ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 9, Issue, 04, pp.48812-48816, April, 2017

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

AN EXPLORING LINK TO PERIODONTITIS: ABO BLOOD GROUP

[1]Dr. Vipin Agarwal, *[,2]Dr. Sunny, [3]Dr. Mehak Kaul and [4]Dr. Sonali Agarwal

[1]Private Practice, Modinagar, Ghaziabad, Uttarpradesh
[2]Senior lecturer, Department of Periodontology, Seema Dental College & Hospital, India
[3]PG 3rd Year, Department of Periodontology, Seema Dental College & Hospital, India
[4]Senior lecturer, Department of Pedodontics, Seema Dental College & Hospital, India

ARTICLE INFO

Article History:
Received 23rd January, 2017
Received in revised form
06th February, 2017
Accepted 26th March, 2017
Published online 20th April, 2017

Key words:

ABO antigen,
Gingivitis,
Periodontitis.

ABSTRACT

Background: Human periodontal disease comprises a heterogenous group of infectious diseases that lead to pathologic destruction of the periodontium. Periodontal diseases have varied aetiology i.e. bacterial, host response and clinical disease progression. The most important blood-typing system, the ABO blood group, is the determinant for transfusion reactions and organ transplantation. Here in this study we will be investigating the prevalence of chronic periodontitis in patients with different blood groups.
Material and Methods: A total of 875 subjects in the age group of 25 yrs and 45 yrs and of both sexes with equal percentage of males and females were selected at random, belonging to Rishikesh, Uttarakhand. The study subjects were grouped into healthy/mild gingivitis, moderate/severe gingivitis, and periodontitis group, based on Loe and Silness index and clinical attachment loss as criteria. The study group was further categorized and graded using Ramfjord's periodontal disease index. Further blood investigations were made to detect the blood group.
Results: It was concluded that the blood groups B and A were associated with diseased periodontium.
Conclusion: The prevalence of blood group A is more in this geographic location, followed by blood groups B and O, and the least prevalent was blood group AB. There was an increased prevalence of subjects with blood groups A and O with healthy periodontium, while blood groups B and A showed inclination toward diseased periodontium. This association can be due to various blood group antigens acting as receptors for the infectious agents associated with periodontal disease.

Citation: Dr. Vipin Agarwal, Dr. Sunny, Dr. Mehak Kaul and Dr. Sonali Agarwal, 2017. "An exploring link to Periodontitis: ABO blood group", *International Journal of Current Research*, 9, (04), 48812-48816.

INTRODUCTION

ABO blood group system was discovered by Karl Landsteiner in 1900 when he noticed that the red cells of some individuals could be agglutinated by the serum of others. (Webert *et al*., 2005) He discovered that blood clumping was a reaction which occurs when the receiver of a blood transfusion has antibodies against the donor blood cells. His efforts paved the way for the blood transfusions to be carried out safely. (Pai *et al*., 2012) The history of investigations regarding the relation between blood groups and dental diseases goes back to 1930. (Ishikawa, 2000) Systemic, local, genetic and environmental factors play an important role in causing periodontal diseases despite the fact the primary factor is bacterial plaque. (Novak and Novak, 2007) Periodontal disease may be regarded as a range of different diseases for which certain individuals are at relatively high risk. In high risk patient groups, host factors appear to play an important role in susceptibility to periodontitis and this risk may be partly under genetic control. (Hart and Kornman, 2000) 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 particular blood group antigen has somehow increased the susceptibility to the disease. The relationship between ABO blood group and their susceptibility to chronic disease as an example of genetic basis for family predisposition was for the first time brought into consideration by Faser Roberts in the year 1957. (Roberts, 1957) There is a constant relationship established between certain systemic diseases and blood group phenotypes. Blood Group A individuals have been reported to be more susceptible to gall stones, cholitis. (Jesch *et al*., 2007) The antigens of ABO system rest on 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 and these 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 of the precursor structure. (Webert *et al*., 2005; Campi *et al*., 2007) Gawrzewska (1975) demonstrated that individuals of blood group O have greater severity of periodontal diseases but individuals with Blood group A have greater resistance to

******Corresponding author:* **Dr. Sunny,**
Senior lecturer, Department of Periodontology, Seema Dental College & Hospital, India

Periodontal disease. The association of blood group with periodontal diseases was first discussed by Weber and Pastern. (Mahajan and Kohad, 1998) Kaslick *et al*. (1980) studied the association of aggressive periodontitis and ABO blood group. They found the predilection of Periodontitis more in blood group B than in blood group A. Plethora of studies have been conducted in the field of medicine. Surprisingly, very less number of studies have been conducted to determine the relationship between ABO groups and the prevalence of dental diseases. The purpose of the present study was to explore such a possibility to determine the association of ABO blood groups and chronic periodontitis in Rishikesh, Uttrakhand. It is expected that performing investigations in this research area will make it possible to better understand the risk factors of periodontal diseases and to predict the effective methods of prevention and treatment of periodontal diseases.

MATERIALS AND METHODS

After obtaining consent form from each subject a total of 875 subjects, in the age group of 25 yrs and 45 yrs and of both sexes with equal percentage of males and females were selected at random, subjects belonging to Rishikesh, Uttarakhand with 28 teeth excluding the 3rd molar were included in this study. Subjects who were unable to perform routine oral hygiene, smokers, alcoholics, those with previous history of antibiotic therapy, those who have had periodontal treatments were excluded from this study. Using a proforma, the details of each subject such as name, age, sex, medical, past dental history were recorded. Plaque Index (Silness and Loe), (1963) Gingival Index (Loe and Silness) (1967) and Ramfjords Periodontal Index (PDI) (Russell, 1956) were recorded using a mouth mirror and Michigan "O" Probe. PDI score for each individual was obtained by totaling the score 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 & Silness Index as: Group I (mild gingivitis), Group II (Moderate), Group III (severe gingivitis). Also, the patients were divided into 4 grades. According to the following range of their severity of Periodontal Involvement based on Ramfjord's Periodontal Index as: 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 & above). Blood samples were collected using sterile disposable lancet and finger prick method. The blood grouping was done using slide agglutination method (visual method).

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

In this study performed on 875 subjects, the prevalence of subjects with blood groups A, B, AB, and O was 305 (34.85%), 280 (32%), 115 (13.14%), 175 (20%) respectively. The frequency distribution of gingivitis in Table 1 suggests maximum percentage (19.44%) of healthy subjects was associated with blood group O followed by AB (17.39%) and minimum percentage (7.14%) of the same was with blood group B followed by A (8.33%). Also the maximum percentage (92.85%) of the disease subjects was associated with blood group B followed by A (91.66%) and minimum percentage (80.55%) was associated with blood group O followed by AB (82.6%).The result was statistically significant (chi- 23.5, degree of freedom-3, p-0.0001). Table 2, Graph 1 suggest maximum percentage (36.06%) of mild gingivitis was associated with blood group A followed by AB (30.43%) and minimum percentage (11.42%) of mild gingivitis was associated with blood group O followed by B (19.6%). Also maximum percentage (24.59%) of moderate gingivitis was associated with blood group A followed by AB (13.04%) and minimum percentage (7.14%) of moderate gingivitis was associated with blood group B followed by O (11.42%). The maximum percentage (77.14%) of severe gingivitis was associated with blood group O followed by blood group B (73.21%) and minimum percentage (39.34%) of severe gingivitis was associated with blood group A followed by AB (56.52%). The result was statistically significant (Chi = 103, Degree of Freedom- 6, P-0.0001).

Table 3, Graph 2 suggests maximum percentage (19.45%) of healthy subjects was associated with blood group O followed by AB (17.4%) and minimum percentage (7.14%) of healthy subjects was associated with blood group B followed by A (8.2%). Maximum percentage (22.23%) of simple gingivitis was associated with blood group O followed by A (19.6%) and minimum percentage (14.3%) of simple gingivitis was associated with blood group B followed by AB (17.4%). Also maximum percentage (13.4%) of beginning progressive destructive periodontal disease was associated with blood group AB followed by B (12.5%) and minimum percentage (8.33%) of beginning progressive destructive periodontal disease was associated with blood group O followed by A (9.9%). Maximum percentage (16.66%) of established progressive destructive periodontal disease was associated with blood group O followed by A (16.40%) and minimum percentage (8.6%) of established progressive destructive periodontal disease was associated with blood group AB followed by B (9.64%). Maximum percentage (46.42%) of terminal disease was associated with blood group B followed by A (45.9%) and minimum percentage (33.33%) of terminal disease was associated with blood group O followed by AB (43.2%). The result is highly significant (Chi- 38.8, Degree of Freedom-12, P-0.0001).

Table 1. Distribution of percentage and frequency of abo blood group with healthy periodontium (grade 0) and with diseased periodontium (grades i, ii, iii and iv)

			Distribution of abo blood group			
State of the periodontium	Total number (n)		A	B	Ab	O
Grade 0	99	Number	25	20	20	34
		Percentage	8.33	7.14	17.39	19.44
Grade i, ii, iii and iv combined	776	Number	280	260	95	141
		Percentage	91.66	92.85	82.6	80.55
Total	875	Number	305	280	115	175
		Percentage	100	100	100	100

(Chi- 23.5, Degree of Freedom-3, P-0.0001: very highly significant).

Table 2. Distribution of percentage and frequency of ABO blood groups with mild gingivitis (groups i), moderate gingivitis (groups ii) and severe gingivitis (groups iii)

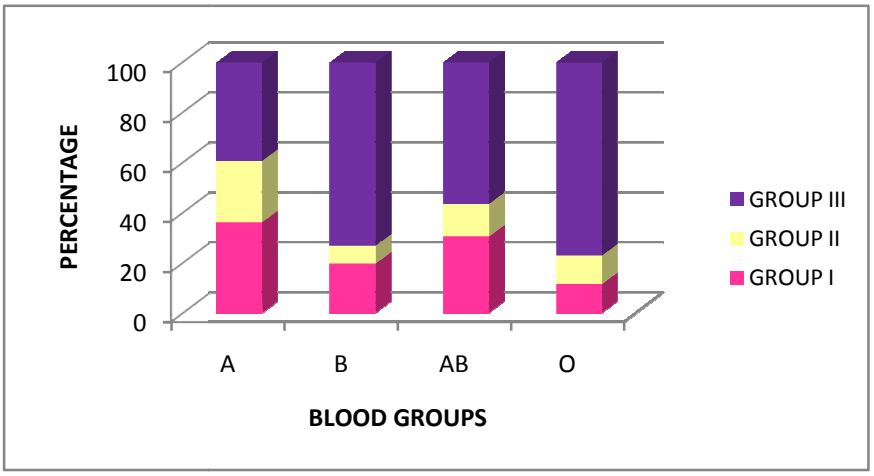
Groups	Total number (n)		A	B	AB	O
Group i	220	Number	110	55	35	20
		Percentage	36.06	19.64	30.43	11.42
Group ii	130	Number	75	20	15	20
		Percentage	24.59	7.14	13.04	11.42
Group iii	525	Number	120	205	65	135
		Percentage	39.34	73.21	56.52	77.14
Total	875	Number	305	280	115	175
		Percentage	100	100	100	100

(Chi = 103, Degree of Freedom- 6, P-0.000: very highly significant).

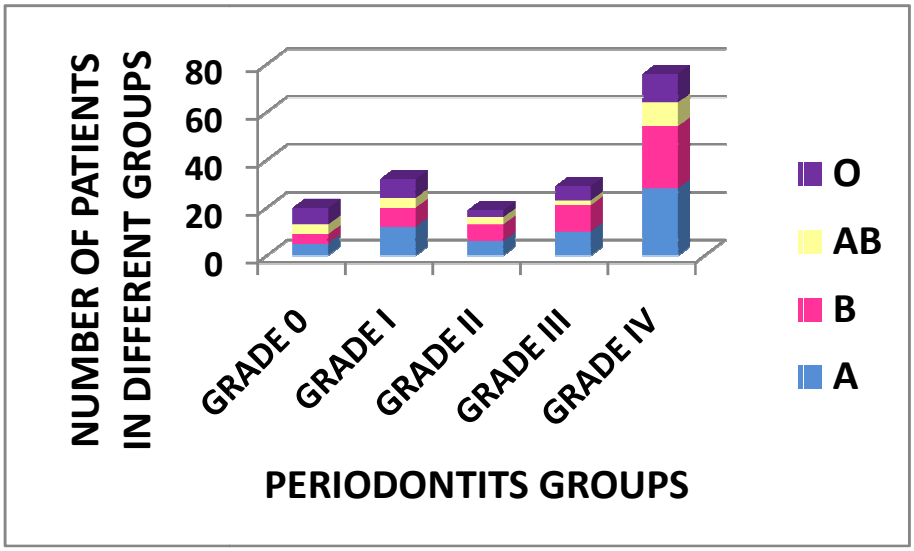
Table 3. Distribution of percentage and frequency of ABO blood groups in various grades (i, ii, iii, iv) of periodontitis

State of the periodontium	Total number (n)		A	B	AB	O
GRADE 0	99	Number	25	20	20	34
		Percentage	8.2	7.14	17.4	19.45
GRADE I	159	Number	60	40	20	39
		Percentage	19.6	14.3	17.4	22.23
GRADE II	94	Number	30	35	15	14
		Percentage	9.9	12.5	13.4	8.33
GRADE III	144	Number	50	55	10	29
		Percentage	16.66	9.64	8.6	16.4
GRADE IV	379	Number	140	130	50	59
		Percentage	45.9	46.42	43.2	33.3
TOTAL	875	Number	305	280	115	175
		Percentage	100	100	100	100

(Chi- 38.8, Degree of Freedom-12, P-0.0001: very highly significant).



Graph 1. Distribution of percentage and frequency of ABO blood groups with mild gingivitis (groups i), moderate gingivitis (groups ii) and severe gingivitis (groups iii)



Graph 2. Distribution of percentage and frequency of ABO blood groups in various grades (i, ii, iii, iv) of periodontitis

DISCUSSION

The paradigm of pathogenesis of periodontitis is shifting. Microorganisms play an important role in inflammatory periodontal disease, but the progression of disease is related to host based risk factors. Indeed, the periodontal diseases are now recognized to be ecogenetic diseases, which highlight their multifactorial nature. (Kinane and Bartold, 2007) 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. (Hellström *et al*., 2004) The antigens of ABO system are located on carbohydrate oligosaccharide chains, which are parts of glycosphingolipids or gp molecules.the genes of ABO system donot encode directly for the antigens but encode for the enzymes that add specific sugars to the red cell membrane. These sugars are the ABO red cell antigens that are detectable in serological testing. (Webert *et al*., 2005) 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 very few and highly differentiated cells, leaving the precursor H antigen expressed on most spinous cells. In contrast, in the non‐keratinized epithelium of the buccal mucosa, the precursor 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. (Campi *et al*., 2007) In a study conducted by Hellstrom and Hallberg (2004) it was found that carbohydrates act as receptors for *Porphyromonas gingivalis* and these carbohydrate receptors constitute the ABO antigens. (2004) New studies (Dabelsteen, 2002) have given a link between the fringe genes and epithelial differentiation. Fringe genes are cell differentiation proteins that possess glycosyltransferase activity. These proteins initiate elongation of carbohydrate residues attached to notch receptors, which are transmembrane proteins that mediate communication associated with cell differentiation. The finding that fringe is expressed differently in mouse‐stratified epithelium and that the gene product is glycosyltransferase is interesting in relation to the finding of a sequential expression of carbohydrates during epidermal differentiation, particularly as in mice, blood group antigen related carbohydrates are found to be expressed in specific structures such as taste buds, tongue papillae, and gingival junctional epithelium. (Campi *et al*., 2007) Demir *et al*. (Turgut Demir *et al*., 2007) 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. Periodontal disease has a multifactorial etiology and the etiopathogenesis of the disease not been completely established yet, with some studies suggesting that genes play one of the crucial role in the causation of disease. (Hart and Kornman, 2000) The purpose of the study was to explore such a possibility and to correlate ABO blood group and periodontal status with severity of periodontal involvement in Rishikesh, Uttarakhand. Different geographic locations show variations in the prevalence of A, B, AB, and O blood groups, as observed by Pradhan *et al*. (1971) in their study. When the percentage distribution of A, B, AB, and O blood groups and various grades of health, gingivitis and periodontitis (Ramfjord's criteria of scoring) (Loe, 1967) were studied, it revealed interesting findings, maximum percentage of subjects with mild (36.06%) and moderate gingivitis (24.59%) was associated with blood group A and severe gingivitis was associated with blood group O (77.14%).

Maximum percentage of subject with health (19.45%) and simple gingivitis (22.23%) was associated with blood group O, beginning of periodontal diseases was associated with blood group AB (13.4%), established progressive destructive periodontal disease was associated with blood group A (16.66%) and terminal destructive periodontal disease was associated with blood group B (46.42%). Overall maximum percentage of subjects with health was associated with blood group O (19.44%) and overall maximum disease was associated with blood group B (92.85%). This finding was not in accordance to the observation made by Pradhan *et al*. (1971) where they reported that A blood group predominated in healthy periodontium and blood groups AB and O showed more inclination toward diseased periodontium. In another study conducted by Ghamadi *et al* (2009) in 2009 it was concluded that subjects with blood group B showed inclination towards periodontitis which is in accordance with our study. Also in one of the studies conducted by Habeeb *et al*. (2014) in the year 2014 they concluded that the prevalence of diseased periodontium was more in the subjects with blood group O as the predilection of population with blood group O is more in Saudi region which is in contrast to the present study In the present study and various other studies that reported on ABO blood group and periodontal disease, a difference is found in the percentage and frequency distribution of A, B, AB, and O blood group in different periodontal status and also in different grades of periodontal involvement. It is very difficult to elaborate a hypothesis on why subjects with particular blood group are found in increased frequency in healthy, gingivitis, and periodontitis groups, and also in various grades of periodontal involvement. However, occurrence of gingivitis and periodontitis is the result of many factors and the probable genetic influence demonstrates a small facet of multifactorial etiology of this disease. Since most of these studies are carried out on a small group of subjects, until universal figures are made available, the decision as to whether a particular blood group has a particular immunity or susceptibility should be put off. Until then, all reports of preponderances should be accepted with a pinch of salt.

Conclusion

There is a correlation existing between periodontal disease and ABO blood group in Rishikesh, Uttarakhand state. The prevalence of blood group A is more in this geographic location, followed by blood groups B and O, and the least prevalent was blood group AB. There was an increased prevalence of subjects with blood groups O with healthy periodontium, while blood group B showed inclination toward diseased periodontium. This association can 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 group points toward susceptibility of subjects with certain blood groups to periodontal disease.

REFERENCES

Al Ghmadi AST. 2009. Association between ABO blood groups and severity of chronic periodontitis. JKAU: *Med.Sci*., 16:31-41.

Campi C, Escovich L, Valdés V, Garcva Borrás S, Racca L, Racca A *et al*. 2007. Secretor status and ABH antigens expression in patients with oral lesions. *Med Oral Patol Oral Cir Bucal*., 12:431‑4.

Dabelsteen E. 2002. ABO blood group antigens in oral mucosa. What is new? *J Oral Pathol Med*., 31:65‑70.

Gwarzewska B. 1975. ABO Rh and MM Blood groups systems and ABH group factors in saliva as related to Parodontal Diseases. *Czas Stomatol*., 28:1007-14.

Habeeb B, Jaber H, Ala T. 2014. Study the relationship between ABO blood groups and gingivitis disease. *J Kufa Nursing Sci.*, 4.31-7.

Hart TC. and Kornman KS. 2000. Genetic factors in the pathogenesis of periodontitis. *Periodontol*, 1997;14:202-15.

Hellström U, Hallberg EC, Sandros J, Rydberg L, Bäcker AE. 2004. Carbohydrates act as receptors for the periodontitis-associated bacterium Porphyromonas gingivalis: a study of bacterial binding to glycolipids. *Glycobiology*, 14:511-9.

Ishikawa I. 2000. Host responses in periodontal diseases: A preview. *Periodontol*, 43:9‑13.

Jesch U, Endler PC, Wulkersdorfer B, Spranger H. 2007. ABO blood group. Related investigations and their association with defined pathologies. *Sci World J*., 7:1151‑4.

Kaslick RS, West TL, Chasens AI. 1980. Association between ABO blood groups, HL-A antigens and periodontal diseases in young adults: a follow up study. *J Periodontol*., 51:339-342.

Kinane DF. and Bartold PM. 2000. Clinical relevance of host responses of periodontitis. *Periodontol*, 43:278‑93.

Loe H. 1967. The gingival index, the plaque index and the retention index systems. *J Periodontol*., 38:610-16.

Mahajan NM. and Kohad RM. 1998. Association between ABO blood groups and periodontal diseases. *J Ind Soc Periodontol*., 1:62‑3.

Novak MJ, Novak KF. Chronic Periodontitis. In: Michael G. Newmann, Henry H. Takei, Perry R. Klokkevold, Fermin A. 2007. Carranza, editors. Carranza's Clinical Periodontology. 10th ed. St. Louis Missouri: W.B. Saunders Company, p.494-99.

Pai GP, Dayakar MM, Shaila M, Dayakar A. 2012. Correlation between "ABO" blood group phenotype and periodontal disease: Prevalence in South Kanara district, Karnataka state, India. *J Ind Soc Periodontol*., 16:519-23.

Pradhan AC, Chawla TN, Samuel KC, Pradhan S. 1971. The relationship between periodontal disease and blood groups and secretor status. *J Periodontal Res*., 6:294-300.

Roberts JA. 1957. Blood groups and susceptibility to disease: A review. *Br J Prev Soc Med*., 11:107‑25.

Russell AL. 1956. A system of classification and scoring for prevalence and incidence of periodontal disease. *J Dent Res*., 35:350-59.

Silness J. and Loe H. 1963. Periodontal diseases in pregnancy II. Correlation between oral hygiene and periodontal conditions. *Acta Odont Scand*., 24:747-59.

Turgut Demir, Adnan Tezel, DDS, Recep Orbak, Abubekir Eltas Cankat Kara, and Fahri Kavrut. 2007. The Effect of ABO Blood Types on Periodontal Status. *Eur J Dent*, 1:139–143.

Webert KE, Chan HHW, Smith JW, Heddle NM and Kelton JG. 2005. Red Cell Platelet and White Cell Antigens. In: Kasper, Dennis L., and Tinsley Randolph Harrison. Harrison's principles of internal medicine. New York: McGraw-Hill, Medical Pub. Division.

****