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Interaction of dental anxiety and ABO secretor status of blood group on dental caries in a group of children

Interação da ansiedade odontológica e o status secretor do grupo sanguíneo ABO na carie dental em um grupo de crianças

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ABSTRACT

Objective: To evaluate the interaction of the dental anxiety precedents at the first dental examination and the AB secretor status of blood groups (A, B, AB, and O) on dental caries experience and severity in a group of school children. **Material and Methods:** This is a cross-sectional study included 81 healthy children aged 6-8 years from primary schools in Baghdad; with negative previous dental visit. Dental anxiety represented by physiological measures was measured by pulse oximeter. Dental caries experience and severity was recorded. Unstimulated salivary samples were taken from the children to determine the salivary secretor status for AB blood type. **Results:** The anxiety was decreased as age increases; boys were more anxious than girls; and more anxious children were found in non-secretor group; Dental caries was higher in non-secretor anxious children all with non-significant difference. **Conclusion:** There is little evidence that the AB secretor status and anxiety to have influence on dental caries experience and severity, as there are many factors may interact to propagate the caries experience and severity.

KEYWORDS

Dental anxiety; Dental caries; Children.

RESUMO

Objetivo: Avaliar a interação dos precedentes da ansiedade odontológica no primeiro atendimento e o status secretor do grupo sanguíneo ABO (A, B, AB, and O) na experiência e severidade de carie dental em um grupo de crianças em fase escolar. **Material e Métodos**: Este estudo cruzado incluiu 81 crianças saudáveis, com 6-8 anos de idade de escola primária em Baghdad; sem atendimento odontológico prévio. A ansiedade odontológica representada por medidas fisiológicas foi avaliada pelo oxímetro de pulso. A experiência à cárie bem como a severidade foram registradas. Amostras de saliva não estimulada foram coletadas das crianças para se determinar o status secretor salivar para tipo sanguíneo AB. **Resultados**: A ansiedade diminuiu conforme a idade aumentava; meninos foram mais ansiosos do que as meninas; e crianças mais ansiosas foram encontradas no grupo não secretor. A cárie dental foi maior no grupo não secretor de crianças ansiosas sem diferença significante. **Conclusão**: Há uma pequena evidência de que o status secretor AB e ansiedade tem influência na experiência e na severidade da cárie dental, assim como há vários fatores que podem interagir para propagar a experiência de cárie e sua severidade.

PALAVRAS-CHAVE

Ansiedade odontológica; Cárie dental; Crianças.

INTRODUCTION

Anxiety is a physiological reaction that is accompanied with higher activity of sympathetic branch of autonomic nervous system [1]. A review study [2] reported that one out of 10 children have some level of dental fear and anxiety, who procrastinate seeking dental treatment. Anxiety can be measured by several methods; one of the reliable indicators for the anxiety is the heart rate as reported by several authors [3-5]. Furthermore, some scientists recommend the use of pulse oximeter (which measures the changes in the heart rate and oxygen saturation) to measure dental anxiety for children [3,4].

The secretion of AB antigen in saliva has been considered by some authors as an anti-caries agent [6,7], and patients who are secretors had less dental caries than non-secretors [8]; however, this suggestion is still a matter of controversy, as it disagrees with other findings that carry a proposition of non-significant relation of dental caries with the secretor status [9,10].

The link between dental caries and anxiety was reported by many researchers who proposed a positive relationship between them in adults [11, 12] and in children [13-16], both in primary and secondary dentitions, with a detrimental effect on the oral hygiene in general. This relationship is reciprocal; i.e. dental anxiety may lead to dental caries, or patients with dental caries may have more dental anxiety, as reported by these studies. Conversely, some scientists did not find a significant relationship between anxiety and dental caries experience and severity [17-19].

There are no previous reports on the literature that relate dental anxiety with the salivary AB secretor status, although some studies found an association between ABO blood group and pre-operative anxiety, as AB blood group had the highest level of pre-operative anxiety [20]. On the same field, another researcher found that blood group A had significantly higher depression and trait anxiety than blood group O [21]. On the contrary, another study showed no association between ABO blood group with obsessive compulsive neurosis (primordial personality trait) [22].

So, the purpose of the present study was to fill the gap in the literature to evaluate the interaction of the dental anxiety precedes the first dental examination and the AB secretor status on dental caries experience and severity of a group of school children. The null hypothesis stated that there is no interaction between the dental anxiety and AB secretor status on dental caries in children.

MATERIALS AND METHOD

This is a cross-sectional study with the sample size was calculated by using G power 3.1.9.7 (Program written by Franz-Faul, Universitatit Kiel, Germany) with power of study=80%, alpha error of probability=0.05, and partial eta square was 0.14 (large effect size). Thus the effect size of F was 0.403 (Large effect size), according to ABO blood groups with dental caries) [8] and dental anxiety with dental caries [13], with all these conditions, the definitely sample size was 79. Accordingly, the subjects of this study were 81 children aged 6-8 years who were selected randomly from primary schools in Baghdad; all of them were healthy with negative previous dental visit. Approval was obtained for the research protocol from scientific and ethical committees in the College of Dentistry / University of Baghdad, numbered 222320. Oral examination was performed according to the criteria of WHO [23]. Dental anxiety represented by physiological measures (heart rate (HR) and oxygen saturation (SpO2)) was measured by pulse oximeter (WRINERY, Hunan Accurate Bio-Medical Technology Co., Ltd.). Dental caries severity was recorded according to the criteria of Manjie et al., 1989 [24] as follows:

Grade 1

Smooth surface: white/opaque or brownish lesion in enamel only, including slight loss of the surfaces, appears smooth, hard, and glossy; the lesion is most often separated from the gingival margin.

Occlusal surfaces: dark fissures or pits which are hard on probing; the lesion appears to be confined to the enamel where there is extrinsic discoloration only, then recorded as sound.

Approximal surfaces: clinically visible, whitish/ brown lesion where no obvious cavity can be probed; where a proximal surface are not in contact with the neighboring tooth, then the same criteria as for smooth surfaces are applied.

Grade 2

Smooth surfaces: enamel lesion (white/ opaque or brownish/ dark in color) including

slight loss of surface, but without suspected dentinal involvement; the surface is rough or softened and dull.

Occlusal surfaces: fissures and pits with distinct sticking on probing indicative of ongoing caries activity without evidence of dentinal involvement.

A proximal surfaces: recording of dark enamel lesion catching on probing, but no evidence of dentinal involvement.

Grade 3

Coronal caries: involving the dentin, but pulpal involvement is not suspected.

Grade 4

Coronal caries: with possible or definite pulpal involvement.

Unstimulated saliva samples were taken from the children according to Fejerskov and Thylstrup, 1994 [25]; then, they were taken for laboratory analysis to determine the salivary secretor status for AB blood type by Wiener agglutination inhibition test. It depends on the utilization of the principle of agglutination inhibition; as the presence of agglutination incomes a negative test, while if there is no agglutination then a positive result was recorded [26]. SPSS was used in order to analyze the estimated data; frequencies, percentages, means, standard deviations, z-test, and factorial Analysis of Variance ANOVA were used. P value was set at a level of significance when $P<0.05$.

RESULTS

The demography of the total sample according to the age, gender, and ABO secretor status by anxiety is illustrated in Table 1. The anxiety was decreased as age increases, boys were more anxious than girls, and more anxious children were found in non-secretor group, all with non-significant z-test at 0.05 level of significance.

Dental caries experience in primary teeth was higher in non-secretor children than secretor children, and also higher in anxious than non-anxious children, although with non-significant difference. Caries experience in permanent teeth was higher in the B secretor group than others and the non-anxious children than anxious children, although with non-significant difference (Table 2).

Regarding caries severity in primary teeth, the highest mean with d3 category was found for anxious, non-secretor children, with non-significant difference among different groups of anxiety and secretor status (Table 3). The less severe grades of dental caries (d1 and d2) were found more in B secretor groups, while the more advanced caries lesion (d3 and d4) were found more in non-secretor groups with non-significant difference among different groups of anxiety and secretor status.

For the permanent teeth, the highest mean with D2 category was found for non-anxious, A secretor children, with non-significant difference among different groups of anxiety and secretor status (Table 4). The least severe grade D1 was seen in non-secretor group, while D2 and D3 grades were seen more in secretor, non-anxious groups with non-significant differences.

DISCUSSION

AB antigens are oligosacchrides that can be attached to lipids of cell membrane of some

Table 1 - Distribution of subjects by demographic data according to anxiety

Variables	Category	Anxious		Non-anxious		Total	%
		N.	%	N	%		
Age (years)	6	22	27.2	12	14.8	34	42.0
	7	16	19.8	10	12.3	26	32.1
	8	8	9.9	13	16.0	21	25.9
Gender	Boys	27	33.3	16	19.7	43	53.0
	Girls	19	23.5	19	23.5	38	47.0
ABO	O	24	29.6	17	21.0	41	50.6
	A	12	14.8	10	12.3	22	27.1
	B	10	12.3	8	9.9	18	22.2
Total		46	56.8	35	43.2	81	100

Table 2 - Descriptive and statistical test of caries experience of primary and permanent teeth among blood groups by anxiety using factorial Analysis of Variance

Caries experience	Anxiety	ABO						Total		F	P value
		O		A		B					
		Mean	SE	Mean	SE	Mean	SE	Mean	SE		
ds	Anxious	14.667	2.034	12.583	2.876	10.100	3.150	13.130	1.504	0.650	0.525
	Non- anxious	12.529	2.416	11.600	3.150	14.375	3.522	12.686	1.573		
	Total	13.780	1.7629	12.136	1.3569	12.000	2.3066	12.938	1.085		
dmfs	Anxious	14.667	2.034	12.583	2.876	10.100	3.150	13.130	1.504	0.650	0.525
	Non- anxious	12.529	2.416	11.600	3.150	14.375	3.522	12.686	1.573		
	Total	13.780	1.7629	12.136	1.3569	12.000	2.3066	12.938	1.085		
dmft	Anxious	7.000	0.762	6.667	1.077	5.700	1.180	6.630	0.568	0.449	0.640
	Non- anxious	2.000	5.412	0.905	5.600	1.180	6.125	5.629	0.573		
	Total	6.341	0.6321	6.182	0.5249	5.889	0.9798	6.198	0.408		
DS	Anxious	0.571	0.309	0.250	0.501	0.625	0.501	0.514	0.211	0.882	0.419
	Non- anxious	0.467	0.366	1.222	0.473	1.167	0.579	0.833	0.280		
	Total	0.528	0.1889	0.765	0.3789	0.857	0.4901	0.657	0.171		
DMFS	Anxious	0.571	0.306	0.222	0.467	0.625	0.4960	0.500	0.206	0.930	0.400
	Non- anxious	0.467	0.362	10.222	0.467	1.000	0.530	0.806	0.272		
	Total	0.528	0.1889	0.722	0.3598	0.800	0.4598	0.638	0.166		
DMFT	Anxious	0.476	0.233	0.222	0.356	0.500	0.377	0.421	0.167	0.950	0.392
	Non- anxious	0.400	0.276	1.000	0.356	0.714	0.404	0.645	0.194		
	Total	0.444	0.1514	0.611	0.2698	0.600	0.3352	0.522	0.127		

ds=decayed surfaces of primary teeth; dmfs= decayed, missed and/or filled surfaces of primary teeth; dmft= decayed, missed and/or filled primary teeth ; DS= decayed surfaces of permanent teeth; DMFS= decayed, missed and/or filled surfaces of permanent teeth; DMFT= decayed, missed and/or filled permanent teeth.

Table 3 - Descriptive and statistical test of caries severity of primary teeth among blood groups by Anxiety using factorial ANOVA

Caries severity	Anxiety	ABO						Total		F	P value
		O		A		B					
		Mean	SE	Mean	SE	Mean	SE	Mean	SE		
d1	Anxious	0.708	0.266	0.500	0.376	0.800	0.412	0.674	0.204	0.426	0.655
	Non-anxious	0.647	0.316	1.000	0.412	.625	0.461	0.743	.189		
	Total	0.683	0.165	0.727	0.273	0.722	0.403	0.704	0.141		
d2	Anxious	1.625	0.420	2.250	0.594	2.900	0.651	2.065	.334	0.757	0.473
	Non-anxious	1.294	0.499	1.500	0.651	1.125	0.728	1.314	.289		
	Total	1.488	.348	1.909	0.354	2.111	0.511	1.741	0.230		
d3	Anxious	11.875	1.819	10.167	2.573	7.200	2.818	10.413	1.342	0.915	0.405
	Non-anxious	8.765	2.161	7.600	2.818	10.750	3.151	8.886	1.428		
	Total	10.585	1.578	9.000	1.151	8.778	2.178	9.753	0.978		
d4	Anxious	1.583	0.627	0.167	0.887	0.000	0.972	0.870	.375	0.659	0.520
	Non-anxious	2.412	0.745	2.500	0.972	2.500	1.086	2.457	.610		
	Total	1.927	0.523	1.227	0.651	1.111	0.646	1.556	0.348		

cells, or as soluble antigens in saliva and other body fluids [27]. It had been reported that there are more carbohydrates in salivary glycoproteins of secretors than non-secretors [28]. Salivary macromolecules especially the blood groups antigens play as essential receptor sites in these defense mechanisms [29, 30].

Dental anxiety was measured in this study by the physiological measurements (HR and SpO2), as these are important vital signs for proper patient's monitoring during the dental treatment [31]. When anxiety increases, there is an increase in the HR and hyperventilation [32]. Previous reports on the normal values of HR

Table 4 - Descriptive and statistical test of caries severity of permanent teeth among blood groups by Anxiety using factorial ANOVA

Caries severity	Anxiety	ABO						Total		F	P value
		O		A		B					
		Mean	±SE	Mean	±SE	Mean	±SE	Mean	±SE		
D1	Anxious	0.429	0.201	0.000	0.307	0.125	0.326	0.263	0.123	0.100	0.905
	Non-anxious	0.867	0.238	0.667	0.307	0.571	0.348	0.742	0.191		
	Total	0.611	0.170	0.333	0.229	0.333	0.159	0.478	0.112		
D2	Anxious	0.429	0.264	0.111	0.403	0.625	0.427	0.395	0.175	0.984	0.379
	Non-anxious	0.333	0.312	1.000	0.403	0.857	0.457	0.645	0.239		
	Total	0.389	0.140	0.556	0.305	0.733	0.452	0.507	0.144		
D3	Anxious	0.143	0.077	0.111	0.118	0.000	0.125	0.105	0.063	1.231	0.299
	Non-anxious	0.000	0.091	0.222	0.118	0.143	0.134	0.097	0.054		
	Total	0.083	0.061	0.167	0.090	0.067	0.067	0.101	0.042		
D4	Anxious	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	NA	NA
	Non-anxious	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		
	Total	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		

and SpO_2 in children according to different ages were taken to determine the anxious from non-anxious children [33] and, in order to justify the category, it was stipulated for the child to have an increase of both HR and SpO_2 in order to be recorded as anxious. In spite of the fact that there was no dental intervention except for the dental examination in the present study, there was 56.79% of children with dental anxiety, which disagrees with previous studies that didn't find any change in the physiological measurements during examination [34, 35]. This may be due to national variations, or because the children did not see the dentist previously and were not familiar with the dental environment, as previous dental visits may act as a protective factor against anxiety [19]. This may give a clue that the dental anxiety may originate without any previous dental visits or even simple intervention, instead; it can be caused by collective attitudes and thoughts.

Additionally, anxiety decreased as the age increased, what is in agreement with previous studies [19, 36, 37], and this is a logical consequence as with increasing age of the child, there will be increase in perceptive ability, better acceptance of their environment and improved awareness of fearsome circumstances [38]. Furthermore, one can notice in this study surprisingly, that the boys were more anxious than girls, although with non-significant difference which may be because of one of the limitations of this study that the boys in the total sample were more than girls.

The number of anxious children with non-secretor status (O) was higher than those with secretors (A and B) although with non-significant difference. There are no previous articles to compare with, and different from other studies that correlated the ABO blood groups with depression [39, 40]. The scenario of correlation the ABO blood types with anxiety is mainly by the role of glycosyltransferase, which has different activities in different blood types. Glycosyltransferase is associated with neuroinflammatory response which in turn persuades anxiety disorder [41, 42]. Glycosyltransferase affects the synthesis of ABO blood groups' antigens which give various patterns of preoperative anxiety [43]. These facts are specifically documented for the blood groups, but the results of the present study suggest negative influence regarding the salivary secretor status and anxiety.

As reported by previous study, there was less favorable behavior of self-care in anxious children, in addition to poorer health consequences, and evasion from dental treatments and dental care [44]. Nonetheless, the results of the present study revealed no influence of dental anxiety on dental caries experience and severity which is in accordance with previous studies [18, 19].

CONCLUSION

There is little evidence that the AB secretor status and anxiety to have interaction on dental caries experience and severity, as there are

multiple factors may interact to propagate the caries experience and severity.

Authors Contributions

ZJJ: Did all the work.

Conflict of Interest

No conflicts of interest declared concerning the publication of this article.

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Regulatory Statement

This study was conducted in accordance with all the provisions of the local human subjects oversight committee guidelines and policies of College of Dentistry / University of Baghdad. The approval code for this study is: 222320.

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