

The Effect of Salivary Zinc Concentration in Dental Caries Experience

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Key words

Dental caries,
Zinc, saliva.

Abstract

This study was aimed to investigate the relationship between caries experience and Zinc concentration in salivary supernatant.

Materials and methods: This study was done on Forty healthy-looking dental students in Tikrit University, with age range between 19-24 years, stimulated mixed saliva were collected from them and the supernatant part of it were subjected to analysis by Atomic Spectrophotometer in analytical center of chemical engineering college/ Tikrit University, to estimate Zinc concentration. Assessment of caries prevalence was carried out by clinical examination using DMFT and DMFS indices. Zinc concentration and dental caries experience took place in relation to gender.

The result showed that the Zinc level in saliva of caries experience group was 76.6 ± 20.6 ng/ml, while that of caries free group was 72.6 ± 32.3 ng/ml. The total mean of saliva Zinc concentration in saliva of males in both groups was higher than females.

Saliva zinc concentration was higher in individuals with caries free when compared with individuals having caries experience. The severity of dental caries was associated with the increasing salivary zinc concentration. There was significant differences between the salivary zinc concentration in both sexes. Males in both groups having higher salivary zinc concentration than that in females.

Introduction

Dental caries is one of the most prevalent disease and dates back to antiquity. The widely recognized inverse relationship between the prevalence of dental caries and the ingestion of the fluoridated drinking water prompted investigators to look at other trace elements⁽¹⁾.

Trace elements either directly or indirectly influence the susceptibility of the teeth to dental caries.

Investigations suggested that, some trace elements are cariogenic^(2,16), mildly cariostatic^(3,4), and some are strongly cariostatic^(3,4,5,6,18). Zinc was considered to be a doubtful element among trace elements that inhibit caries development^(7,19). However, Lin and liu showed that increased dental caries along with a decrease in plasma Zinc level in contraceptive steroid-treated rats. Furthermore, Zinc deficiency has been related to certain oral disease, such as taste impairment in human⁽⁸⁾. Other researchers have shown that certain subjects with

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hypogeusia (loss of taste acuity) exhibited lower Zinc content in serum and parotid saliva. Serum and parotid saliva Zinc levels, taste perception and taste bud anatomy returned to normal in some of these patients after Zinc treatment⁽⁹⁾. The role of the Zinc in the development and mineralization of tooth has not been clearly defined, so this study was designed to study the effect of Zinc on the susceptibility of teeth to dental caries.

Materials and Method

This study were carried out on the students of College of Dentistry \ University of Tikrit, it take place at 2009-2010, the students were divided into two groups:-

- 1- Caries experience group, consisted of 30 students .
- 2- Caries free group, consisted of 10 students .

The students were normal healthy males and females, their age range between 19-24 years, firstly they asked to participate in the study after explanation the aim of the research. Assessment of caries experience was carried out by calculating the DMFS (decayed, missing, filling surfaces) and DMFT (decayed, missing, filling tooth) for each individual, following the basic methods of oral health survey of the world health organization⁽¹⁰⁾.

Oral examination took place on chair with artificial light. Plane mouth mirror and sharp dental explorer were used. The procedure of the Zinc analysis in saliva take place as follows:

- 1- Five milliliters of stimulated mixed saliva were collected by uniform stimulus (Arabic gum) for each individual before breakfast samples were collected between 8.00-11.00 a.m..
- 2- The samples were collected in test tubes fitted by parafilm cover.
- 3- Samples were centrifuged at 3000 rpm for 30 minutes.
- 4-The supernatant was directly aspirated in the flame of Atomic Absorption Spectrophotometer (model AA 6200) to measure the Zn content in it. The statistical analysis of the data to determine the significant differences between the groups was tested by using student t-test,

correlation coefficient test (r) and ANOVA (analysis of variance) F-test was used whenever indicated, taking P value <0.05 as the limit of significance²⁰.

Results

Table (1) illustrated distribution of subjects examined in this study according gender. Total sample represented 40 dental students, 42.5% was males and 57.5% was females. The group of students with caries experience, 36.7% was males and 63.3% was females, while the second group which represent caries free students (control group), 60% was males and 40% was females . Table (2) showed the saliva Zinc concentration in two different studied groups. The mean of Zinc level in saliva of caries experience group was 76.6 ng/ml, ranging from(10.9 – 130) ng/ml, while the mean value of Zinc level in saliva of caries free group was 72.6 ng/ml, ranging from (34.6-127.9) ng/ml. Concentration of Zn saliva were higher in students with caries experience when compared to that of the students with caries free, using t-test (0.34) to asses the difference between the means of these two groups it revealed not significant ($p < 0.05$) as illustrated in table (2). The severity of dental caries also studied in this research, in relation to Zinc concentration, the total mean of saliva Zinc concentration of each sub group increased with the increased DMFT value as seen in table (3), but the difference statistically not significant ($p > 0.05$). Moreover, the results concerning the caries experience in relation to salivary Zinc concentration and gender as indicated in table (2) showed that the concentration of Zinc in saliva in males of both groups (caries experience and caries free) was higher in comparison with that in the females, and the difference statistically significant ($t = -2.8; p < 0.05$). The difference was highly significant in sub group having score 11 of DMFT index as explained in table(3). Such a result was also obtained after sub grouping subjects with caries experience according to severity of dental caries even when they recorded by other index (DMFS), as seen in table (4), the

difference also statistically significant ($t=1.87; p<0.05$).

Discussion

As the total body concentrations of many enriched elements in saliva are extremely small, their enrichment in saliva suggests special roles for these elements in the oral cavity⁽¹¹⁾. Advanced biochemical and clinical studies, analyzing the specific effects of saliva on the oral cavity pathology have recently confirmed saliva to be one of the most important factors with a role in arresting caries progression and possible role in reversing the initial injury to the hard dental tissue. Saliva can also be the diagnostic fluid both for periodontal and other disease⁽¹²⁾. This study showed that Zinc level in saliva of caries experience group was 76.6 ± 20.6 ng/ml, which is higher than that which found by Ibrahim⁽¹³⁾ which was 40.2 ± 21.4 ng/ml also for Iraqi dental students with caries experience in Baghdad university, this may attributed that our study take-place in other Iraqi district, that may be variation in concentration of zinc in water or soil in these provinces, also may due that previous study brought up during years of economic sanctions and food rationing system that may affect the concentration of Zinc in saliva. Considering the relation between the salivary Zinc concentration and dental caries experience, the mean of concentration of Zinc in saliva was higher among students with caries experience than the students with caries free, this result is contradicts the results of many previous studies^(14,15,13). But this result comes in agreement with the finding of Moriwaki et al⁽¹⁶⁾. In a tentative classification suggested by Novia⁽³⁾, Zinc was considered to be a doubtful element among trace minerals that inhibit caries development.

Current study revealed that the total mean of saliva Zinc concentration of each subgroup increased with increased severity of dental caries (DMFT), this go in harmony with the previous finding of this study, while it disagree with previous study⁽¹³⁾, which found a negative correlation between salivary Zinc concentration and severity of caries experience. Other findings of this study showed that salivary Zinc concentration in males of both groups was higher than that in females, this is in accordance with Lane and Peach study⁽¹⁷⁾. While Ibrahim had found that no difference in the level of saliva Zinc concentration between males and females. Various investigators are of the opinion that salivary trace elements influence the susceptibility of tooth to dental caries. But up to date very few studies were conducted in this subject, more studies however are required in this subject.

Conclusions and Recommendations

- 1- Saliva zinc concentration was higher in individuals with caries free when compared with individuals having caries experience.
- 2- The severity of dental caries was associated with the increasing in salivary zinc concentration.
- 3- There was significant differences between the salivary zinc concentration in both sexes. Males in both groups having higher salivary zinc concentration than that in females.
- 4- This study attract attention for the possible role of zinc on dental caries. Further studies required to evaluate its level in the saliva of large community and its relation to dental caries.
- 5- Analyzing zinc level in the water and soil and its relation to the saliva zinc level in resident population.

Table(1):- Sample Distribution according to gender

Gender	No. of Caries experience	%	No. of Caries free (control group)	%	Total	%
M	11	36.7	6	60	17	42.5
F	19	63.3	4	40	23	57.5
Total	30	100	10	100	40	100

Table(2):- Saliva Zn. Concentration according to the gender distribution.

Saliva Zinc Concentration(x)± S.D. ng /ml						
Caries Experience	No.	Females	No.	Males	Total	Mean ±S.D
Caries Experience	19	69.29±22.42	11	89.2±37.0	30	76.6±20.6
Caries Free	4	42.45±9.05	6	92.7±24.8	10	72.6±32.3
Total	23	64.63±23.04*	17	90.45±32.41*	40	

*p<0.05

Table(3):-Saliva Zinc Concentration according to DMFT Score.

DMFT	Sex	No.	Saliva Zn.(X) ±S.D. ng/ml
1-5 (A)	M	5	91.6±33.4
	F	14	67.9±19.7
	T	19	74.09±25.39
6-10 (B)	M	5	81.4±45.2
	F	4	67.6±32.8
	T	9	75.3±38.4
11 ⁺ (C)	M	1	116.2±1.00 **
	F	1	96.1±1.00
	T	2	106.2±14.2

**p<0.01

Table (4):- Saliva Zinc concentration according to DMFS Score.

DMFS	Sex.	No	Saliva Zn.(X) +S.D. ng/ml
2-11	M	8	93.2±30.1 *
	F	16	71.1±20.5
	T	24	78.48±25.76
12-21	M	1	71.7±62.9
	F	2	55.6±.00
	T	3	66.4±45.4
22-31	M	2	59.6±68.9
	F	1	96.1±1.00
	T	3	71.80±53.1

**p<0.01

NOTE: M=Male, F=Female, Zn=Zinc, S.D.=Stander deviation

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