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RESEARCH ARTICLE

Correlation between blood group and dental caries in 20-60 years age group: A study

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Abstract

Background: The correlation between certain systemic diseases and ABO blood group is a well-documented fact. The studies conducted on the association between dental caries and ABO blood group till date are limited. Here is a study conducted to find out whether blood group affects the prevalence of dental caries. **Materials and Methods:-** A total of 100 patients of 20-60 yrs age group attending the outdoor of Conservative Dentistry&Endodontics were randomly selected for the study. Only patients holding a certified copy indicating blood group obtained from a registered pathological laboratory were selected for the study. Dental caries was scored using WHO index and DMFT score was calculated from it. **Results**:- Blood group B was found to be more prevalent among the subjects and B blood group patients had the highest mean DMFT score and AB the lowest among all groups but the results were not stastistically significant.**Conclusion**:- there is no correlation between blood group and dental caries found in the study. Further studies need to be conducted on a larger population to derive any conclusive results on whether the ABO blood group system has any influence on the prevalence of dental caries.

Introduction

The most important blood-typing system, the ABO blood group, is the determinant for transfusion reactions and organ transplantation. Unlike the other blood-typing systems, the ABO blood type system has significance beyond transfusion and transplantation, as, for example, it determines many of the digestive and immunological characteristics of the body. [(1)]The ABO blood type system comprises of four blood types: O, A, B and AB. Blood group O erythrocytes have no true antigen, but blood serum of O-type individuals carries antibodies to both A and B antigens. Type A and B erythrocytes carry the A and B antigens, respectively, and make antibodies to the others. Type AB erythrocytes do not manufacture antibodies to other blood types because they have both A and B antigens.[(1)] Anthropologists have used the ABO blood types as a guide to the development of modern humans. Many diseases, particularly digestive disorders, cancer, and infection, show preferences among the ABO blood types.These preferences are not generally understood or appreciated by physicians or the general population.[(1)]

The other important blood system is the Rhesus (Rh) system. This system is determined by the nature of different proteins present on the surface of erythrocytes. Few studies have investigated the relationship between blood type and dental caries[2].
The antigens of the ABO system are an integral part of the red cell membrane, which is also found in plasma and other body fluids. The presence or absence of certain antigens has been associated with various diseases and anomalies, with antigens also acting as receptors for infectious agents. Immunohistochemical studies have demonstrated the presence of A/B antigens on spinous cells in the non-keratinized oral epithelium of blood group A and B persons, where basal cells express precursor structures and the more-differentiated spinous cells express the A or B antigens. Blood group O persons who do not have the A and B gene-coded glycosyltransferase express a fucosylated variant (Ley) of the precursor structure.[3] On chromosomes 11 and 19, are present the blood type secretor genes. Although an individual's secretor gene is independent of his blood type, it influences the way the blood type is expressed. Everyone caries a blood type antigen on their blood cells, but most people (between 80 and 85%) have blood type antigens that float around freely in their body secretions. These people are called secretors, because they "secrete" their blood type antigens into their body fluids, such as saliva, mucus, and semen. People who do not secrete their blood type antigens in other fluids besides blood are non-secretors[1].
Individuals of blood group A appear to have a lower incidence of caries and cavities compared with those with other blood groups; this difference is particularly marked if the Group A individuals are secretors. The secretion of ABO antigens into saliva probably inhibits the ability of bacteria to attach to the tooth surface; this is because many of these bacteria have surface lectins, which they use to attach to body surfaces and are often ABO specific. Also, non-secretors tend to have lower levels of the immunoglobulin A (IgA) antibodies in their saliva, which may compromise their ability to keep bacterial counts low. [2]
Faser Roberts discussed the relationship between ABO blood group and susceptibility to chronic disease as an example of genetic basis for family predisposition. In India and Western countries, many workers have tried to find out the relationship between ABO blood group and various systemic diseases, and the results showed that some diseases like dental caries, salivary gland tumors, chicken pox, malaria, oral cancer, hematological malignancies, ischemic heart disease, cholera, etc., had significant association. [4]

Rolla et al (1969) reported that the acquired enamel pellicle containing glycoproteins with blood group activity has a high affinity for hydroxyapatite and may thus be selectively absorbed onto tooth surfaces[5]. Since this acquired pellicle is thought by some to be the first stage of plaque formation[6] and the principal etiology of dental caries is dental plaque, there is considerable interest upon whether there is a correlation between dental caries and blood group. There is a dearth of literature on any association between dental caries and blood group.

Therefore the purpose of the present study is to determine whether there is any correlation between dental caries status and blood groups of a random group of patients of 20-60 years age group.
The null hypothesis to be tested is that there is no difference in prevalence of dental caries among different blood groups.

REVIEW OF LITERATURE:-

Aitchison and Carmichael(1962) found out a high percentage of group O and a low percentage of group A in caries immune individuals and the opposite in caries rampant group. [7]

Witkop et al (1963) found no association between DMF scores and ABO and MN system. [8]

However Roark et al(1963) found out a significant association between MN blood group and caries history. [9]

Janghorbani et al(1996) found that in soldiers of a military base in Kerman, the mean value for DMF index was the lowest in B blood group(3.9) and the highest in AB blood group (4.9), however no statistically significant difference was observed(P=0.09). The DMF index was not found to be related to Rh blood factor[10].

Velasco Moncada et al(2005) found no relation between def and blood type groups[11].

Aim and objective:-
The purpose of the present study is to determine whether there is any correlation between dental caries status and blood groups of a random group of patients of 20-60 yrs age group.

Materials and methods:

The present study was conducted in the department of Conservative Dentistry &Endodontics, Guru Nanak Institute of Dental Science & Research; Kolkata-700114. The study protocol was approved by the ethics committee of Guru Nanak Institute of Dental Science & Research, Kolkata. A written informed consent was obtained from the participants.

Study population:- Random patients attending the OPD of the dept. of Conservative Dentistry &Endodontics were selected for the study.

INCLUSION CRITERIA:-
1) Patients of age group 20-60 yrs were selected for the study.
2) Both male and female patients were selected for the study.
3) Patients were selected irrespective of any contributory medical history.
4) Patients holding a certified copy indicating blood group obtained from a registered pathological laboratory were selected for the study.

EXCLUSION CRITERIA:-
1) Patients below 20 yrs and above 60 yrs were not selected for the study.
2) Patients who are unaware of their blood group were not included in the study.
3) Teeth missing due to reasons other than that of caries are not scored.
4)Teeth having restorations due to aesthetic purposes or reasons other than caries like laminates, crowns are not scored.

Patients of age group 20-60 yrs were randomly selected for the study. A history sheet containing duly filled details pertaining to the study was obtained from each patient. The sample size necessary for the study was calculated on the basis of prevalence of dental caries in adults. Results were obtained on the basis of a pilot study conducted on 100 subjects and consulting a statistician.

Intraoral examination was carried out in a dental chair by a mouth mirror, a standard WHO probe and adequate illumination (as described in Oral Health Survey; Basic Methods; WHO 1997) and caries status of each patient was assigned using the WHO index (Oral Health Survey; Basic Methods; WHO 1997) for the dentition status and treatment need. The treatment need score was not assigned. For each patient, dentition status score was assigned for each tooth (Oral Health Survey; Basic Methods; WHO 1997) and the DMFT score was calculated from it for each patient. The blood group was determined from the details filled out in the history sheet.
The examination was carried out by two observers separately in the same day to avoid the chances of bias.

RESULTS:-

Statistical Analysis:
Statistical Analysis was performed with the help of Epi Info (TM) 3.5.3. EPI INFO is a trademark of the Centers for Disease Control and Prevention (CDC).
Descriptive statistical analysis was performed to calculate the means with corresponding standard deviations (s.d.). Also One Way Analysis of variance (ANOVA) followed by Tukey's Test was performed with the help of Critical Difference (CD) or Least Significant Difference (LSD) at 5% and 1% level of significance to compare the mean values. $p \leq 0.05$ was taken to be statistically significant.

Table-1: Mean± s.d., median and range of dental caries score (DMFT score) of different blood groups

Group	Mean ± s.d.	Median	Range (Minimum – Maximum)
A (n=24)	5.08±3.98	4.5	0 – 12
B (n=35)	6.80±5.21	8.0	0 – 20
AB (n=10)	4.40±3.65	3.5	0 - 10
O (n=27)	4.85±5.23	3.0	0 - 16

Table- 2: ANOVA table for between groups

Source	D. F.	Sums of squares	Mean sum of squares	'F'	'p'
Between Groups	3	86.24	28.74	1.24	>0.05
Residual	92	2123.24	23.07	-	
Total	95	2209.48	-	-	

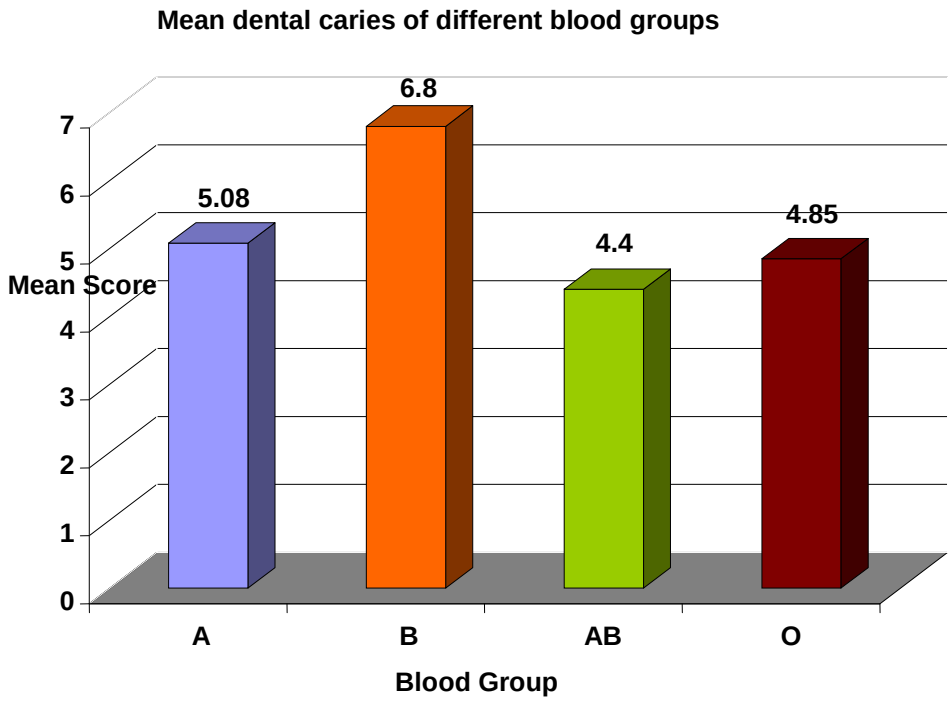
D.F. – Degrees of Freedom

F – F-Statistic
* - Statistically Significant
ANOVA showed that there was no significant difference in scores of dental caries of different blood groups ($F_{3,92} = 1.24; p>0.05$).

Table-3: Critical Difference (CD)

CD	Value
At 5% level of significance (CD_5)	2.23
At 1% level of significance (CD_1)	3.84

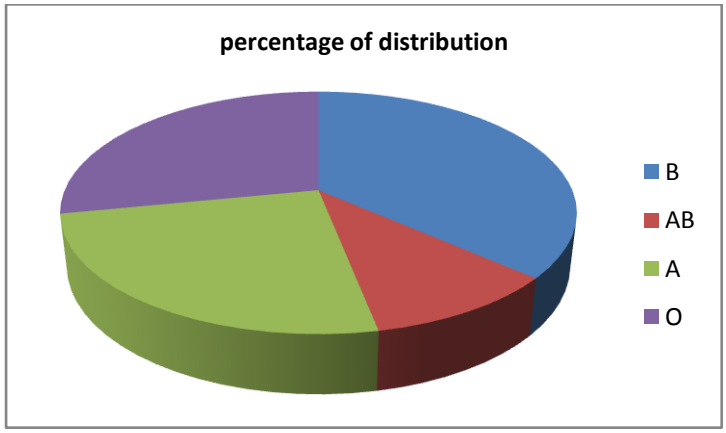
Though the mean score of dental caries for the patients with blood group B was higher than the other blood groups, as per CD there was no significant difference in the mean score of dental caries of different blood groups ($p>0.05$).



Thus it may be concluded that the score of dental caries does not depend on the blood group of the patients.
Since there was no paired observation of dental caries for the patients with different blood groups, Pearson Correlation Co-efficient could not be calculated and the results were compared through ANOVA.

Null Hypothesis: Is there any difference of dental caries for the patients with different blood groups against the alternative hypothesis that there is difference in score of dental caries.

Here the null hypothesis is found true.



(B-36.5%; AB-10.4%;A-25%;O-28.1%)

Discussion:-

Although several studies have been carried out to investigate the relation between ABO blood group and incidence of disease in medicine, limited research has been made to investigate the relation between ABO blood groups and incidence of oral diseases. Few researchers claimed that there was a relation where as

some others could not find any, which was attributed, to geographical diversity in the population[12]. With advances in research it was understood that apart from the common etiological agents and environmental factors, certain unknown factors did play a role in the development of dental caries. Thus the focus of determining the disease susceptibility changed to genetics. However, the studies investigating the relation between ABO blood grouping and dental caries is limited.

ABO blood group and Rh system distributions show marked variation around the world. Some variations have even been reported in different areas within the same country[12].

Mondal et al(2012), Agrawal et al(2014) and various other researchers have found the distribution of ABO system blood groups in various populations of West Bengal and India to occur as O>A>B>AB or O>B>A>AB with O being the most prevalent blood group[13], [14]. In our study the distribution of B blood group was the highest followed by O . This is in contrary to most of the studies but in accordance with the fact that B blood group was most prevalent among Asians-27%.[15]Again since the study population was limited such results should not be extrapolated to the whole of the population and warrant further studies.

Many authors have documented the possibility of association of genetic polymorphisms of the ABO blood group to various infectious diseases, specially of the foregut.[16], [17]

In our study B blood group was found to have the highest mean score for DMFT index although the difference of mean scores among the different blood groups was not statistically significant.

The association of blood group and dental caries can be better explained by the fact that the blood group substances secreted in saliva can result in aggregation of microorganisms and their removal from the oral cavity. It appears that the secretion of our ABO(h) antigens into saliva probably inhibits the ability of bacteria to attach to the tooth surface,(3) since many of these bacteria possess lectins on their surface which they use to attach to body surfaces, and many of these lectins are ABO(h) specific[18]. It has been suggested that high-molecular-weight parotid saliva agglutinins, and similar proteins found in submandibular-sublingual saliva, are the most important salivary proteins in promoting the adhesion of Streptococcus mutans[19], [20], [21].On the other hand, when these same proteins exist in the liquid phase, they may promote bacterial aggregation and, hence, the clearance of bacteria from the oral cavity. The two most abundant agglutinins in saliva are high-molecular-weight agglutinin from parotid saliva and mucins. Of the mucins, the low-molecular-weight form, MG2, is more efficient in bacterial aggregation and clearance than the high-molecular-weight form, MG1. MG1 bears ABH and Lewis blood group antigens for microbial adherence. Indeed, MG1 predominates in the saliva of caries-susceptible subjects, while the level of MG2 appears to be consistently higher in the saliva of caries-resistant individuals. Several studies, however, have reported an inverse relationship between the aggregating activity of saliva and colonization of S.mutans[22], [23], [24], and also a positive correlation between the adhesion-promoting activity of saliva and dental caries[25].

In a study by Ligtenberg et al, it was found that the average aggregation activity of blood group B was much lower than for blood group A or O. The role of blood group antigens in bacterial aggregation was confirmed by inhibition studies with blood group specific sugars and various other sugars. GalNAc, specific for blood group A, inhibited bacterial aggregation by saliva whereas D-galactose, specific for blood group B, and D-fucose, specific for blood group O, did not[26]. This result is in accordance with the findings of our study that B blood group had higher caries prevalence. The group with the lowest incidence of dental caries is blood group A[27]. But in our study AB blood group had the lowest mean DMFT score for caries. Since the AB study population was limited, such results need to be confirmed with further studies on a larger scale of population. Rh-ve blood groups were not included in the statistical analysis since they were very limited in number and hence the Rh system was not taken into consideration. Moreover previous studies on blood group and caries incidence were conducted on any specific population or ethnic group and so the results may differ due to geographical and ethnic diversity.

Conclusion:- the findings obtained from the study are:-

1) B blood group had the highest mean DMFT score for dental caries and AB had the lowest but the results are not statistically significant.
2) No correlation of blood group with dental caries prevalence can be obtained.

The limitations of the study are:- small study population and no determination of "secretor" status. Further studies need to be conducted on a larger population to derive any conclusive results.

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