SALIVA AND SERUM MALONDIALDEHYDE LEVELS IN APPARENTLY HEALTHY INDIVIDUALS IN KURDISTAN REGION / IRAQ

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Submitted 1/11/2017; accepted 31/12/2017

ABSTRACT

Background: Saliva is a fluid secreted by the salivary glands and it is divided in to serous and mucus components. Despite its physiological roles in lubricating the oral cavity and digestion, it also acts as a simple diagnostic tool reflecting body's systemic diseases. The aim of the present study is to determine malondialdehyde (MDA) levels in saliva and serum of apparently healthy individuals and to find if there is an association between dental caries, periodontal disease and salivary MDA.

Subject and Methods: This cross sectional study involved sixty fourparticipants who were medical students attending Duhok College of Medicine. Clinical information and all relevant data were obtained according to a questionnaire. Both salivary and serum MDA levels were measured manually in unstimulated saliva and sera of participants using Thiobarbuturic acid method.

Results: Malondialdehyde is measurable in saliva of apparently healthy individuals and was significantly lower than serum MDA level ($p<0.001$). There was a statistically highly significant positive correlation between both salivary and serum MDA levels ($p=0.0007$). Moreover, both Salivary and serum MDA levels were significantly positively correlated with weight and BMI ($p=0.03$, $p=0.03$ and $p= 0.04$ and 0.05) respectively. There were no significant correlations between salivary MDA with dental caries index (dmft score) and periodontal disease index.

Conclusions: Based on the current results, salivary MDA is significantly positively correlated with serum MDA, weight and BMI. No significant association of salivary MDA with dental caries and periodontal disease were observed.

Duhok Med J 2017; 11 (2): 11-18

Keywords: Malondialdehyde, Periodontal disease and saliva.

Saliva is a fluid secreted by salivary glands and about 600 ml is secreted daily[1]. Both serous and mucus components of saliva contain a variety of substances like minerals, enzymes, electrolytes and even immunoglobulins[2]. Despite its physiological roles in lubricating oral cavity and digestion, saliva represents a part of the immune system containing immunoglobulin (mainly IgA) and non-immunological factors (lysozyme, lactoferrin,histatins and salivary peroxidase systems) protecting the oral cavity from different types of antigens. Studies emphasized the role of saliva as a simple diagnostic tool reflecting body's

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systemic diseases[3].

However,Lipid peroxidation has a free radical chain reaction which causes degeneration of cell membranes.

Lipid peroxides are disintegrated quickly and form reactive carbon compounds. Among these, MDA is an important reactive carbon compound which is used commonly as an indicator of lipid peroxidation[4]. Malondialdehyde (MDA) which is the end byproduct of lipid peroxidation has been implicated as a marker for oxidative stress in a variety of pathological conditions including periodontal diseases[5].

Previous studies indicated that increased MDA levels are closely associated with the severity of periodontal disease. In addition, detection of salivary MDA level may provide additional advantages in elucidating the pathogenesis of periodontal disease[6,7]. The aim of the present study is to investigate the possibility of detection and measurement of malondialdehyde in saliva of apparently healthy individuals and to find out if there is any correlation between salivary, serum MDA, BMI and some oral health indices.

SUBJECTS AND METHODS

After receiving an approval letter from medical research ethics committee, this cross sectional study was performed at Department of Medical Physiology from September – December 2017. The study involved sixty four (25 males and 39 females) apparently healthy participants who weresecond stage medical college students at University of Duhok. There ages were ranged between 20-21 years. All participants gave their informed consent. At the beginning, oral examination was done for each participant by a professional dentist and both periodontal index [8] and dmft (decayed, missed, filled teeth)score[9] were estimated according to referenced criteria. This followed by collecting unstimulated saliva and venous blood samples for measurement of MDA levels. Both salivary and serum MDA levels were measured manually using thiobarbuturic acid method[10].

Other relevant parameters such as weight, height and BMI in addition to other necessary information were obtained.Statistical analysis was done using SPSS software version 18. Results were expressed as mean ± standard error. t-Test used to estimate the statistical significance between two variables. One way ANOVA was used to calculate the statistical differences between several variables. The *p* value <0.05 was considered statistically significant.

RESULTS

Demographic characteristics, mean salivary and serum MDA levels of study subjects are shown in **Table 1**.

Table1: Demographic parameters, mean salivary and serum MDA levels of the study group.

Parameters	Mean ± SE	*P* value
Height (cm)	**166 ± 0.02**	
Weight (kg)	**58.62 ± 2.33**	
Body Mass Index (BMI, kg/m^2).	**21.2 ± 0.59**	
Number and percentage of male participants.	**25 (39 %)**	
Number and percentage of female participants.	**39 (61 %)**	
Salivary MDA (ng / ml)	**0.9 ± 0.15**	**< 0.001**
vs	**Vs**	
Serum MDA (ng / ml)	**1.31 ± 0.16**	

https://doi.org/10.31386/dmj.2017.11.2.2

Mean salivary MDA level was significantly lower than serum MDA level (p<0.001. According to gender, there were no statistically significant differences in both salivary and serum MDA levels (p= 0.17 and 0.34) respectively, (Table2).

Table 2: Comparison between mean salivary and serum MDA according to gender.

Parameters	GroupI (male n=25) Mean ± SE	Group II (females n=39) Mean ± SE	*p* value
Salivary Malondialdehyde (MDA), ng/ml	1.04 + 0.79	0.8 + 0.44	0.17
Serum Malondialdehyde (MDA), ng/ml	1.41 + 0.68	1.21 + 0.65	0.34

Based on dmft score and periodontal index, mean salivary and serum MDA levels didn't show statistically significant differences, (Tables 3).

Table 3: Comparison between mean salivary and serum MDA according to dmft score and periodontal index.

dmft Score/ Periodontal Index	Salivary Malondialdehyde (MDA), ng/ml	Serum Malondialdehyde (MDA), ng/ml
dmft Score (0-6), N = 45	0.89 ± 0.18	1.29 ± 0.19
dmft Score (7-12), N = 19	0.86 ± 0.24	1.36 ± 0.35
p value	0.45	0.42
Periodontal index 0-0.2 N = 30	0.92 ± 0.22	1.36 ± 0.26
Periodontal index 0.3-0.9 N = 24	0.91 ± 0.27	1.28 ± 0.29
Periodontal index 1-1.9 N = 8	0.79 ± 0.52	1.23 ± 0.4
Periodontal index 2-more N = 2	0.51 ± 0.45	1.33 ± 0.69
p value	0.788	0.962

Table 4, shows the spearman's correlation coefficient between both serum and salivary MDA with other parameters.

Table 4: Spearman's correlation coefficient between MDA and other parameters

Parameters	*r* value	*p* value
Salivary MDA – Serum MDA	0.41	0.0007
Salivary MDA – height	0.138	0.2
Salivary MDA – weight	0.265	0.03
Salivary MDA – BMI	0.268	0.03
Salivary MDA – dmft	- 0.08	0.4
Salivary MDA – perio	- 0.16	0.1
Serum MDA – height	0.1	0.4
Serum MDA – weight	0.241	0.048
Serum MDA – BMI	0.231	0.05
Serum MDA – dmft	0.09	0.45
Serum MDA – perio	- 0.007	0.9

There was a statistically highly significant positive correlation between salivary and serum MDA levels p=0.0007, (figure - 1). Salivary MDA was significantly positively correlated with both weight and BMI (p=0.03). Serum MDA as well displayed significant positive correlations with weight and BMI (p= 0.04 and 0.05) respectively. There were no significant correlations between salivary MDA with dmft score and periodontal index.

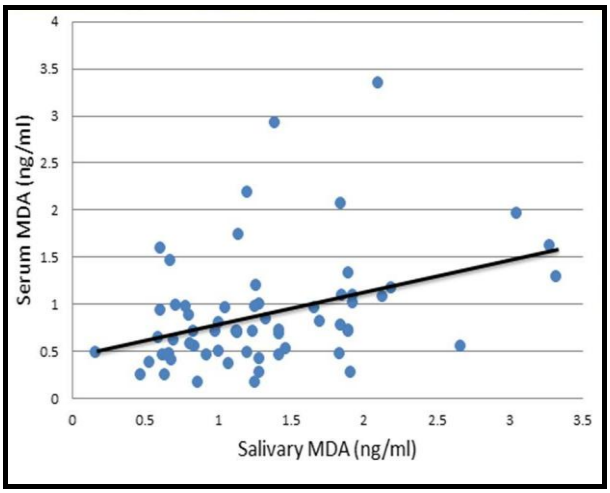

Figure 1: Correlation coefficient between salivary and serum MDA.

DISCUSSION

This cross – sectional study was conducted on a group of apparently healthy subjects of same age group and of both gender. Unstimulated salivary sample were used to detect and measure MDA, because unstimulated saliva contains higher concentrations of screening and diagnostic biomarkers[11].In the current study, MDA was detected and measured spectrophotometrically in saliva and serum, salivary MDA was about 31.3% lower than serum MDA (0.9 vs 1.31ng/ml, $p<0.001$). Comparison of salivary and serum MDA levels between males and females were statistically not significant; similar finding were observed by Motamayel et al[12]; However, Block et al[13] found significantly higher lipid peroxidation among women but they were unable to explain this difference and hypothesized that to the higher percentage of body fat in women. In contrary Tothova et al[14] found Thiobarbituric acid reacting substances (TBARS) concentration in saliva sample of boys was significantly higher than girls.

No significant different in salivary and serum MDA levels were detected between those with low dmft score (0-6) and high dmft score (7-12) and also no significant correlations were observed between dmft score with salivary and serum MDA levels. Rai et al [15] reported no statistical different in salivary MDA level between caries-free subject and those with dental caries, moreover, Tothova et al [14]found that caries index as a marker of dental status is not a significant determinant of salivary MDA level. The possible reason behind such no difference may be the subjects involved in this study are well educated person and probably they routinely and regularly brush teeth and have good oral hygiene.

Previous studies showed significantly higher level of MDA is periodontitis[12, 15, 16] with higher lipid peroxidation in patients with severe but not moderate periodontitis, however in the current study no significant difference in salivary and serum MDA levels were observed according to periodontal index, with no significant correlation, most of the subject involved in study have no or mild periodontitis, periodontal index was between 0-0.9 in 54 subjects out of total 64.

There was highly significant positive correlation between salivary and serum MDA levels ($p=0.0007$). Smriti et al[17]found strong and significant positive correlation between serum and salivary MDA in both controls and diabetics. This indicates that salivary MDA in diabetic patients may result from a state of systemic dyslipidemia and serum composition is reflected in the saliva composition.

Present study showed significant positive correlations between MDA (serum and salivary) with weight and body mass index. Similar findings were observed by Atabay et al [18] indicating that increases in serum and salivary MDA levels associated with increased weight and BMI, regardless of periodontal status, are reflective of increases in oxidative stress as a result of obesity. Obesity may be described as a state in which systemic, low-grade inflammatory stimulus can produce oxidative stress [18]. In contrast to our findings Blok et al [13] found that body mass index is not associated with MDA.

 https://doi.org/10.31386/dmj.2017.11.2.2

The limitations of this study were small sample size, subjects were of same age group and all were medical college students. Therefore, further studies are indicated with larger sample size, different age groups and from different sectors and occupations in the community.

In conclusion; according to the current findings, salivary MDA is significantly positively correlated with serum MDA, weight and BMI. No significant association of salivary MDA with dental caries and periodontal disease were observed.

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 https://doi.org/10.31386/dmj.2017.11.2.2

ثوختة

هەلسەنگەندنا مالون دایناەلدیهاد دخوییندێ وسیرومێ دا ل دەف کەسێن ساخلەم ل هەرێما کوردستانێ/ عیراق

پاشەکی و ئارمانج: خوزی رشتنەکە د ئێتە چێکرن ژلایێ رژێنێن خوزییڤە و جورێن زەلال و تاری پێك دئێت. سەرەرای کارێن وێ بێن فسیولوجی وەك تەرکرنا دەڤی و هەرسکرنا خوارنێ، دئێتە بکارئینان وەك رێکەکا بسانەهی بو دەستنیشانکرنا نەخوشیان. ئارمانجا ڤێ ڤەکولینێ دا دیار کەین ئەرێ مالون دایئەلدیهاید دئێتە دیتن و قەبارەکرن د خوزییدا و دیارکرنا گرێدانا قەبارێ وی د خوزییدا دگەل قەبارێ وی د خوینێدا.

رێکێن ڤەکولینێ: ئەڤ ڤەکولینا پان هاتیە ئەنجامدان ب پشکداریا 64 قوتابیێن کولیژا پزیشکی/ زانکویا دهوك. پێزانینێن کلینیك هاتنە تومارکرن. قەبارێ مالون دایئەلدیهاید هاتە پشکنینکرن د خوزییێ و د خوینێدا بریکا ترشێ تایوباربیچیورئیك.

ئەنجام: مالون دایئەلدیهاید هاتە دیتن و قەبارەکرن دخوزیا کەسێن ساخلەمدا و رێژەیەکا بەرچاڤ کێمتر بوو ژ مالوندایئەلدیهایدێ خوینێ ($P < 0,001$) ئەنجامان دیارکر گرێدانەکا بەرچاڤ و پوزیتیڤ لناڤبەرا مالون دایئەلدیهاد د خوزیێ و د خوینێدا. زێدەباری ڤێ چەندێ گرێدانەکا بەرچاڤ و پوزیتیڤ هەبوو دناڤبەرا رێژا مالون دایئەلدیهاید د خوزییدا دگەل کێشا لەشی و BMI($P = 0,03$, $P = 0,03$, $P = 0,04$ and $P = 0,03$) لدیف ئێکدا.

چ پەیوەندییێن بەرچاڤ دناڤبەرا رێژەیا مالون دایئەلدیهاید د خوزییدا دگەل DMFT و پیڤەرێ نەخوشیا دەوروبەرێن ددانا نەبوون.

دەرئەنجام: پالپشت بڤان ئەنجامان مالون دایئەلدیهاید یێ هەی و دئێتە قەبارەکرن د خوزییا کەسێن ساخلەمدا و پەیوەندیەکا بەرچاڤ و پوزیتیڤ هەیە دگەل مالون دایئەلدیهاید د خوینێدا و کێشا لەشی و BMI. چ پەیوەندییێن بەرچاڤ دناڤبەرا رێژەیا مالون دایئەلدیهاید د خوزییدا دگەل DMFT و پیڤەرێ نەخوشیا دەوروبەرێن ددانا نەبوون.

الخلاصة

قياس المالون دايألديهايد فى اللعاب والمصل لدى الاشخاص الطبيعيين في اقليم كردستان/العراق

الخلفية والأهداف: اللعاب هو سائل يفرز من قبل الغدد اللعابية و يتكون من السوائل المصلية والمخاطية. بالاظافة الى الوظيفة الفسلجية للعاب المتمثل بترطيب التجويف الفمي و الهضم, يستخدم كوسيلة تشخيص سهلة ينعكس امراض الجسم. الهدف من البحث هو بيان مدى امكانية قياس المالون دايألديهايد في عينات لعاب الاشخاص الاصحاء و هل هناك علاقة بينتركيز المالون دايألديهايد الموجود في عينات اللعاب و مصل الدم.

طرق البحث: تضمنت هذة الدراسة العرضية64 مشاركا اصحاء الذين كانوا طلاب كلية الطب في جامعة دهوك. بعد الحصول على المعلومات المطلوبة,تم قياس(مالون دايألديهايد) في عينات اللعاب و دم المشاركين باستخدام طريقة حامض ثايوباربوجوريك.

النتائج: تمكن ايجاد و قياس المالون دايألديهايد في عينات لعاب المشاركين الاصحاء وكان التركيز اقل و معنوي احصائيا من المالون دايألديهايد الموجود في عينات الدم ($p<0.001$). أظهرت النتائج وجود علاقة موجبة و معنوية احصائيا بين تركيز المالون دايألديهايد في عينات الدم واللعاب. أظافة كانت هناك علاقة موجبة و معنوية احصائيا بين تركيز مالون دايألديهايد في اللعاب و الدم مع الوزن و مؤشر كتلة الجسم ($p=0.03$, $p=0.03$ and $P = 0.04$ and 0.05). لم يتم ايجاد علاقة معنوية بين تركيز مالون دايألديهايد في اللعاب و مقياس DMFT ومؤشر مرض ما حول السن.

الاستنتاجات: استنادا الى هذه النتائج توجد علاقة موجبة ومعنوية بين المالون دايألديهايد في عينات لعاب و بين تركيز مالون دايألديهايد في المصل و الوزن و مؤشر كتلة الجسم. لم يتم ايجاد علاقة معنوية بين تركيز مالون دايألديهايد في اللعاب و مقياس DMFT ومؤشر مرض ما حول السن.

 https://doi.org/10.31386/dmj.2017.11.2.2