The association between severity of dental caries and salivary immunoglobulins in asthmatic adult patients

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Abstract

The salivary samples were collected adequately from 80 subjects distributed equally (40 asthmatic subjects and 40 control subjects) of ages range between 20-60 years. This comparative survey was determining the caries index(DMFT),*Streptococcus mutans* , *Streptococcus sobrinus* ,salivary IgA and IgE. So this study have shown highly significant difference $P \leq (0.01)$ found in effect of age on salivary IgA in control adult subjects and non-significant difference ($P > 0.05$) displayed in influence of age on salivary IgA. So this comparative investigation have demonstrated that non-significant difference ($P > 0.05$) found in influence of age on salivary IgE to both groups of study. However, the correlation between age and salivary IgE is a weak negative relationship.

Key words: *Asthma, dental caries, salivary IgA, salivary IgE*

Introduction

Asthma is a chronic disease causing airway inflammation in the lungs involving many cells and cellular elements. Worldwide, roughly 300 million people are affected by this disease irrespective of the age [1]. During the last few decades, disease has been elevated in some countries but has stabilized in other countries [2,3]. The asthma in period of adulthood is more frequent in females than in males [3] . Today, the most active available therapy for asthma is anti-inflammatory inhalers (glucocorticosteroids) and, if necessary, the addition of ß2 agonists (bronchodilatory agents) [4].

It's attributed to hyper-responsiveness of airways to triggers that impacts the sensitivity of the nerve endings in the air passages of lungs and so they become easily excited, for example exercise as well as allergens, which causes recurrent symptoms e.g. dyspnea (shortness of breath), coughing ,chest tightness and wheezing [5].This disease can be considered as the most common in childhood and is also a major problem of public health in adult populations. In an attack, the lining of the pathways swell resulting the narrowing of the airways and decreasing the passage of air in and out of the lungs [6]. The basic mechanism of asthma is an inflammatory process in the airways. The highest prevalences of asthma were recorded in Peru, Australia, New Zealand and the lowest recorded prevalence was documented in Albania and Russia[7].

The asthmatic patients have many problems in oral health. One of these problems is dental caries (DMFT index) which characterized by an irreversible contagious disease of multi-factorial etiology resulting demineralization of inorganic elements and destruction of an organic part of tooth structure [8]. Several surveys have been shown an elevated incidence of dental caries in asthmatic patients [9].The increased incidence of caries is attributed to: low salivary PH (reduced buffering capacity) , low salivary flow rate , raised consumption of carbonating drinks and sweets and magnified desiccating effect due to mouth breathing. Mutans streptococci (MS) is dominant cariogenic bacteria considered to be high in asthmatic subjects as compared to non-asthmatic subjects due to decreased salivary flow rate [10] .

Materials and Method

Sugar Bactracin-20M (Sugar bacitracin -20 modified)agar (which is obtained from Bulgaria),

Human IgE ELISA kit(that we got from Al-shkairate

establishment for medical supply, Jordan) and Salivary IgA ELISA kit (which is got from LDN, Germany)

Method

This comparative study involved the salivary samples of 40 control subjects and 40 asthmatic patients of ages between 20-60 years according to the birthday[11] .Collecting the saliva was made in early morning between 8am to 9 am. Prior to collecting the saliva, subjects were advised not to drink or eat for 3 hours before this step. Around 1 to 3 ml of total unstimulated saliva was assembled easily by drooling into sterilized cups that possess graduations, with the forward tilted head or by permitting the accumulation of saliva in the mouth and then expectorate into a cup (to avoid any possible contamination), while the determination of salivary flow rate(ml/min) must be done by using the graduated cup as(volume of saliva sample collected is divided on time needed for collecting the saliva) ml /min [12] .Then taking 0.5 ml by micropipette for serial dilution tube, and the resulting saliva should be centrifuged for 3000 rpm for 10 min. , and the clear supernatant saliva was collected and stored in a freezer at -20°C. The use of Vortex mixer for two minutes so that salivary samples be homogenous. Tenfold steps of serial dilution were prepared , 0.1 ml was withdrawn from each dilution (10^{-1} ,10^{-2} ,10^{-3},10^{-4} ,10^{-5}) and spreading by use of sterile microbiological spreaders on the petri dish plates of SB-20M agar .

These plates were incubated anaerobically by using a gas pack provided in an anaerobic jar for 24 hours at 37◦C followed by aerobic incubation for 24 hours at 37◦C. such experiment was accomplished in duplicate.

Results and Discussion

The caries index (DMFT), microbial counts , salivary IgA and salivary IgE in two study groups are demonstrated in table 1 and table 2. The results displayed the mean rank of DMFT in control group is higher in males as compared with females. Also the mean rank of microbial counts represented with *Streptococcus mutans* , *Streptococcus sobrinus* and total streptococci counts in males is higher than that of females. As related to the salivary IgA and salivary IgE, there is non-significant differences ($P > 0.05$) between the gender and both salivary immunoglobulins(IgE and IgA) as shown in table 1.

As for asthma group, table 2 demonstrates non-significant differences ($P > 0.05$) between influence of gender on DMFT index , microbial counts and salivary immunoglobulins represented with salivary IgE and IgA.

Table 1: Descriptive statistics and gender difference for the variables in control group

Variables	Descriptive statistics								Gender difference	
	Males (N=28)				Females (N=12)					
	Median	Min.	Max.	Mean Rank	Median	Min.	Max.	Mean Rank	MWU	p-value
Age	41	20	59	21.6	35.5	21	49	18.0	137.5	0.367
DMFT	10	1	24	21.1	8.5	1	24	19.1	151	0.615
***S. mutans* count**	6.15	1.3	16.4	21.5	5.7	2.5	12	18.1	139.5	0.400
***S. sobrinus* count**	1.35	0.3	5.1	21.1	1.3	0.6	3	19.0	150.5	0.605
Total Streptococci count	7.4	1.7	21.5	21.4	7.5	3.1	14.3	18.5	143.5	0.469
IgA	179	73	641	21.5	157.5	78	281	18.2	140	0.408
IgE	12.6	2.1	31.6	18.6	25.7	4.7	34.5	24.9	115.5	0.121

Table 2: Descriptive statistics and gender difference for the variables in Asthmatic group.

Variables	Descriptive statistics								Gender difference	
	Males (N=24)				Females (N=16)					
	Median	Min.	Max.	Mean Rank	Median	Min.	Max.	Mean Rank	MWU	p-value
Age	42	20	57	21.271	39	22	59	19.344	173.5	0.609
DMFT	10	2	25	20.938	10	3	20	19.844	181.5	0.771
S. mutans count	7.95	2.7	21.3	21.167	6.6	2.1	26.3	19.500	176	0.659
S. sobrinus count	2.05	0.6	5.4	21.854	1.85	0.4	5.3	18.469	159.5	0.369
Total Streptococci count	10.5	3.3	26.7	21.208	8.85	2.5	29.2	19.438	175	0.639
IgA	224.5	130	347	21.729	201.5	129	322	18.656	162.5	0.415
IgE	14.4	1.6	34	18.167	24.8	1.6	39.3	24	136	0.122

Table 3: Relation between the DMFT and all variables in both groups

Variables		Groups	
		Control	Asthma
Age	r	0.032	0.308
	p-value	0.846	0.053
S. mutans count	r	0.524	0.674
	p-value	0.001	0.000
S. sobrinus count	r	0.623	0.586
	p-value	0.000	0.000
Total Streptococci count	r	0.552	0.660
	p-value	0.000	0.000
IgA	r	-0.076	-0.009
	p-value	0.641	0.954
IgE	r	0.179	-0.038
	p-value	0.270	0.815

Table 4: Relation between the IgA and all variables in both groups

Variables		Groups	
		Control	Asthma
Age	r	0.967	-0.267
	p-value	0.000	0.096
S. mutans count	r	-0.165	-0.103
	p-value	0.308	0.526
S. sobrinus count	r	-0.013	-0.087
	p-value	0.937	0.594
Total Streptococci count	r	-0.145	-0.095
	p-value	0.372	0.558
IgE	r	-0.275	-0.306
	p-value	0.086	0.055

Table 5: Relation between the IgE and all variables in both groups

Variables		Groups	
		Control	Asthma
Age	r	-0.190	-0.087
	p-value	0.240	0.592
S. mutans count	r	0.007	0.077
	p-value	0.967	0.637
S. sobrinus count	r	0.110	-0.065
	p-value	0.500	0.689
Total Streptococci count	r	0.035	0.059
	p-value	0.830	0.717

In this comparative study , results display there is a weak positive relationship of DMFT with age in both groups of study with non-significant differences ($P > 0.05$) between DMFT and age in control group and asthma group. Also results indicate highly significant ($P \leq 0.01$) difference between DMFT and *S. mutans* count in both groups. Also there is highly significant difference ($P \leq 0.01$) between DMFT and *S.sobrinus* in both groups. Subsequently, the difference is highly significant ($P \leq 0.01$) between DMFT and total Streptococci count in both groups of study. Low salivary PH (reduced buffering capacity) , low salivary flow rate and other parameters

are increasing severity of caries and subsequently elevation of MS levels in asthmatic patients [10] .However, there is non- significant differences (P > 0.05) between DMFT index and both salivary immunoglobulins (IgA and IgE) in control group and asthma group .At the same time, the correlation is a weak negative relationship between DMFT and salivary IgA in both groups, but the correlation between DMFT and salivary IgE is a weak positive relationship in control group and weak negative relationship in asthma group. .Relatively there is an increase in mean values of IgE in asthma group as compared with control group. Increased Th2 levels in the airways liberate specific cytokines which stimulate inflammation of eosinophils and generation of IgE(immunoglobulin E) by mast cells[13]

In regards to salivary IgA, results illustrates the mean value in control group is higher than that of asthma group and this is may be due to taking ß2 agonists that aggravate the severity of caries by decrease the salivary flow rate and reduce levels of salivary IgA in asthmatic patients. So the correlation this salivary parameter with age in control group is a strong positive relationship and the difference is highly significant (P ≤ 0.01), but in asthma group ,there is non-significant difference (P > 0.05) between salivary IgA and age with taking in consideration that there is a weak negative relationship. So the results demonstrated that there is a weak negative relationship between salivary IgA and *S.mutans* count as well as the correlation between salivary IgA and *S.sobrinus* count is also a weak negative relationship.

As for the correlation between both salivary immunoglobulins (IgA and IgE) is a weak negative relationship whether in control group or till in asthma group. So the statistical difference between salivary IgA and IgE is non-significant (P > 0.05) .

Results displayed that in both groups of study there is a weak negative relationship between IgE and age as well as non-significant statistical difference (P > 0.05) . So the correlation in both groups is a weak positive relationship between IgE and *S. mutans* count with non-significant statistical difference (P > 0.05), but the correlation is a weak positive relationship between IgE and *S. sobrinus* count in control group and a weak negative relationship between them in asthma group. So statistically there is non-significant difference (P > 0.05) between IgE and *S. sobrinus* in control group and asthma group.

Conclusion

As related to the low salivary flow rate and low PH in asthmatic adult patients, the levels of dental caries index (DMFT), *S.*mutans and *S. sobrinus* are higher in asthma group than that in control group.

So the mean value of IgA is higher in control subjects than that in asthmatic adult patients. So the mean value of IgE in asthmatic subjects is higher than that in control subjects.

Ethical Clearance: The Research Ethical Committee at scientific research by ethical approval of both MOH and MOHSER in Iraq

Conflict of Interest: None

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