a strong quality.

Table 1: Characteristics of studies assessed

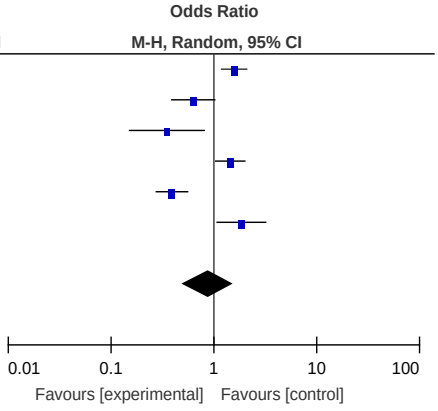
Authors, Study year	Sample size	Groups	Results
Demir et al.[16] 2007	1351	Group I(Healthy) Group II(Gingivitis) Group III(Periodontitis)	The majority of the patients with blood group AB were healthy, whereas the O blood group was found in periodontitis.
Gautam et al. [18]2017	537	Group I(Healthy) Group II(Gingivitis) Group III(Periodontitis)	Greater Prevalence of healthy gingiva was seen in blood group AB and Blood group B showed Prevalence for periodontitis.
HamedMurtazari et al. 2015	146	Group I(Healthy) Group II(Gingivitis) Group III(Periodontitis)	Greater Prevalence of healthy gingiva was seen in blood group B and AB, whereas blood group O showed a high prevalence of periodontitis.
Koregal et al.[6] 2010	1220	Group I(Healthy) Group II(Gingivitis) Group III(Periodontitis)	Blood group AB showed a higher percentage of healthy patients, whereas blood group O showed a higher percentage of periodontitis
Pai et al.[18] 2012	750	Group I(Healthy) Group II(Gingivitis) Group III(Periodontitis)	Prevalence of Blood group O and AB was a more healthy group, and blood groups B and A was more in the periodontitis group
Vivek S et al. [3] 2013	220	Group I(Healthy) Group II(Gingivitis) Group III(Periodontitis)	Prevalence of blood group AB was more for healthy group whereas blood group O was more for periodontitis group

Table 3(a): Forest plot depicting the distribution of "O" blood group among periodontitis and healthy groups

	Periodontitis subjects		Healthy subjects			Odds Ratio
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Random, 95% CI
Demir et al 2007	229	554	110	356	18.1%	1.58 [1.19, 2.09]
Gautam et al 2017	33	181	58	222	16.7%	0.63 [0.39, 1.02]
Hamed Murtazari et al 2015	19	48	30	46	13.4%	0.35 [0.15, 0.81]
Koregar et al, 2010	141	512	70	336	17.9%	1.44 [1.04, 2.00]
Pai et al 2012	142	441	102	186	17.7%	0.39 [0.28, 0.56]
Vivek S et al 2013	79	120	51	100	16.2%	1.85 [1.07, 3.19]
Total (95% CI)		**1856**		**1246**	**100.0%**	**0.87 [0.49, 1.54]**
Total events	643		421			

Heterogeneity: Tau² = 0.44; Chi² = 56.84, df = 5 (P < 0.00001); I² = 91%

Test for overall effect: Z = 0.47 (P = 0.64)



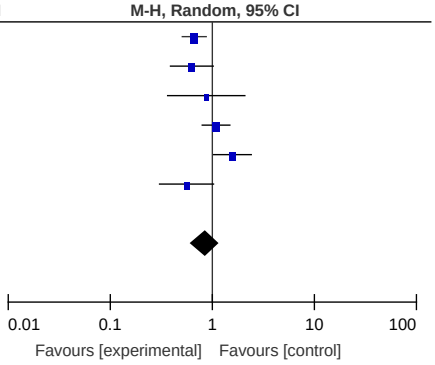
Blood group 'O' patients had an Odds of 0.87 times to report with periodontitis (CI = 0.49 – 1.54), but was not statistically significant at p = 0.64(NS).

Table 3(b): Forest plot depicting distribution of "A" blood group among periodontitis and healthy groups

	Periodontitis subjects		Healthy subjects			Odds Ratio
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Random, 95% CI
Demir et al 2007	211	554	171	356	21.9%	0.67 [0.51, 0.87]
Gautam et al 2017	33	181	58	222	16.5%	0.63 [0.39, 1.02]
Hamed Murtazari et al 2015	11	40	20	66	9.2%	0.87 [0.37, 2.08]
Koregar et al, 2010	141	512	87	336	20.8%	1.09 [0.80, 1.49]
Pai et al 2012	118	441	35	186	18.0%	1.58 [1.03, 2.41]
Vivek S et al 2013	25	120	32	100	13.6%	0.56 [0.30, 1.03]
Total (95% CI)		**1848**		**1266**	**100.0%**	**0.85 [0.62, 1.19]**
Total events	539		403			

Heterogeneity: Tau² = 0.11; Chi² = 17.02, df = 5 (P = 0.004); I² = 71%

Test for overall effect: Z = 0.94 (P = 0.35)



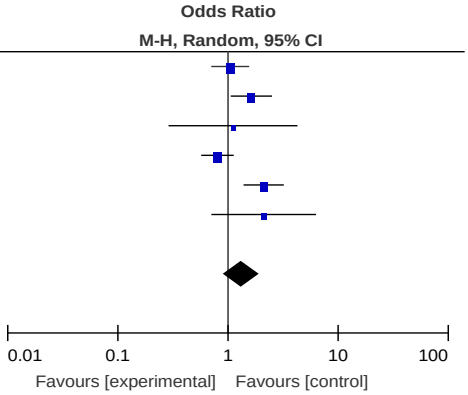
Blood group 'A' patients had an Odds of 0.85 times to report with periodontitis (CI = 0.62 – 1.19), but was not statistically significant at p = 0.36. (NS)

Table 3(c): Forest plot depicting distribution of "B" blood group among periodontitis and healthy groups

	Experimental		Control			Odds Ratio
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Random, 95% CI
Demir et al 2007	81	554	50	356	21.4%	1.05 [0.72, 1.53]
Gautam et al 2017	72	181	64	222	20.5%	1.63 [1.08, 2.47]
Hamed Murtazari et al 2015	4	40	6	66	6.2%	1.11 [0.29, 4.21]
Koregar et al, 2010	108	512	84	336	22.7%	0.80 [0.58, 1.11]
Pai et al 2012	155	441	38	186	20.7%	2.11 [1.41, 3.17]
Vivek S et al 2013	12	120	5	100	8.5%	2.11 [0.72, 6.21]
Total (95% CI)		**1848**		**1266**	**100.0%**	**1.33 [0.91, 1.94]**
Total events	432		247			

Heterogeneity: Tau² = 0.14; Chi² = 16.85, df = 5 (P = 0.005); I² = 70%

Test for overall effect: Z = 1.48 (P = 0.14)



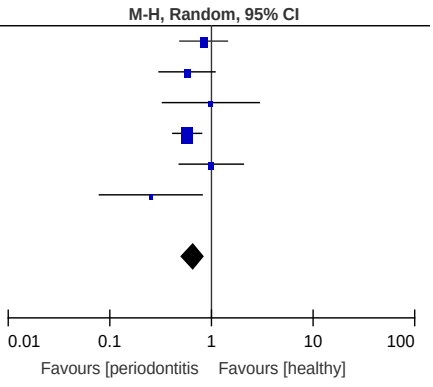
Blood group 'B' patients had an Odds of 1.33 times to report with healthy group (CI = 0.91 – 1.94), but was not statistically significant at p = 0.14

Table 3(d): Forest plot depicting distribution of "AB" blood group among periodontitis and healthy groups

	Periodontitis subjects		Healthy subjects			Odds Ratio
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Random, 95% CI
Demir et al 2007	33	554	25	356	20.3%	0.84 [0.49, 1.44]
Gautam et al 2017	16	181	32	222	15.4%	0.58 [0.31, 1.09]
Hamed Murtazari et al 2015	6	40	10	66	5.7%	0.99 [0.33, 2.96]
Koregar et al, 2010	95	512	95	336	41.3%	0.58 [0.42, 0.80]
Pai et al 2012	26	441	11	186	12.2%	1.00 [0.48, 2.06]
Vivek S et al 2013	4	120	12	100	5.1%	0.25 [0.08, 0.81]
Total (95% CI)		**1848**		**1266**	**100.0%**	**0.66 [0.50, 0.86]**
Total events	180		185			

Heterogeneity: Tau² = 0.02; Chi² = 5.92, df = 5 (P = 0.31); I² = 15%

Test for overall effect: Z = 3.03 (P = 0.002)



Blood group 'AB' patients had an Odds of 0.66 times to report with periodontitis (CI = 0.50 – 0.86), which was highly statistically significant at p = 0.002**

Meta-Analysis

Revman 5.4 software was used for statistical analysis. Forest plots were made to address the heterogeneity of the studies involved. Random effect model was used for all the quantitative analysis and calculated at 95% Confidence intervals

DISCUSSION

Gingivitis and periodontitis are chronic inflammatory diseases of the periodontium, which may lead to the loss of tooth if left untreated.[12]The primary cause of periodontal diseases is bacterial plaque. Also, other various factors causing it such as age, sex, education, place of residence, oral hygiene habits, socio-economic status, genetic characteristics and smoking habits act as risk factors for the occurrence of periodontal diseases.[13,14,15,16]

The genetic discrepancy may act as a risk or protective factors even in periodontitis. The alteration in the process of periodontal disease and oral ecology depends on genetic factors.[17] Minimal studies have been conducted and interpreted the association between blood group, Rh factor and periodontal disease in the Indian population. In the prevention of periodontal diseases, many new arenas can be opened with the identification of this association.[18]

Demir et al. concluded that different ABO blood groups show significant differences in the rates of colonization of a number of periodontal pathogens that are the main etiologic agents of periodontal diseases.[16] Pai et al. concluded that the Prevalence of blood group O was more in the south Kanara district, followed by blood groups B and A, also least prevalent in blood group AB. The percentage distribution in healthy/mild gingivitis was seen in blood group O, whereas the AB blood group was seen in moderate/severe gingivitis. B and A blood group subjects were categorized in the periodontitis group.[19] Vivek et al., in their study, revealed that subjects with blood group O and Rh-positive had a greater propensity for periodontitis.[3]

Various other studies have reported on ABO blood group and periodontal disease correlation. A difference is found in the percentage and frequency distribution of A, B, AB and O blood group in different periodontal status. Hence it is not easy to explain a hypothesis on the correlation of subjects with a particular blood group in increased frequency in healthy, gingivitis and periodontitis groups. However, periodontal disease is a multifactorial disease that includes systemic diseases, host response and genetic influence as a small facet amongst its aetiology. Thus, most of these studies are carried out on small sample size. It will be too early to make a conclusion about the definite association between the two entities.

So, a large number of subjects would be required to be designed in any study to conclude over the association of ABO blood group and periodontitis.

CONCLUSION

Variability across studies with regards to the results obtained makes it difficult to draw robust conclusions. On evaluating the results obtained from various studies, the meta-analysis done proved to be efficient to conclude. The prevalence rate of blood group AB was significantly lesser than other blood groups, but on meta-analysis, it was inferred that it has the highest risk of acquiring periodontitis when calculated on odds ratio. Likewise, the prevalence rate of blood group A and O was significant and showed an inclination towards periodontitis. On further evaluation, blood group B was at the highest Prevalence and showed the lowest risk of periodontitis. Thus, meta-analysis can be devised for getting an appraisal to rule out the high risk for the disease of the blood groups.

ACKNOWLEDGEMENT

I acknowledge Dr SahanaShivkumar, Professor and Head, Department of Public Health Dentistry, for the analysis of this study.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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