

Salivary Zinc Level Determination in Patients with Benign Migratory Glossitis

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الخلاصة

الأهداف: تحديد ومقارنة تركيز مستوى مادة الخارصين في اللعاب ومعدل جريان اللعاب في مجموعة المرضى المصابين بالتهاب اللسان المهاجر الحميد ومجموعة السيطرة. **المواد وطرق العمل:** أجريت هذه الدراسة على 42 شخصا قسموا إلى مجموعتين: مجموعة المرضى المصابين بالتهاب اللسان المهاجر الحميد (22 مريضا و (20) شخصا سليما. تم جمع اللعاب بدون تحفيز وتم تحديد معدل جريان اللعاب بالإضافة إلى قياس تركيز مستوى الخارصين في اللعاب. تم تحليل تركيز الخارصين بواسطة جهاز امتصاص الطيف الضوئي الذري. **النتائج:** أظهرت النتائج إن معدل جريان اللعاب في مجموعتي المرضى و السيطرة هو (0,5459 مل / دقيقة) و (0,6840 مل / دقيقة) بالتعاقب، بينما معدل تركيز الخارصين في لعاب المرضى هو (0,0964 جزء من مليون) أما تركيزه في لعاب مجموعة السيطرة هو (0,1383 جزء من مليون). لم تظهر في هذه الدراسة أي علاقة بين معدل جريان اللعاب و تركيز الخارصين في لعاب مجموعتي المرضى و السيطرة. **الاستنتاجات:** لم تظهر هذه الدراسة السريرية علاقة معنوية بين المرضى المصابون بالتهاب اللسان المهاجر الحميد مع تركيز مستوى الخارصين في اللعاب و كذلك معدل جريان اللعاب.

ABSTRACT

Aims: To determine and compare the salivary zinc level concentration (SZLC) and salivary flow rate (SFR) in patient with benign migratory glossitis (BMG) and in control normal subjects, also to evaluate any relationship among these variables in each group. **Materials and Methods:** The study was conducted on 42 individuals who were allocated into two groups: patients group was comprised of 22 patients who did have (BMG) and 20 healthy subjects. Unstimulated whole saliva was collected and both SFR and SZLC were determined. Zinc analysis was performed with an atomic absorption spectrophotometer. **Results:** The mean SFR in patients and control groups were 0.5459(ml / min) and 0.6840(ml / min) respectively, whereas the mean SZLC for patients was 0.09764(ppm) and 0.13830 (ppm) for control group. SFR was not differ significantly between both groups ($p > 0.099$), also SZLC was not significantly differ in both groups too ($p > 0.169$). **Conclusions:** This clinical study could not establish significant association between BMG and both SZLC and SFR.

Keywords: Benign migratory glossitis, salivary zinc concentration, salivary flow rate, healthy tongue.

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INTRODUCTION

Benign migratory glossitis (BMG) is also called "geographic tongue", "wandering rash", and "erythema migrans". It refers to irregularly shaped reddish areas of depapillation and thinning of dorsal tongue epithelium which is surrounded by a narrow zone of regenerating papillae that is whiter than the surrounding tissue surface.⁽¹⁾ This lesion characterized by map-like appearance that changes location from day to day.⁽²⁾ BMG is common in young and middle aged adults with an age range of 5 to 84 years with predilection for females.⁽¹⁾ The most frequently reported prevalence is in the range of 1 to 2.5 %.⁽³⁾

It is either associated with soreness and burning pain or asymptomatic.⁽²⁾ The cause of this lesion is unknown. BMG is a condition with a genetic predisposition as demonstrated by HLA B15, DR5 and DRW6.⁽⁴⁾ Fissured tongue is often associated with BMG. Also, patients with geographic tongue have a significantly greater personal or family history of asthma, eczema, and hay fever.⁽⁵⁾ Geographic tongue has also been seen with increased frequency in patients with pernicious anemia and in pregnant patients, in whom it is possibly associated with folic acid deficiency or hormonal fluctuations.⁽⁶⁾

Zinc deficiency is another related

factor. The role of zinc sulfate on BMG healing was proven by some investigators.⁽⁷⁾ The importance of zinc in human nutrition and human health and disease has been extensively documented.⁽⁸⁾ Zinc influence many body system and function including growth, bone formation, brain development, reproduction, fetal development, sensory function (smell and taste), immune mechanism, membrane stability and wound healing.⁽⁹⁾ Food sources of zinc that can readily supply including meat, liver, sea food, milk and milk products, eggs and grains.⁽¹⁰⁾ Zinc is present in many biological tissues and fluids such as plasma, serum, whole blood, erythrocyte, leukocyte, urine, hair and saliva.^(11, 12) Several methods involve the use of flame atomic absorption spectrophotometer (AAS) in clinical and research laboratories in an effort to determine body zinc status.^(11, 12) Henkin et al suggested that zinc levels in saliva may be superior way to assess zinc nutritional status of human subjects.⁽¹³⁾ The mean concentration of salivary zinc on healthy individuals were ranged from 0.170,⁽¹⁴⁾ 0.173⁽¹⁵⁾ and 0.478⁽¹⁶⁾ ppm in resting whole mixed saliva. Many factors influenced the salivary zinc levels such as dietary intake, the SFR, the nature and duration of stimulation, the time of the day, smoking and drugs.⁽¹⁷⁻¹⁹⁾ The mean unstimulated whole SFR was 0.46 ml / min and ranged from 0.1 to 1.6 ml / min in normal healthy individuals.⁽²⁰⁾ Many investigators classified their patients into those with low SFR if it is ranged from 0.1 to 0.19 ml / min.⁽²¹⁾

The aims of this clinical study were:

To determine the SZLC and SFR in patients with BMG and normal subjects.

To compare the SZLC and SFR in both groups.

To evaluate any relationship among SZLC and SFR in each group.

MATERIALS AND METHODS

The study samples consisted of 42 individuals of age ranging from 5 to 50 years of age who were allocated into two groups: Group 1 (patient group) was comprised of 22 patients, 11 males and 11 females with a mean age of 23.4 years who did have BMG selected among the patients attended Oral Medicine Clinic, College of

Dentistry, Mosul University. Group 2 (control group) was composed of 20 healthy subjects, 10 males and 10 females who did not have BMG selected from Dental staff and 5th year Dental Students. All study samples did not use any drugs, smoking or have not any systemic diseases associated with similar BMG lesion.

Patients group satisfied the following criteria:

1. Presence of active lesion of BMG.
2. Positive history of recurrent lesion of BMG.
3. Objectives confirmation of BMG disease through clinical examination and according to the diagnostic criteria reported by Ghom.⁽¹⁾ The diagnostic criteria include localized reddish depapillated area surrounded by whitish regenerated tissue surface.

Control group satisfied the following criteria:

1. They meet the criteria of no previous history of BMG lesion.
2. They have not any clinical conditions that could pose a health risk to the subjects.

Saliva Collection and Analysis:

Saliva was always collected 2hrs after last meal. Unstimulated whole mixed saliva samples were obtained by having the patients and volunteers spit into sterile plastic calibrated container. Three ml of saliva was collected for each individual and the time was measured to estimate the salivary flow rate for each sample. The salivary container is immediately closed with a plastic stopper and store in refrigerator until the time of analysis. Calculation of the salivary flow rate (SFR) was done as volume in (ml) of salivary sample divided by the time in (minute).

Analysis of saliva for zinc ion concentration was carried out with an atomic absorption spectrophotometer (AAS) Name PYE UNICOM PS9 Italy 1982. In this study we also used a zinc cathode lamp and zinc ion stock solution.

Standard Zinc Solution Preparation⁽²²⁾:

The standard zinc solutions (stock solution) were prepared according to the dilution low for solution. According to this low, the chemist prepared the standard stock solution of zinc chloride and deionized water in part per million (ppm) as

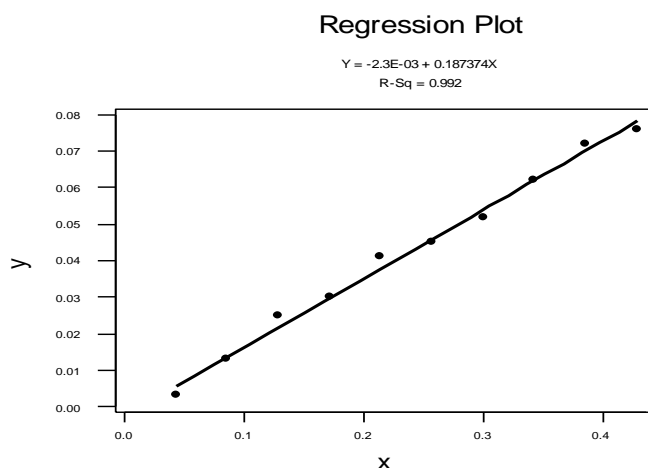
following:

ppm 10 = weight / 1000 x 106

Weight = 10 x 1000 / 1000000 = 0.01 gm.

This 0.01 gm is to be solved in 1000 ml of deionized water in order to obtain a solution with concentration of 10 ppm of zinc chloride. Then the others aqueous working standard solution also prepared with different concentrations from the original

solution. The concentrations of working standard solution were 0.1 to 1 ppm of zinc chloride which was equal to 0.04 to 0.4 ppm zinc ion. After measuring those different concentrations of zinc ion by AAS, a curve drawn for zinc concentration in ppm which is obtained from the device for each concentration as shown in Figure (1).



X = Zinc ion concentration in ppm; Y = Reading value from Atomic Absorption Spectrophotometer.

Figure (1). Standard zinc solution curve in ppm.

Salivary zinc ion concentration was measured for 42 salivary samples by using AAS with zinc cathode lamp. The reading from the device was pointed to the standard solution curve and according to the calibrated curve method; the reading was determined by the use of regression plot to obtain SZLC in ppm.

Statistical Analysis:

The data were analyzed and described statistically by Tables, Figures, mean and standard deviation. The difference between the means value of SZLC and SFR of two groups were made by student t-test. The relationship of SZLC and SFR in each group was tested by Pearson Correlation Coefficient.

RESULTS

Table (1) demonstrates the characteristic of both patients with BMG and control groups by age range, sex ratio, SFR and SZLC. The SFR of patients were analyzed with greatest frequency being observed in range of 0.3 ml / min to < 0.4 ml/ min (22.7 %) while in control group the ranges were 0.5 ml / min to < 0.6 ml / min (25%).The lower limit of SFR in patients group was 0.23 ml / min and 0.3 ml / min in control group. The highest limit of SFR in patients was 1 ml / min and 1.5 ml/ min in control groups as shown in Table (2).

Table (1). Characteristics of patients with BMG and control subjects.

Study group	Study group number	Age range Years	Sex ratio Male: Female	SFR range ml / min	SZLC range ppm
patient	22	5 - 45	1:1	0.23 - 1	0.012 - 0.247
control	20	21 - 50	1:1	0.3 - 1.5	0.012 - 0.428

Table (2). The frequency and percentage of salivary flow rate in both patient and control groups.

Salivary flow rate value ml /minute	Frequency	Percentage %
0.2 - < 0.3	P 4 C 1	18.2 5
0.3 - < 0.4	P 5 C 2	22.7 10
0.4 - < 0.5	P 4 C 4	18.2 20
0.5 - < 0.6	P 1 C 5	4.5 25
0.6 - < 0.7	P 1 C 0	4.5 0
0.7 - < 0.8	P 3 C 3	13.6 15
0.8 - < 0.9	P 2 C1	9.1 5
0.9 - < 1.0	P 2 C 3	9.1 15
≥ 1	P 0 C 1	0 5

P = patient; C = control

The greatest frequency of SZLC was observed in concentration of < 0.1 (59.1 %) in patients group and 50 % in control group. The lower limit of SZLC was 0.012 ppm and the highest limit was 0.247 ppm in patients group whereas in control group,

the lower limit was 0.012 ppm and the highest limit was 0.428 ppm as revealed in Table (3). The mean values and standard deviation observed for each group were reported in Table (4).

Table (3). The frequency and percentage of salivary zinc level concentration in both patient and control groups.

Percentage	Frequency	salivary zinc level concentration ppm
59.1 %	P 13	0 - < 0.1
50 %	C 10	
27.3 %	P 6	0.1 - < 0.2
25 %	C 5	
13.6 %	P 3	0.2 - < 0.3
15 %	C 3	
0 %	P 0	0.3 - < 0.4
5 %	C 1	
0 %	P 0	≥ 0.4
5 %	C 1	

P = patient; C = control

Table (4). Salivary flow rate and salivary zinc level concentration: Means value and Standard deviation

Parameter	Study group number	Mean	Standard deviation
Salivary flow rate MI / min	P 22	0.5459	0.24541
	C 20	0.6840	0.28458
salivary zinc level concentration ppm	P 22	0.09764	0.072752
	C 20	0.13830	0.112698

P = patient; C = control

The means SFR were 0.5459 and 0.6840 for patient and control groups respectively. The means SZLC were 0.09764 for patient and 0.13830 for control groups. SFR was not differ signifi-

cantly between patient and control groups ($P > 0.099$) as shown in Table (5), also SZLC was not differ significantly between both groups ($P > 0.169$) as revealed in Table (6).

Table (5). Comparison of salivary flow rate between patient and control groups.

Parameter	t- value	df	P - value
Salivary flow rate MI / min	-1.684	40	0.099 Non significant

P-value is significant at the level 0.005

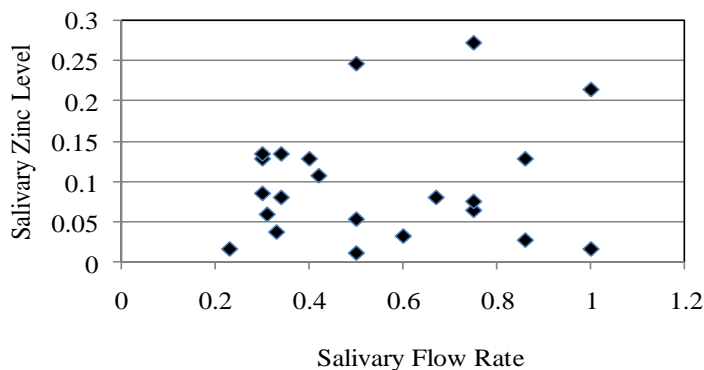
Table (6). Comparison of salivary zinc level concentration between patient and control groups.

Parameter	t- value	df	P - value
salivary zinc level concentration ppm	-1.402	40	0.169 Non significant

P-value is significant at the level 0.005

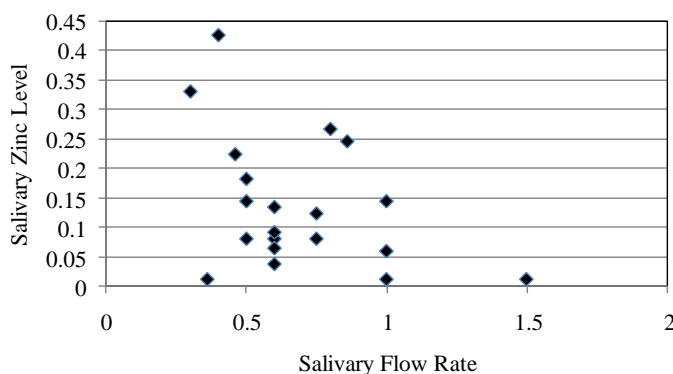
There was no relationship between SFR and SZLC in patient group ($r = 0.122$, P value = 0.05870) as shown in Fig (2). The result of the correlation of SFR and

SZLC in control group was ($r = 0.405$, P value = 0.077), considered as a not significant as demonstrated in Fig (3).



Pearson correlation $r = 0.122$ P value = 0.0587

Figure (2). Correlation of salivary zinc level and salivary flow rate in patient group.



Pearson correlation $r = -0.405$ P value = 0.077

Figure (3). Correlation of salivary zinc level and salivary flow rate in control group.

DISCUSSION

This clinical study was carried out to determine SZLC in normal subjects and patients with BMG, also to compare these findings in relation to SFR.

It has been reported that patients suffering from certain systemic illness and taking medicaments that could produce a collateral effect on the central and peripheral nervous system may present the same alteration in their saliva as those observed in their blood.⁽²³⁾ In this study, salivary sample has a major advantages rather than blood due to simple access and acceptable by the patients and volunteers. Although many predisposing factors have been proposed to explain the causes of BMG, it still remains obscure. There have been numerous reports on conditioned zinc deficiency in various disease status and has been estimated that marginal zinc deficiency is likely to exist worldwide.⁽²⁴⁾ De-

clined or elevated zinc concentration in saliva can be regarded as a favorable indicator for oral health of those patients.

In this study, there was statistically no significant difference of SZLC between patients and control groups; also a negative relationship has been noticed between BMG and SZLC. The clinical significant of these findings are poorly understood, ranging from zinc element being considered as a protective substance to being viewed as a destructive substance.

On the other hand, one study has demonstrated that levels of serum zinc are decreased in patients with BMG. Zinc sulfate is effective in maintaining healthy epithelial tissues and renewing of filiform papillae in patients with BMG and according to this study, they hypothesized that zinc could be the element responsible for BMG inhibition.⁽⁷⁾ However, the results of

this study rejected this proposed hypothesis.

Our data for SZLC in normal control group was quite consistent with Greger and Sickles⁽¹⁴⁾ and similar to another paper by Atilla *et al*⁽¹⁵⁾ who measuring the level of zinc in saliva. Other paper by Mathur *et al*⁽¹⁶⁾ gave much higher salivary zinc level. The reasons for this discrepancy among literatures are not clear; it may be attributed to the methodological and racial differences or type of foods.

The mean of SFR measured in this study was nearly comparable to that reported by many investigators.^(20, 21) The non-significant relationship between SFR and SZLC was found in this study, indicating that decreasing SFR might not result in a reduction of the SZLC. This result disagreed with the result of different studies who found the reverse correlation.^(25, 26)

CONCLUSION

This clinical study could not establish significant association between BMG and both SZLC and SFR.

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