Dental Caries and Salivary Immunoglobulin A in Relation to ABO Blood Type and Rh Factor among Dental Students Aged 20-21 Years Old

Juman Dhia Alkhayoun[1], Muna Abdullah Saleem[2*], Wasan Lafta Abdulla[3]

[1]Department of Preventive and Pedodontics, College of Dentistry, University of Baghdad, Iraq

[2]Department of Basic Science, College of Dentistry, University of Baghdad, Iraq

ABSTRACT

Background: (ABO) Blood type has an effect on general health including oral health. Dental caries are the common infectious disease of the mouth. Saliva plays significant roles in oral cavity; for example, salivary immunoglobulin's play important role in immunity of the body and the mouth. Various studies conducted on the different effects of IgA on oral cavity, especially dental caries, and found controversial results. The aim of the current study is to assess of the prevalence of caries experience among different blood type in relation to salivary IgA.

Materials and Methods: Two hundred and nine students in college of dentistry, Baghdad University aged 20 years old were selected; they were divided to four groups regarding to their blood type, Dental experience was diagnosed and recorded according to DMFs Index, this allows recording decayed lesion by severity. Saliva sample pooled for analysis.

Results: In the current study the blood type O was more common followed by A and B, whereas the less common was AB type, also the present study found only few students with AB-. Caries experiences (DMFs) found to be statistically significant among different blood types, since DMFs was higher among type AB and lowest among A blood type. Level of salivary IgA was high among blood type O and low among blood type AB. Also its level among blood group with Rh- higher than that with Rh+. Finally, this study found that there is inverse relation between dental caries and salivary IgA.

Conclusion: ABO blood type and Rh have an effect on prevalence of caries and level of IgA in saliva.

Key words: ABO blood group, Rh factor, Dental caries, Salivary IgA

INTRODUCTION

Dental caries is a multifactorial disease and one of the main causing factors is saliva. Salivary components of saliva, its viscosity, flow rate, buffering capacity, etc., play a main role in the prevention, initiation, and progression of the caries. It helps in the prevention of the progress of dental caries by its antibacterial effect [1]. Dental caries stay the most prevalence trouble in dentistry. Dental plaque, oral hygiene, dietary factors are contributed to be important etiological factors, therefore many of the studies have an emphasis on these factors only, but also one of the major factor is the genetic factor which is inherited from the birth, for example, blood groups. Every person has his or her own blood group like with caries index [2,3].

ABO blood type is the most widely used system to detect important factors like transfusion of blood and tissue histocompatibility for organ transplants and tissue grafting. It also important for detects the antibodies and antigens present in the body [4]. In this system, there is four groups of blood A, B, AB & O [4]. O group called universal donor because has no antigen but have both A and B antibodies. Whereas AB group has no antibodies but has both A & B antigen, therefore it called a universal recipient. There is another important type of blood grouping is Rhesus factor (Rh). This system is depended on the presence of several proteins found on the surface of the red blood cells [5]. Antigens A and B are found on the cell membrane of the erythrocytes. While

the antibodies are found in plasma. The decayed, missing, and filled teeth (DMFT) index has been used in epidemiological surveys of oral health. It is widely used by the World Health Organization (WHO) for comparing and measuring the dental caries in individuals. The index expresses the mean number of DMFT in individual whose DMFT index is taken [6].

Secretory IgA is the main components in saliva. It is the first line of defense mechanism of the host against pathogens, which invade the surfaces of mucosa. Salivary IgA (s-IgA) antibodies could help immunity of oral cavity by preventing the adherence of microbe, neutralization of viruses, enzymes and toxins; or by acting in synergy with other factors such as lactoferrin and lysozyme. As a vital fluid of mouth, the saliva plays an important and benefit role in balancing the mouth and its components may affect personal health status. Salivary IgA can had an important role with salivary lysozyme and fight microbes of oral cavity [7]. The present study aimed to found the probable relationship between the level of salivary IgA and the number of decayed teeth. The current study done to search for which blood type has the highest probability for dental carries.

MATERIALS AND METHODS

The human sample

In this study 209 students of third grade in Dentistry College, university of Baghdad and participated in present study for blood type identification and oral health examination; then subgroups were taken for further salivary analysis include 80 students 20 students for each blood type. Informed consent obtained from each student enrolled in present study before any data collection and examination of the oral health status.

Determination of ABO blood type and Rh factor

The blood typing carried out based on agglutination. Agglutination mean the collection of separate particles like RBCs into masses, agglutination occurs if an antigen mixed with its corresponding antibody, which called isoagglutinin. Agglutination appears when A antigen is mixed with anti A or B antigen is mixed with anti B. The blood typing done by the slide method [8].

Oral examination

Oral examination done under standardized conditions according to the basic methods of oral health surveys of world health organization [9]. Oral health assessment carried out in a suitable chair using portable lamp for artificial illumination.

Dentition status

An examiner was trained and informed with WHO instructions on oral examination, the examination was done while the students sitting on the dental chair, Plain mouth-dental mirrors (No. 4). Sickle-shaped dental explorers were used. Examination included all surfaces of teeth. Atooth was considered to be present when any part of the tooth was visible [10].

Collection of Saliva Samples

The stimulated whole saliva was taken under standard conditions, following the instructions cited by Tenovuo, et al. [11]. The collection of saliva was done between 9 and 11 am after 2 hours with student being prevented of drinking, eating or brushing. Each student was asked to chewing apiece of Arabic gum for one minute, and then removed all saliva by expectoration; after that chewing was persist for five minutes with the same piece of gum and saliva collected in a sterile screw capped bottle. For 10 minutes, the saliva was centrifuged at 3000 r.p.m then the supernatants was separated by micropipette and then stored at (-20°C) in a deep freeze until the time of measurement of IgA. Measurement of IgA done by Enzyme Linked Immunosorbent Assay method.

RESULTS

Table 1 shows that the O blood type was more common (33.5%), followed by A type (27.8) and B type (23.9) whereas the less common was AB (14.8).

The distribution of caries free students according to blood type are shown in Table 2.

The percentage of caries among students with blood type A was the highest (20.68), than students with other blood types, while students with blood type AB had the lower percentage (6.45).

Table 3 show the percentage of --Rh among students with blood type O was highest (24.28)

than student with other blood types, while students with blood type AB had the lowest percentage (16.12).

The current study show that the level of IgA among blood groups was significant differ, since highest level was found among blood group O (221.213), while the level of IgA among blood group AB was lowest (108.873) as in Table 4.

Also the results of this study revealed that the level of IgA among students with blood types have O+,AB+,A+ and B+ was lower than that in students with blood types O-,AB-,A- and B- as demonstrated in Table 5.

Dental caries represented by DMFs and its components among students with different blood type revealed in Table 6. Results found

that DMFs was statistically significant difference among blood groups, further analysis show that distribution of the decay, missing and filling teeth was high among students with blood type AB, whereas was low among students with blood type A as in Table 6

In addition to that, this study revealed the DMFs between students with blood group has Rh++ and students with Rh—was significant differ. Since the mean of DMFs in students with Rh++ (14.87) was higher than that in students with Rh – (1.58). As revealed in Table 7.

Furthermore the result of the present study show that there is inverse relation between IgA and DMFs in blood groups (A, B, AB and O) was highly significant, p value (0.01, 0.02, 0.02, 0.02) respectively. As demonstrated in Table 8.

Table 1: Frequency distribution of ABO blood types among students.

Blood type	No.	%
O	70	33.5
A	58	27.8
B	50	23.9
AB	31	14.8

Table 2: Distribution of caries free students according to blood type.

Caries free students	Blood type			
	O	A	B	AB
No.	9	12	8	2
%	12.85	20.68	16	6.45
209	70	58	50	31

Table 3: Distribution of --Rh factor according to blood types among students.

Rh factor	Blood type			
	O	A	B	AB
No.	17	13	10	5
%	24.28	22.41	20	16.12
209	70	58	50	31

Table 4: Anova: Distribution statistic test of IgA among blood groups.

	IgA					
Blood Group	Mean	SE	Minimum	Maximum	F	P
0	221.21	20	74.3	429.9		
AB	108.87	10	42.4	336.7	8.336	0.02 [S]
A	212.27	19	42.4	429.9		
B	193.33	20	42.4	429.9		

Table 5: Descriptive and statistical test of IgA between Rh groups by blood groups (IGA).

	RH						T	p
Blood Group	plus++			minus--				
	N	Mean	SE	N	Mean	SE		
0	17	155.618	15.29	13	306.992	25.947	5.026	0
AB	27	96.693	6.414	3	218.5	59.101	2.049	0.174
A	18	138.378	12.516	12	323.108	14.647	9.588	0
B	20	130.965	10.808	10	318.049	28.761	6.089	0

Table 6: Descriptive and statistical test of caries experience of surfaces among blood groups.

	Blood Group	N	Mean	SE	Minimum	Maximum	F	p
	0	70	2.71	0.261	0	8		
D	AB	31	3.68	0.546	0	12	3.548	0
	A	58	1.95	0.284	0	8		
	B	50	2.62	0.356	0	9		
	0	70	0.84	0.285	0	10		
M	AB	31	2.87	0.919	0	20	5.334	0
	A	58	0.43	0.223	0	10		
	B	50	1	0.35	0	10		
	0	70	8.63	0.707	0	20		
F	AB	31	13.16	1.033	0	20	9.98	0
	A	57	6.47	0.764	0	20		
	B	50	7.44	0.727	0	15		
	0	70	12.37	0.998	0	32		
DMFS	AB	31	19.84	1.731	0	40	12.958	0
	A	58	8.66	0.957	0	30		
	B	50	11.08	1.123	0	33		

Table 7: Descriptive and statistical test of caries experience by surfaces in permanent teeth between Rh groups.

	RH							
	plus++			minus--			T	P
	N	Mean	SE	N	Mean	SE		
D	166	3.13	0.188	43	0.67	0.204	8.838	0
M	166	1.34	0.25	43	0	0	5.38	0
F	166	10.33	0.4	42	0.93	0.329	18.133	0
DMFS	166	14.87	0.604	43	1.58	0.409	18.224	0

Table 8: Correlation between caries experience by surface in permanent teeth and salivary IgA by blood group.

Blood Group		IgA	
		R	P
O	D	-0.758	0
	F	-0.855	0
	M	-0.314	0.091
	DMFS	-0.914	0.02
AB	D	-0.326	0.079
	F	-0.777	0
	M	-0.527	0.003
	DMFS	-0.868	0.02
A	D	-0.65	0
	F	-0.883	0
	M	-0.429	0.018
	DMFS	-0.903	0.01
B	D	-0.633	0
	F	-0.843	0
	M	-0.469	0.009
	DMFS	-0.829	0.02

DISCUSSION

ABO blood types are the most investigated system of erythrocyte antigen, and they have been used as genetic markers in studies of their associations with various diseases because ease of identifying their phenotypes [12]. In this study the distribution of blood groups O>A>B>AB and this finding coincide with study conducted by Mondal et al., since they found the blood group O more prevalence and blood group AB less prevalence [13]. Whereas this result disagree with study done by Paromita et al., since they found that the distribution of B blood group was the highest followed by O [14] and differ with study done by Rania et al. since they found that the distribution of A blood group was high followed by B, AB and less distribution was O (A>B>AB>O) [14]. This differences in result attributed to that the distributions of ABO blood

group show marked variation around the world. Some these variations have even been reported in different areas within the same country [15]. Further analysis of the present study show only few students were in AB—blood group and this finding coincide with result obtained by Kaluram et al., since they found from 315 subject only 2 with AB- [16]. In current study AB blood group was found to have the highest mean score for DMFs index and the difference of mean scores among the different blood groups was not statistically significant. This finding agree with study conducted by Govindaraju et al. [17], they attributed the cause for this blood group have no antibodies against bacteria and disagree with study done by Mangal, et al. they found AB blood group had the lowest mean DMFs score for dental caries. As due to certain blood groups which have the ability to secrete their antibodies into the saliva and hence they can prevent dental carries [18]. Further analysis the data of current study revealed that the students with type A had significantly lower DMFs value than students with other blood type and this in disagreement with previous study that found DMF index was the lowest in B blood type and the highest in AB blood type, however no statistically significant difference was found [19]. While agree with earlier study, that found the individual of blood group A had the lowest numbers of cavities [20]. This difference may be attributed to variation in the methods of measuring dental caries and variation in sample size and in addition to that geographical, racial and ethnic condition, which effected on distribution of blood type. The results of the present study found that there is inverse relation between DMFs and salivary IgA, according to the analysis of the current study results, increasing the number of decayed teeth significantly decreased the amount of salivary IgA, which was contrast with the results of the studies by Fidalgo et al. [21], Ranadheer et al. [7], Gornowicz et al. [22], Bagherian et al. [23] and Yang et a. [24]. These studies indicated the higher levels of salivary IgA in the cases with dental caries, compared with caries free ones. Consistent to the results of the current study, Koga-ito et al. [25] and Kuriakose et al. [26] indicated in their studies that the amount of salivary IgA reduced following the increase in the number of decayed teeth and according to their

conclusion, this reduction could be as a result of body defence mechanism. But it seems that the difference between the results of the current study and the aforementioned ones based on differences in IgA measurement method, the age, sample size, and race. In addition, the study by Shifa et al. [1] also found no significant relationship between the amount of salivary IgA and number of decayed teeth: The significant difference between the results of this study and the current one may take from the fact that Shifa et al. [1] only examined the children aged 3 to 6 years with primary dentition.

CONCLUSION

Therefore, this study suggests that ABO blood type and Rh have an effect on prevalence of caries and level of IgA in saliva.

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