The Dental Caries and Some Salivary Constituents among a Group of Ten Years Iraqi Passive Smokers

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ABSTRACT

Background: Passive smoking and dental caries affect the integrity of the health of individuals and both of them affected by sociodemographic characteristics of those individuals. This research aimed to investigate the severity of dental caries in relation to salivary magnesium and zinc of stimulated whole saliva of a group of 10 years passive smokers in comparison with normal subjects.

Materials and methods: the study group included 40 subjects (20boys and 20 girls), with an age of 10 years of passive smokers determined by a questionnaire. The control group included 40 normal subjects of the same gender and age of the study group. The diagnosis and recording of dental caries was measured by (D_{1-4}MFS & d_{1-4}mfs) index according to the criteria of Muhleman (1976). The collection of stimulated whole saliva was performed under standardized condition. The salivary samples were chemically analyzed for measuring of Zn and Mg.

Results: The caries experience among study group was lower than that of control group for primary dentition but without significant difference while for permanent dentition it was equal. Salivary magnesium ions concentration was lower among study group compared with control group with high significant difference. Concerning salivary zinc ion concentration it was higher among study group with high significant difference among females and significant among males. Among males of study group, magnesium correlated negatively significantly with D_1, the same correlation was recorded among females where it was with $D_1$and D_2 while it was correlated positively highly significantly with d_1 of control group and significantly with d_1 and D_3 among males of control group. For salivary zinc it was correlated negatively highly significantly with D_3 of study group.

Conclusion: Passive smoking has no effects on dental caries rather than it affects certain salivary constituents.

Key words: Dental caries, passive smoking, magnesium, zinc. (J Bagh Coll Dentistry 2016; 28(2):98-102).

INTRODUCTION

Breathing smoke of other peoples is known as involuntary, passive or secondhand smoking. It can also called as 'environmental tobacco smoke'. Smokers and non-smokers alike inhale second hand smoke. Inhaling tobacco smoke is an unavoidable consequence of being in an environment that filled with smoke [1].Passive smoking, especially among young children, may cause serious health hazards [2]. Tobacco smoking, now and in the past, has been a custom and addiction primarily of men, leaving women and children as the majority of the world's passive, or involuntary, smokers. Biomarkers of exposure are compounds that can be measured in biological materials such as blood, urine, or saliva [3].

There is evidence that cigarette smoking increases the risk for dental caries development among individuals [4]. Studies in young adults revealed an association between cigarette smoking and tooth loss resulting from dental caries and were recorded that plaque scores in addition to decayed, missing, filled teeth (DMFT) scores were lower significantly among non-smokers than smokers [5,6]; while a study carried out in 2006 failed to find a positive association between caries experience and passive smoking in Japanese children [7].

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Magnesium (Mg) ion is a normal constituent of dental enamel, dentin, and bone; it is existing in a relatively high concentrations in subsurface layer of enamel, its level dental plaque have been associated inversely with caries experience. Magnesium presents in submandibular saliva with higher level than those in parotid saliva and vary inversely with salivary flow rate [8,9].

Magnesium is a mineral that helps with the formation of teeth [10]. Zinc (Zn) is an essential trace element that is present in small amounts in all tissues and body fluids, including saliva [11]. Influence of trace elements on the prevalence of dental caries is a detectable subject however; sufficient evidence has been accumulated to suggest the cariostatic effect of trace elements.

Zinc was considered to be a doubtful element among trace element that inhibits caries development[12].No previous Iraqi studies were conducted concerning the effects of passive smoking on dental caries and some salivary constituents, for that reason this study was done.

MATERIALS AND METHODS

The study group included 40 student (20 boys, 20 girls) aged 10 years old; they were regarded as passive smokers and included in the study according to questionnaire were they should met the following criteria:

- One of the parents of the subject is smoker.

- § The number of cigarettes smoked per day are at least 20.
- § The smoking is indoors.
- § The exposure of subject to environmental smoking was at least for 5 years.

The control group included students machining in number, age and gender with the study group with parents who are not smoke. Caries-experience was diagnosed and recorded according to Decayed, Missing and Filling Surface index (DMFS and dmfs) indices for permanent and primary teeth respectively described by WHO 1987[13].

In addition, the decay fraction of index was recorded according to lesion severity in accordance to the criteria described by Muhlemann [14]. The salivary samples of stimulated saliva were collected under standardized conditions following the instruction cited by Tenovuo and Largerlof [15]. Salivary magnesium and zinc were estimated biochemically by using atomic absorption, data analysis was conducted by application of SPSS program (version 16).

RESULTS

Results showed that there is no significant statistically differences between males and females concerning caries experience and salivary constituents among study or control. For that reason the whole sample were considered one without subgrouping according to gender.

Caries experiences (medians) among study and control groups for primary and permanent dentition are shown in table 1 and 2 respectively. Medians of dmfs among study group were lower as compared to control group but without significant difference statistically ($p>0.05$) while median of DMFS among study and control group were equaled. In the study group and control groups decay component of dmfs and DMFS index represented the highest proportion followed by filling and missing fractions for both primary and permanent dentition. The salivary constituents (medians) among study and control groups are shown in table 3.

Results revealed that magnesium ions concentration which is measured by (mg/L)was lower among study group as compared with control group with highly significant difference, while concerning zinc zinc ions concentration which is measured by (µg / d.L), it was found that study group was higher compared with control group, the difference was statistically high also.

Correlation coefficient between salivary magnesium and zinc with dental caries among study and control group is shown in table 4, where its revealed that magnesium correlated positively highly significantly with d_1 among control group while zinc was correlated negatively highly significantly with D_3 among study group.

Correlation coefficient between salivary magnesium and zinc with dental caries among males of study and control group is shown in table 5, where it's revealed that magnesium correlated significantly in both directions; positively with d_1 and D_3 and negatively with D_1 among males of control group.

Table 6 showed the correlations among females of study and control group, where magnesium correlated negatively significantly with D_1 and D_2 among females of study group.

Table 1: Caries experience and caries severity for primary dentition among study and control groups

	Study group					Control group					Group difference		
Variables	**Min.**	**Max.**	**Median**	**Mean**	**±SD**	**Min.**	**Max.**	**Median**	**Mean**	**±SD**	**Mann-whitney U-test**	**Z-test**	**P-value**
Ds	0	25	6	6.20	5.26	0	37	7	8.03	7.05	667.5	1.27	0.20
Ms	0	10	0	1.25	2.94	0	5	0	0.50	1.52	734	1.06	0.28
Fs	0	0	0	0	0	0	0	0	0	0	800	0	1
dmfs	0	25	6	7.45	5.99	0	37	7.5	8.53	7.19	723	0.74	0.45
d_1	0	3	0	0.63	0.87	0	3	0	0.50	0.78	745.5	0.60	0.54
d_2	0	6	0	0.50	1.15	0	7	0	0.73	1.52	753.5	0.57	0.56
d_3	0	14	3.5	3.90	3.27	0	12	3.5	4.23	3.72	769	0.30	0.76
d_4	0	14	0	1.13	2.84	0	30	0	2.58	5.29	635.5	1.30	0.05

d.f=78

Table 2: Caries experience and caries severity for permanent dentition among study and control groups

	Study group					Control group					Group difference		
Variables	Min.	Max.	Median	Mean	±SD	Min.	Max.	Median	Mean	±SD	Mann-whitney U-test	Z-test	P-value
DS	0	9	4	3.70	1.98	0	10	3.5	3.75	2.92	766	0.33	0.74
MS	0	0	0	0	0	0	10	0	0.25	1.58	780	1	0.31
FS	0	1	0	0.03	0.16	0	2	0	0.05	0.32	799.5	0.01	0.98
DMFS	0	9	4	3.37	2.00	0	12	4	4.08	3.11	795	0.04	0.96
D_1	0	6	2	2.08	1.58	0	6	1	1.53	1.62	618.5	1.78	0.07
D_2	0	5	1	1.15	1.44	0	8	1	1.38	1.84	776	0.26	0.80
D_3	0	6	0	0.43	1.22	0	6	0	0.53	1.30	747	0.74	0.45
D_4	0	2	0	0.05	0.32	0	5	0	0.35	1.25	758.5	1.05	0.29

d.f=78

Table 3: Salivary constituents among study and control groups

Variables	Study group					Control group					Group difference		
	Min.	Max.	Median	Mean	±SD	Min.	Max.	Median	Mean	±SD	Mann-whitney U-test	Z-test	P-value
Mg	0.33	0.69	0.49	0.50	0.09	0.6	0.81	0.66	0.68	0.06	72.5	7.00	**0.00****
Zn	2.5	6.4	4.3	4.39	0.72	2.1	5.5	3.65	3.65	0.89	450	3.37	**0.00****

d.f=78, **Highly significant (P < 0.01)

Table 4: Correlation coefficient between salivary magnesium and zinc and caries experience among study and control groups (ds grades, dmfs, DS grades and DMFS)

Variables	Mg				Zn			
	Study group		Control group		Study group		Control group	
	r	P	R	P	r	P	r	P
d_1	-0.25	0.10	0.48	**0.00****	-0.02	0.88	-0.10	0.52
d_2	-0.09	0.56	0.11	0.47	-0.05	0.74	0.23	0.14
d_3	0.09	0.56	-0.02	0.87	-0.19	0.23	-0.12	0.42
d_4	0.02	0.88	0.02	0.57	0.00	0.98	0.01	0.95
dmfs	0.14	0.38	-0.01	0.92	-0.04	0.77	-0.02	0.86
D_1	0.06	0.70	0.25	0.11	-0.02	0.88	0.12	0.43
D_2	-0.12	0.42	-0.13	0.40	-0.23	0.14	0.24	0.12
D3	0.07	0.63	-0.19	0.23	-0.14	**0.00****	0.05	0.73
D_4	-0.11	0.94	-0.03	0.83	0.23	0.15	0.15	0.34
DMFS	-0.08	0.59	0.06	0.70	-0.20	0.20	0.17	0.26

****Highly significant (P < 0.01)**

Table 5: Correlation coefficient between salivary magnesium and zinc and caries experience among males of study and control groups (ds grades, dmfs, DS grades and DMFS)

Variables	Mg				Zn			
	Study group		Control group		Study group		Control group	
	R	P	R	P	r	P	R	P
d_1	-0.12	0.60	0.53	**0.01***	0.12	0.60	0.00	0.98
d_2	-0.14	0.53	0.02	0.91	-0.01	0.94	0.40	0.07
d_3	0.25	0.28	-0.22	0.33	-0.42	0.06	-0.22	0.34
d_4	0.26	0.26	-0.14	0.55	-0.24	0.30	0.10	0.66
dmfs	0.38	0.09	-0.31	0.17	-0.31	0.17	0.00	0.98
D_1	-0.45	**0.04***	0.24	0.29	0.07	0.77	0.13	0.56
D_2	0.32	0.15	-0.44	0.05	-0.39	0.08	0.21	0.37
D3	0.35	0.12	-0.55	**0.01***	-0.37	0.10	0.02	0.91
D_4	-0.14	0.55	-0.04	0.85	0.30	0.19	0.30	0.91
DMFS	-0.11	0.62	-0.22	0.33	-0.14	0.54	0.41	0.07

* **Significant (P < 0.05)**

Table 6: Correlation coefficient between salivary magnesium and zinc and caries experience among females of study and control groups (ds grades, dmfs, DS grades and DMFS)

Variables	Mg				Zn			
	Study group		Control group		Study group		Control group	
	R	P	r	P	r	P	r	P
d_1	-0.36	0.11	0.43	0.05	-0.24	0.29	-0.21	0.36
d_2	0.02	0.90	0.19	0.41	-0.05	0.80	0.04	0.85
d_3	-0.08	0.72	0.20	0.38	0.06	0.79	0.03	0.89
d_4	-0.20	0.39	0.40	0.07	0.30	0.19	-0.13	0.58
dmfs	-0.10	0.66	0.31	0.17	0.19	0.40	-0.03	0.87
D_1	-0.44	**0.04***	0.26	0.25	-0.11	0.62	0.06	0.78
D_2	-0.05	**0.02***	0.11	0.62	-0.11	0.62	0.31	0.18
D3	-0.10	0.65	0.15	0.50	-0.42	0.05	0.11	0.61
D_4	-	-	-0.01	0.86	-	-	-0.02	0.93
DMFS	-0.09	0.70	0.32	0.16	-0.22	0.33	-0.06	0.78

*** Significant (P < 0.05)**

DISCUSSION

The data of present study showed that there is no significant difference for caries experience as measured by dmfs/DMFS index between study and control groups., the same results were recorded by previous studies [16,17]. Some studies suggested that passive smoking was positively associated with dental caries [18,19], while another study reported no association between passive smoking and dental caries[20,21].

The heterogeneity of these results among studies might be explained by differences in characteristics, smoking habits, and life style of the populations examined, the study design used, and potential confounders considered.

In particular, few of the studies on the association between passive smoking and dental caries controlled for potential confounders, such as socioeconomic status, diet, and oral health behaviors. Other limitations may also influence the interpretation of the current results. As this study is cross-sectional, the temporal nature of the association between passive smoking and dental caries could not be examined.

Passive smoking was assessed by questionnaire reports and was not validated by measurements of biomarkers, such as salivary, serum or urine cotinine levels. Using questionnaires may result in misclassification from recall bias and response bias due to parents' feelings of guilt for smoking in the presence of their children [22].

Regarding concentration of salivary magnesium ion, results showed that magnesium ion concentration was lower among study group including males and females as compared to control group with highly significant difference between them [23], while another study found no significant difference between salivary minerals between smokers and non smokers [24]. This decrease in salivary magnesium explained by Eliasson et al. [25] who had assumed that some of the abnormalities noted in smokers did not seem to be mediated by nicotine. Whereas influence of nicotine on reducing the body weight and indirectly on decreasing the electrolytes.

Results of present study revealed higher salivary zinc concentration among study group as compared to control group with high significant difference, the same result recorded for females but regarding males the difference was statistically significance.

Concerning magnesium ion results revealed negative correlation with dental caries indicated by D_1 among males of the study group which was significance and with D_1 and D_2 among females of the study group which was also significance and this agreed with other studies [26,27] which recorded among healthy individuals; while among control group, the correlation was positive and highly significant with d_1 and significant with d_1 and D_3 among males of the study group, this result explained by Featherstone [28] who described magnesium as a caries promoting mineral as it inhibits remineralization.

Salivary zinc ions concentration was founded to be correlated inversely highly significant with dental caries indicated by D_3 in the study group, however this can be explained by the study of Chandra et al.[29] which found that high level of zinc lead to greater mineralization and accumulation of zinc quantities on surface enamel that become more caries resistance.

Deficiency of micro nutrients like zinc can influence amount and composition of saliva and reduce protective effect of saliva [30]. Increased susceptibility to dental caries in zinc-deficient animals might be mediated by alterations in salivary proteins that are associated with the maintenance of tooth structure [31].

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