ISSN: 0975-833X

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

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

International Journal of Current Research
Vol. 14, Issue, 03, pp.21099-21102, March, 2022

DOI: https://doi.org/10.24941/ijcr.43307.03.2022

RESEARCH ARTICLE

ASSOCIATION BETWEEN ABO BLOOD GROUP AND DENTAL CARIES IN 19-59 YEARS AGE GROUP OF SUBURBAN POPULATION OF NORTH KOLKATA, WEST BENGAL: A CROSS SECTIONAL STUDY

[1]Dr. Paromita Mazumdar, [2,*]Dr. Tanmoy Saha, [3]Dr. Sayantan Mukherjee and [4]Dr. Santanu Sen Roy

[1]Professor, Department of Conservative dentistry and endodontics, GNIDSR, Kolkata
[2]Post graduate trainee, Department of conservative dentistry and endodontics, GNIDSR, Kolkata
[3]Professor, Department of Conservative dentistry and endodontics, GNIDSR, Kolkata
[4]Professor, Department of Public Health Dentistry, GNIDSR, Kolkata

ARTICLE INFO

Article History:
Received 24th December, 2021
Received in revised form
19th January, 2022
Accepted 24th February, 2022
Published online 30th March, 2022

Keywords:

ABO blood group,
Dental Caries Prevalence, DMFT.

Corresponding author:
Dr. Tanmoy Saha

ABSTRACT

Background: The association between certain systemic diseases like diabetes, cardiac disorders and ABO blood group is a well-documented fact. The studies conducted on the association between dental caries and ABO blood group till date is limited. This study was conducted to find out whether ABO blood group affects the prevalence of dental caries. **Method**s: Based on a pilot study, sample size calculation was performed. A total of 198 patients of 19-59 years age group attending the outpatient department of Conservative Dentistry & Endodontics were randomly selected for the study. Patients free from any systemic diseases and holding a valid certified copy indicating ABO blood group, obtained from a registered pathological laboratory or government institute were selected for the study. Dental caries was scored using DMFT index. **Result**s: Blood group O was found to be more prevalent among the subjects and had the highest mean DMFT score and blood group AB the lowest among all groups. The results were statistically significant. **Conclusion**: Based on the results of this study, an association between blood group and dental caries prevalence was found. For more conclusive results to be extrapolated to a larger population, further studies need to be conducted on a on a higher sample size.

Citation: Dr. Paromita Mazumdar, Dr. Tanmoy Saha, Dr. Sayantan Mukherjee and Dr. Santanu Sen Roy. "Association between ABO blood group and dental caries in 19-59 years age group of suburban population of North Kolkata,West Bengal: A cross sectional study.", *2022. International Journal of Current Research, 14, (03), 21099-21102.*

INTRODUCTION

Dental caries is the most common problem ofthe stomatognathic system.Dental plaque, dietary factors and oral hygiene are presumed to be major etiological factors, so most of the studies lay an emphasis on these factors, but the influence of genetic factors like ABO blood group is not usually considered. The individual's susceptibility to dental caries has also shifted to interestsin genetic predisposition as dental caries is a complex interaction of the genetics, host and the environmental factors.

Background: Karl Landsteiner devised the universal ABO system of classifying blood groups.

As these blood groups are determinants of several digestive and immunological traits of the body, its importance extends beyond transfusion and transplantation. [1,2] The ABO system classifies blood into four types: A, B, AB and O.Blood serum of O blood group carries antibodies to both A and B antigensthough true antigen is not present on the erythrocytes. Type A and B erythrocytes carry the A and B antigens respectively, and produce antibodies to the antigen which is absent. As type AB erythrocytes carry both A and B antigens, they do not create antibodies to other blood types. To study the development of modern humans, Anthropologists have used the ABO bloodgrouping as a guide. [1,3]Several studies have studied the correlation between blood groups and systemic diseases such as cancer, diabetes mellitus, dermatological

diseases, cardiovascular diseases and genetic diseases. Therole of Rhesus (Rh) factor is beyond the scope of this study. The ability of bacteria to adhere to the surface of the teeth is probablyinhibited by the secretion of ABO antigens into saliva. The probable reason may be because these bacteria possess surface lectins, which are needed for the attachment to body surfaces, are mostly ABO specific. Lower levels of immunoglobulin A (IgA) antibodies in the saliva of non-secretors might compromise their ability to keep bacterial count to the minimum[4].Limited studies have been done to investigate the correlation between ABO blood group and oral dental caries. The aim of this study was to investigate the association, if any, between ABO blood group and prevalence of dental caries in adult population of Panihati (Sodepur) which is a suburban population of Kolkata, West Bengal.

METHODOLOGY

Study design: Cross-sectional study was conducted to determine the association between ABO blood group and prevalence of dental caries.

Ethical Approval: The study was approved by the Institutional Review Board-IRB (Research Ethics Committee) at Guru Nanak Institute of Dental Science & Research, Kolkata. (IEC No: GNIDSR/IEC/19-22/27). Participation of each participant was voluntary and informed consent was obtained before commencement of the study.

Study population: Panihatiis a locality in suburbanKolkata having a population of 3.77 lakhs (2011 census data). Patientsresiding within the limits of Panihati Municipality and attending theoutpatient department in conservative and endodontics department of Guru Nanak Institute of Dental Science & Research, Kolkata were randomly selected for the study.198 patients meeting the inclusion criteriawas the total sample size.

Sample Size Calculation: P value <0.05 was considered to be significant for this study.Considering effect to be two-sided, value of Z_{α} was calculated to be 1.96. Power of study was assumed to be 90% and $Z_{1-\beta} = 1.28$ was obtained.An effect size of 1.25 was considered to be statistically significant and applying the formula $n > 2(Z_{\alpha} + Z_{1-\beta})^2 \times SD^2/d^2$, n = 39 was derived.

INCLUSION CRITERIA: Patients residing within the limits of Panihati Municipality, belonging to 19-59 years age group irrespective of gender were selected for the study.Patients holding a valid government document or certified copy from a registered pathological laboratory indicating blood group were selected for the study.

EXCLUSION CRITERIA: Patients who did not consent to participate in the study following an initial briefing were excluded. Patients who were unaware of their blood group or could not provide an authentic document were not included in the study.Patients with developmental disorders of teeth, systemic diseases and mental disabilities were excluded from the study.

Clinical examination (determination of dental caries status): The intraoral examination of the participated subjects was carried out in a dental chair under visible light using sterile disposable mouth mirrors and sterile community periodontal index (CPI) probe to visually examine the caries on the occlusal, incisal, buccal and lingual surfaces (as described in Oral Health Survey; Basic Methods; WHO 1997). Type III oral examination was employed in this study. (4) The same person who clinically examined the subjects recorded the values of DMFT. The caries experience of patients was assigned DMFT scores and categorized into 3 groups depending on the severity of dental caries. The caries active groups contain as follows:

Group I: 66 adults with DMFT 1-5
Group II: 66 subjects of DMFT 6-10
Group III: 66 adults of DMFT above 10.

A subject population of 433 was initially examined to arrive at an equal population of 66 subjects in each group which was deemed statistically significant considering dropouts, inability to participate in the study, samples not in accordance withthe study designor noncompliance with the inclusion and exclusion criteria. Thus,a total of 198 data points was arrived at and considered for the study. In the rest 235 patients examined who could not be included in the study were informed about the same and attended to in the departmentfor their dental complaints. Patient information sheet was provided to each of the patients and were free to call the primary investigator at all times regarding any query.

Recording of ABO blood group: A history sheet containing duly filled details pertaining to the study was obtained from each patient. Blood group was recorded from a valid government document or authorized pathological certificate indicating blood groupthat the patient was asked to procure on the day of examination. The*null hypothesis* postulated was thatthere is no difference in dental caries prevalencein the patients with different blood groups.

STATISTICAL TOOLS

Categorical variables are expressed as number of patients and percentage of patients and compared across the groups using Pearson's Chi Square test for Independence of Attributes/ Fisher's Exact Test as appropriate.Continuous variables are expressed as Mean, Median and Standard Deviation and compared across the groups using Kruskal Wallis Test since the data does not follow normal distribution.The statistical software SPSS version 20 has been used for the analysis. An alpha level of 5% has been taken, i.e. if any p value is less than 0.05 it has been considered as significant.

OBSERVATION AND RESULTS

A total of 198 patients participated in the study out of which 113 were male and 85were females; their ABO blood groups are illustrated in figure1. According to ABO blood groups; the majority of participants (n=81) had O phenotype (40.9%), while 28.3% (n=56) had B phenotype, and 19.2% out of them had A phenotype (n=38). AB phenotypes constitute the minority of patients (n=23) (11.6%). As shown in Table 2 and Figure 2, the mean values of DMFT in blood groups O, B, and Atypes were 9.32, 8.46 and 5.71 respectively while in blood group AB it was reported as 5.61. The DMFT index scores were relatively different among the different ABO blood groups, in which blood group O revealed the highest value and

blood group AB showed the lowest value and the differences were statistically significant where the (p- value is <0.001). Figure 3 and Table 3 depicts the association between blood group and the three categories of DMFT score.

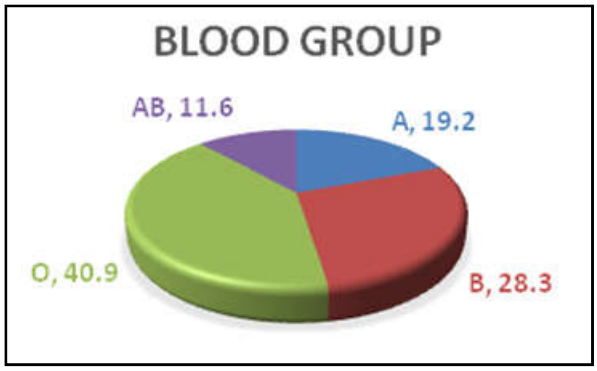

Figure 1. Pie chart for distribution of individuals according to blood groups

More than half of the subjects with blood group O (53.09%; n=43) had high DMFT score >10.

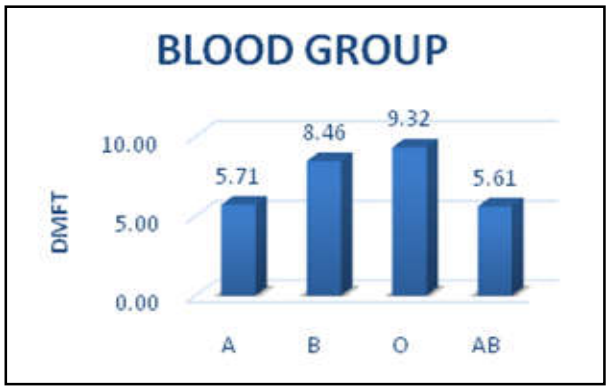

Figure 2. Histogram for DMFT index mean values in different ABO blood groups

Table 2. DMFT index values in different ABO blood groups (Mean ± SD, Median, Range and p- value)

DMFT			
BLOOD GROUP	Mean	Median	Std. Deviation
A	5.71	5.00	3.392
B	8.46	7.00	4.242
O	9.32	11.00	4.975
AB	5.61	6.00	2.808
p Value	<0.001		
Significance	Significant		

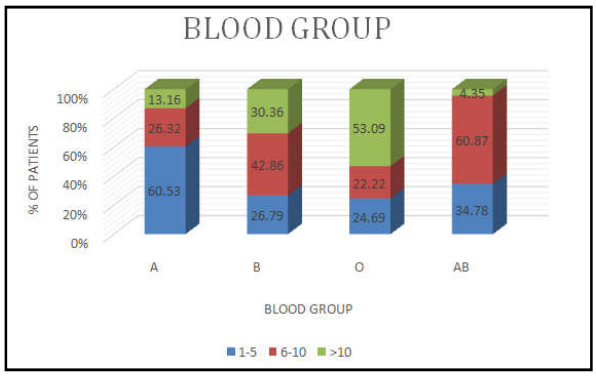

Figure 3. Histogram depicting the association between blood group and three categories of DMFT score

Among the study subjects with blood group B, 42.86% (n=24) had DMFT score 6-10. Majority of the subjects (60.87%; n=14) with AB phenotype had DMFT score 6-10 and one subject had score 8. Subjects with blood group A- had lowest DMFT score for most of participants, with 23 subjects having DMFT score of 1-5. On applying chi square test a statistically significant (p<0.001) result was obtained between the blood groups and the dental caries (DMFT score). The results show that the DMFT score of dental caries may have an association with the ABO blood group of the patients and this finding is statistically significant. Thus, the null hypothesis is found to be false and an alternative hypothesis is postulated that an association exists between ABO blood group and dental caries prevalence.

DISCUSSION

What is already known about this topic?: Several specialized glands such as the sublingual, submandibular and the parotid glandsears are responsible for the secretion of saliva. Since glycoproteins are the constituents of mucins, the submaxillary-sublingual salivary glands profusely produce the ABO blood type antigenswhich are thoroughly distributed in the human saliva (5). Depending on the amount of salivary secretion by the patients, the blood antigens are secreted into the saliva, which have been proposed to be the medium of growth for the bacteria and therefore held indirectly responsible for growth of bacteria which causes dental caries (6).

Main findings of the study: In this study, the population of subjects with O blood group was found to be the highest in number. This is in accordance with most of the studies.Mondal et al (2012) (7) and Agrawal et al (2014) (8) have concluded that the distribution of ABO system of blood groups in different populations of West Bengal and India to be in the order: O>A>B>AB or O>B>A>AB with O being the blood group with the maximum prevalence. Whereas this result disagrees with study done by Paromita et al. (9), where the highest distribution was of B blood group followed by O blood group and Rania et al. (10) which concluded that the distribution of A blood group was the highest and was followed by B, AB and O blood groups (A>B>AB>O). In this study, O blood group was found to have the highest mean score for DMFT index while the lowest mean score was for AB blood group. The difference of mean scores among the different blood groups was statistically significant. The blood group antigens being secreted in the saliva resulted in the aggregation of microorganisms which facilitated their removal from the oral cavity (11). It has been found that the inability of the bacteria to adhere to the surface of the teeth is due to the secretion of ABO (h) antigens into saliva. This is becauselectinspresent on the surface of these bacteria which help in attachment to the body surfacesare ABO (h) specific. (12)

What does this study add?: In this study,individuals have been categorized on the basis of the severity of dental caries. O blood group had highest number of subjects with DMFT score>10whereas A blood group had the highest percentage of subjects with the category of low DMFT score= 1-5. However, in various other studies, a negative correlation is found to existbetween the aggregating ability of the human saliva with that of the colonization of S. mutans (13) and a positive correlationbetween the adhesion-promoting abilityof the human saliva and dental caries. In a study by Ligtenberg et al, it was reported that the average aggregation ability of blood

Table 3. The association between blood group and three categories of DMFT score

		BLOOD GROUP				Total		
		A	B	O	AB		p Value	Significance
DMFT	1-5	23(60.53)	15(26.79)	20(24.69)	8(34.78)	66(33.33)	<0.001	Significant
	6-10	10(26.32)	24(42.86)	18(22.22)	14(60.87)	66(33.33)		
	>10	5(13.16)	17(30.36)	43(53.09)	1(4.35)	66(33.33)		
Total		38(100)	56(100)	81(100)	23(100)	198(100)		

group A and B was much higher than for blood group O, while blood group A reported the lowest incidence of dental caries. But in this study, AB blood group had the lowest mean DMFT score for caries.Inhibition studies conducted with blood group specific sugars and several other sugars confirmed the role of blood group antigens in bacterial aggregation. Salivary inhibition of bacterial aggregation was observed with GalNAc which is specific for blood group A, whereas it was not observed in case of D-galactose which is specific for blood group B and D-fucose which is specific for blood group O. This result is in accordance with the findings of this study that O blood group had higher caries prevalence.

Conclusion

The most prevalent group of blood group was found to be O and least prevalent type was found to be AB. The order of prevalence of ABO blood group was O>B>A>AB. O blood group had the highest mean DMFT score for dental caries and AB had the lowest and the results are statistically significant. The order of blood groupin decreasing order of DMFT scorewas O>B>A>AB. O blood group had the highest percentage of subjects with the category of high DMFT score >10. Whereas A blood group had the highest percentage of subjects with the category of low DMFT score= 1-5.

Limitations: Further studies need to be conducted with higher sample size for the results to be extrapolated to larger population. No determination of "secretor" status was performed. Further studies need to be conducted at the molecular level to confirm the findings of the current study.

Acknowledgement: Panihati Municipality

Conflicts of interest: None

REFERENCES

1. Al Ghamdi AS. Association between ABO blood groups and severity of chronic periodontitis. JKAU Med Sci 2009;16:31-41.
2. Skripal'IG. ABO system of blood groups in people and their resistance to certain infectious diseases (prognosis). Mikrobiol Z 1996;58:102-8
3. Hakomori S. Antigen structure and genetic basis of histo-blood groupsA, B and O: Their changes associated with human cancer. Biochim Biophys Acta 1999; 1473:247-66.
4. Ghamdi A.S.T. (2009 A.D. / 1430 A.H.) Association Between ABO Blood Groups and Severity of Chronic Periodontitis;JKAU: Med. Sci., Vol. 16 No. 3, pp: 31-41
5. Singla S, Verma A, Goyal S, Singla I, Shetty A. Correlation of dental caries and blood group in Western Punjab population in India. Indian J Multidiscip Dent 2015; 5:59-61
6. Arneberg P, Kornstad L, Nordbö H, Gjermo P. Less dental caries among secretors than among non-secretors of blood group substance. Scand J Dent Res 1976; 84:362-6
7. Mondal B, Maiti S, Biswas BK, Ghosh D, Paul S. (2012)Prevalence of hemoglobinopathy, ABO and rhesus blood groups in rural areas of West Bengal, India.;J Res Med Sci. 2012 Aug;17(8):772-6.
8.Agrawal A. ABO and Rh (D) group distribution and gene frequency; the first multicentric study in India;Asian Journal of Transfusion Science ,2014; 8(2): 121-125
9. Mazumdar P, Das UK, Goswami S. Correlation between blood group and dental caries in 20-60 years age group: A study. Int J Adv Res 2014; 2:413-24
10.Kadhum RF, Diab BS. ABO blood type in relation to caries experience and salivary physicochemical characteristic among college students at Al-Diwania governorate in Iraq. J Bagh College Dentistry 2015; 27:1-7.
11. Koregol AC, Raghavendra M, Nainegali S, Kalburgi N, Varma S; ABO blood groups and Rhesus factor: An exploring link to periodontal diseases. IJDR ;2010;21(3): 364-368
12. Haertig A, Krainic K, Vaillant JM, Derober; (Medicolegal identification : teeth and blood groups (author's transl)); Rev StomatolChirMaxillofac. 1980;81(6):361-3
13. Rosan B,Appelbaum B,Golub E,Malamud D, Mandel I D(1982).Enhanced saliva-mediated bacterial aggregation and decreased bacterial adhesion in caries-resistant versus caries-susceptible individuals.Infect Immun38:1056-1059

****