OXIDATIVE STRESS IN DENTAL CARIES AND PERIODONTAL DISEASE AMONG SECONDARY SCHOOL STUDENTS IN DUHOK, KURDISTAN REGION, IRAQ

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ABSTRACT

Background: The main oral health concerns and markers of the oral health burden globally are dental caries and periodontal diseases. In the etiology and pathogenesis of various oral disorders, including dental caries and periodontal diseases, oxidative stress has been involved. The most commonly investigated markers of oxidative stress reactions include lipid peroxidation, protein oxidation, and antioxidant status.

Aim: The aim of the study was to evaluate the interrelation between markers of salivary oxidative stress on dental caries and periodontal disease among secondary school students in Duhok City.

Material and methods: Across a sectional study performed on a randomized sample of 809 high school students (395 females and 414 males) aged 14-20 years from eight secondary schools from 4 quarters of Duhok city from December 2018 to May 2019. Unstimulated saliva was collected for the analysis of total antioxidant capacity (TAC) and Malondialdehyde (MDA) followed by a clinical examination. Dental caries assessment was performed using the Decayed, Missing, and Filled/Teeth (DMFT) index and periodontal status were evaluated using the Gingival Index (GI) and the Plaque Index (PI). Subsequently were divided into high caries ≥ 5 and low caries group < 5 according to caries status; furthermore, they were subdivided according to the periodontal status into students with healthy/mild gingivitis and students with moderate/severe gingivitis.

Results: The study results showed that there was no significant difference between the mean TAC levels in terms of decay status and periodontal disease in females (p=0.057), males (p=0.110) and the whole sample (p=0.741). Concerning the MDA and the decayed status, the mean MDA level was higher in those with DMFT of ≥ 5 relative to those with DMFT <5 in the entire sample and male patients. While the difference between females was not significant between the two DMFT groups (p = 0.473). Significantly, higher MDA levels (p<0.01) were found in males with moderate to severe gingivitis compared with those with mild gingivitis. However, the difference among females was not significant (p = 0.890).

Conclusions: MDA levels were relatively higher among students of the high caries group and periodontal disease, suggesting that oxidative stress is correlated with the process of dental caries and periodontal disease.

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Keywords: Dental caries, Malondialdehyde, Oxidative stress, Periodontal disease, Total antioxidant capacity.

Oral health is an integral part of overall health and has a significant impact on the quality of life. The main oral health problems and measures of the oral health burden worldwide are dental caries and periodontal diseases[1,2]. Oxidative stress arises as a state of disruption between the development of free radicals

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and the antioxidant system's ability to overcome their effects[3]. Oxidative stress and Reactive Oxygen Species (ROS) have a major role in the pathogenesis of many diseases. ROS damage to DNA (4), lipids, protein and enzymes contributes to the damage of tissue[5,6]. Oxidative stress has been implicated in the etiology and pathogenesis of dental caries and periodontal diseases[6-13]. Several studies on the role of saliva antioxidants have recently reported that imbalances between free radicals and saliva antioxidants may play an important role in the initiation and development of dental caries[6-11]. Salivary antioxidants consist of salivary uric acid, salivary peroxidase, and various minor enzymes. The integrated ability to counter oxidative stress of these enzymes is often called the total antioxidant capacity (TAC) of saliva[10]. Jurczak et al. reported that the strong antioxidant defense resulted in the inactivation of ROS, thereby making cariogenic bacteria more vulnerable to multiplication and differentiation. Additionally, the saliva antioxidant mechanism, such as reduced glutathione (GSH), oxidized glutathione (GSSG), and Total antioxidant capacity TAC (with the exception of the host immune system cell antioxidant protection systems), assists in the degradation of resistance to the oral cavity colonizing bacteria, ensuring their enhanced vulnerability to various forms of stress[11]. Oxidative stress has been associated with the development of periodontal disease, induced by disruption of host inflammatory regulation in response to bacterial infection[12-14]. The overgrowth of bacteria causes periodontal disease. When this occurs, free radicals are mainly over-produced by overactive neutrophils. If antioxidants do not balance these free radicals, they will cause tissue damage[13]. The prevalence of dental caries and periodontal disease is remarkable[15]. Generally, ninety seven percent of people are affected by dental caries during their lifetime. In total, 59% of children between the ages of 12-19 would have at least one recorded cavity[2].

Likewise, periodontal diseases, consisting of gingivitis and periodontitis, are highly prevalent and can affect up to 90 % of the worldwide population. Previous studies have shown that the prevalence of gingivitis is over 80.0% in children and adolescents[16,17].

To gain insight into the association between dental caries, periodontal disease and oxidative stress, we measured salivary Malondialdehyde (MDA) and total antioxidant capacity (TAC) and analyzed its relation to both dental caries and periodontal disease.

MATERIALS AND METHODS

The study has been carried on a sub sample selected from a previous study conducted on 809 randomly selected high school students aged 14 to 20 years in Duhok city, Kurdistan Region, Iraq, from October 2018 to May 2019; Measuring the prevalence of dental caries and periodontal disease (Hamonari et al. 2020, accepted for publication in JCRD).

Scientific and ethical approval for the study was authorized by the Scientific Committee of the College of Dentistry/University of Duhok (approval no. 690). Also, prior to visiting selected schools, clearance from the Directorate-General for Education in Duhok was obtained by receiving a formal request

from the College of Dentistry (approval no. 18064), the school authorities were contacted, and the study purpose was clarified to them. The aim was outlined to all students. In the presence of headmasters, verbal informed consent was obtained from all students. Participants were informed that they would be able to withdraw from the study at any time.

The clinical dental examination

The dental examination was performed by one of the authors, who is a specialist dentist under standardized conditions using a disposable mouth mirror, calibrated periodontal probes, masks, and gloves in their schools on a regular classroom chair using daylight.

The status of dental caries was recorded using the index of decayed, missing, and filled/teeth (DMFT). The analysis of dental caries was carried out and reported according to the criteria of the WHO[18]. The examination was implemented in a systematic approach starting from the last upper right molar proceeding in an orderly manner from one tooth or tooth space till the last lower right molar. Only extensive, clinically visible carious surfaces were reported, and this is consistent with the WHO recommendation for the definition of dental decay as "cavities with a softened dentin floor." For this study, students have been categorized into two groups; the high caries group (HCG) comprised students who had (DMFT ≥5), and the low caries group (LCG) comprised students who had (DMFT <5). Adolescents with at least five decayed teeth needing restoration have been classified as active caries according to WHO criteria[6,18].

The following indices have been reported for assessing the periodontal status of the studied participants: Plaque Index (PI) of Silness and Loe[19], and Gingival Index (GI) of Loe and Silness[20]. The examination procedure includes evaluating four surfaces (buccal, lingual/palatal, mesial, and distal) of six index teeth[18,23,26,38,43,46]. The presence of dental plaque (PI) and gingivitis (GI) was measured based on four surfaces of the index teeth referred to in order to determine the presence/absence of symptoms of the indicated indices. The sites were probed with an elaborated periodontal probe, waiting 10 seconds to confirm the presence or absence of gingival bleeding, the existence of dental plaque was evaluated if it was observed with the naked eye or if there was an excess of soft matter in the gingival pocket and/or on the tooth and gingival margins (score 2 and 3 respectively, according to PI)[19] and regarded as present if the characteristic sign was seen on at least one site. Gingivitis was reported to be present when at least one location showed bleeding during examination (scores 2 and 3 according to GI)[20].

Saliva sampling

Unstimulated whole-saliva samples were collected between 9:00, and 10:00 am prior to clinical examination. During a 10-min duration of the restricted conversation, the respondents were positioned correctly and were guided to allow saliva to accumulate in the bottom of the mouth and drain it into a sterile saliva-collecting vial and not to swallow any saliva for the duration of the collection, keeping the head inclined mildly forward. Approximately 2 mL of unstimulated total saliva obtained was centrifuged for 10 minutes at 3000 rpm to extract cell debris.

The salivary samples were placed on ice, stored at 4 ° C and moved within 20 minutes to the laboratory and held at 80 ^{0}C until the analysis was carried out[21].

Biochemical analysis of saliva:

Total Antioxidative Capacity (TAC)

TAC was assessed by the TAC kit commercially available (Assay Kit Rel Diagnostics, Turkey). Measurements were done as instructed by the manufacturer.

The TAC assay had been based on radical reduction measurements of 2,2'-azino-bis (3-ethylbenzothiazoline-6-sulphonic acid; ABTS). For salivary TAC measurements, 225 µl assay Reagent 1 (acetate buffer, pH 5.8) was combined with 5 µl saliva and absorbance was measured at 420 nm after 30 s of incubation. 20 µl of reagent 2 (ABTS, 30 mM in acetate buffer, pH 3.6) was subsequently added to each sample, and absorption at 420 nm was measured after 5 min of incubation. Before and after the addition of Reagent 2, the TAC was calculated on the basis of the 420 nm absorbance variations. The test was calibrated with trolox and the results were presented in the form of mMtrolox per literequivalent[9].

Malondialdehyde (MDA)

MDA reacts with thiobarbituric acid (TBA) to give a pink color. This was read at 535nm[22].

A mixture of 0.375 g of thiobarbituric acid, 15 g of trichloroacetic acid and 2.21 mL of 0.25 N HCl was used to formulate MDA reagents. To dissolve the ingredients, the sample solution has been warmed and kept at 4° C.

16.4l of the standard Malonaldehyde solution was taken and made up to 100ml with distilled water. The sample of saliva was mixed with the MDA reagent.

One mLof TCA-TBA-HCl reagent was added to the diluted sample. The obtained samples were placed for 15 minutes in a boiling water bath. The reaction mixture was cooled and centrifuged.

The supernatant was taken, and the optical density of the pink color formulated was read at 535 nm. The Malondialdehyde concentration in the sample was calculated by plotting the absorbance obtained against the standard graph. The optical density of the pink color formed was directly proportional to the concentration of Malondialdehyde in the given sample. The optical densities of the test samples were calculated by plotting against the standard graph and multiplied by the respective dilution factors, and the final concentration was expressed as µM/100 mL.

STATISTICAL ANALYSIS

Statistical analyses were performed using the Statistical Package for Social Sciences (SPSS, version 22). The Chi-square association test was used to compare the proportions. The exact Fisher test was used when the expected count of more than 20% of the cells in the table was less than 5. The student test of two independent samples was used to compare two means. The paired t-test was used to compare the means of the same sample before and after the intervention. The McNemar test was used to compare the proportions of the same sample, both before and after an intervention. A p-value of $\leq$ 0.05 was considered to be statistically significant.

RESULTS

The total sample size that had been studied was 809. The mean age ± SD was 16.87 ± 1.16 years, which ranged between 14 and 20 years. The median was 17 years. Table 1 shows that the highest proportion (61.7%) of the sample aged 16-17 years, 32.9% of the females were aged 18-20 years compared with 21.7% of the males (p< 0.001). The mean age of females (17.1 years) was significantly higher than in the males (16.7 years) (p< 0.001).

Table 1. Distribution of demographic characteristics by age and gender

	Female		Male		Total		p-value
Age (years)	No.	%	No.	%	No.	%	
14-15	12	3.0	78	18.8	90	11.1	
16-17	253	64.1	246	59.4	499	61.7	
18-20	130	32.9	90	21.7	220	27.2	< 0.001
Mean (±SD)	17.1	(±1.1)	16.7	(±1.2)			< 0.001
Total	**395**	**100.0**	**414**	**100.0**	**809**	**100.0**	

* p ≤ 0.05 (Significant), ** By Chi-square test.

Table 2 shows that there was no significant difference in the mean of the total antioxidant levels regarding the decayed status in females (p = 0.057), males (p = 0.110), and in the whole sample (p = 0.741). Concerning the MDA and the decayed status, the mean MDA level was higher in males with DMFT of ≥ 5 (2.94 nmol/L) compared with 2.62 nmo/L among those with DMFT of < 5 (p = 0.016) Considering the whole sample, the mean value was also higher among those with DMFT of ≥ 5 (2.58 nmol/L) compared with 2.28nmol/L among those with DMFT of < 5 (p< 0.001). While the difference in females was not significant between the two DMFT groups (p = 0.473).

Table 2. Total antioxidant capacity and Malondialdehyde by decay status and gender

	Decay status				
	DMFT< 5		DMFT ≥ 5		
	Mean	(±SD)	Mean	(±SD)	p-value*
Female					
TAC(mmol/L)	1.33	(±0.67)	1.20	(±0.64)	0.057
MDA(nmol/L)	2.06	(±0.79)	2.00	(±0.78)	0.473
Male					
TAC(mmol/L)	1.17	(±0.66)	1.28	(±0.68)	0.110
MDA(nmol/L)	2.62	(±1.23)	2.94	(±1.33)	0.016
Whole sample					
TAC(mmol/L)	1.26	(±0.67)	1.25	(±0.67)	0.741
MDA(nmol/L)	2.28	(±1.02)	2.58	(±1.24)	< 0.001

* p ≤ 0.05 (Significant), **Unpaired t-test

Table 3 shows no significant difference between patients with mild gingivitis and patients with moderate or severe gingivitis regarding the mean of the total antioxidant

capacity among females only (p = 0.452), among males only (p = 0.365), or in the whole sample (p = 0.269). In contrast, the means of the Malondialdehyde were significantly (p< 0.001) higher among those with moderate or severe gingivitis compared with those with mild gingivitis males only or in the whole sample. However, the difference was not significant among females (p = 0.890).

Table 3. Total antioxidant capacity and Malondialdehyde by the severity of gingivitis and gender

	Severity of Gingivitis				
	Mild		Moderate / Severe		
	Mean	(±SD)	Mean	(±SD)	p-value*
Female					
TAC(mm0l/L)	1.25	(±0.66)	1.30	(±0.66)	0.452
MDA(nmol/L)	2.03	(±0.93)	2.04	(±0.65)	0.890
Male					
TAC(mm0l/L)	1.20	(±0.71)	1.26	(±0.66)	0.365
MDA(nmol/L)	2.46	(±1.35)	3.02	(±1.23)	< 0.001
Whole sample					
TAC(mm0l/L)	1.22	(±0.68)	1.28	(±0.66)	0.269
MDA(nmol/L)	2.23	(±1.16)	2.58	(±1.12)	< 0.001

* $p \leq 0.05$ (Significant), **Unpaired t-test

DISCUSSION

In the current study, an attempt was done to evaluate the salivary total antioxidant capacity and Malondialdehyde levels in secondary school students and to clarify its relation with the severity of caries and periodontal disease. The most noticeable fact of the present study was the appearance of high levels of the salivary MDA in males with moderate to severe gingivitis compared with those with mild gingivitis?

Saliva has been used as a diagnostic tool; it is well recognized as a biomarker source in the diagnosis and prognosis of diseases[23.24]. Saliva may be a substitute for blood as a non-invasive and safe route. Saliva collection is relatively safe and helps in the early detection of oral diseases, such as dental caries and periodontal diseases. Studies have demonstrated the potential importance of saliva since there is a significant association between salivary parameters and oral diseases[7,8,23,24]. Biomarkers of oxidative stress may be identified at measurable levels in saliva since they are persistent in this fluid. The saliva concentrations of these biomarkers indicate specific oxidation pathways related to caries and periodontal disease. Biomarkers including TAC and MDA to identify free radicals have been shown to be present in the saliva of children and adolescents[24]. The antioxidant capacity of saliva could be a key factor in determining the outcome of the disease in the oral cavity. Different pathological alterations within the oral cavity could be attributed to decreased saliva oxidant capacity[25], which may increase MDA production, MDA is one of the major by-products of lipid

peroxidation that is developed in saliva in the host tissue cells, resulting in lower immune response. Some antioxidant mechanisms in oral fluids and cells disturb ROS production and free radicals to prevent oral disease[7].

This study showed no significant difference in TAC levels between DMFT>5 and DMFT<5 groups. A study by Ahmadi-Motamayel et al.[6], also supported this observation. Salivary and serum TAC levels in 15-19-year-old students with active caries and caries-free groups did not show statistically significant differences. Whereas other studies have shown that saliva TAC was significantly lower in students with dental caries relative to those without dental caries among students of the same age group[8,9], while other studies have found significantly greater levels of TAC in caries-active adolescents than caries-free controls[7,25]. In certain studies, antioxidant components in saliva were associated with dental caries. However, no significant relationship was reported. Perhaps the TAC of the saliva sample is more relevant in relation to dental caries than any single component which is a part of the salivary TAC as implied in these studies[25]. According to the presented findings, TAC of saliva linked to dental caries was not influenced by the gender of the students, the same results observed by other studies[6,9].

The reason for the controversy seen in various studies could be attributed to different methods of calculating TAC level, sample size, research population, the methodology of selection of cases, or rather high levels of oxidative stress.

The results of this study confirm a higher level of MDA in the caries-active group relative to the caries-free group, which is similar to the results of other studies[6,26, 27].

In the current study, MDA level was significantly higher among males than females, on the contrary, another study has revealed elevated levels of MDA in females than males[6].

The high challenge of oxidative stress associated with a decreased antioxidant capacity could play an essential part in periodontal pathogenesis[14].

It is important to note that MDA levels were significantly higher among those with moderate/ severe gingivitis than those with mild gingivitis. This is consistent with other studies that have reported higher MDA levels in periodontal disease that have increased with worsening periodontal status[14,28]. Furthermore, Tóthová et al. found that in periodontal disease, salivary levels of lipid peroxidation products, protein oxidation markers, and DNA damage markers were higher[24]. That confirms increased radical activity of oxygen during periodontal inflammation, MDA synthesis could be due to a decrease in antioxidants destroyed in periodontal tissues[14]. Local and systemic prescriptions of antioxidants may be beneficial in reducing oxidative stress levels in periodontal diseases and may have potential benefits for patients' overall health.

Limitations

The limitations of the present study were that antioxidant and oxidative stress were not assessed on the basis of disease severity and therapy. Research on the assessment of MDA levels in terms of disease severity and therapy might be

effective in the early diagnosis and prevention of periodontal disease.

In future studies, the contribution of other variables such as age, diet, genetics, smoking, physical activity, obesity, hormones, and stress must be addressed.

More longitudinal research should also be conducted out in the future to find out the actual impact of dental caries and periodontal disease on TAC and MDA levels.

CONCLUSION

The current study found no significant differences in salivary TAC in participants with dental caries and periodontal disease compared to healthy controls. The oxidative stress marker was significantly higher in the caries group than in the healthy control group, and elevated MDA levels were also observed in periodontal patients, suggesting that increased oxidative stress may be associated with dental caries and periodontal disease.

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پوختە

رولێ تەئکسدی دکریمبونا ددانا ونەساخیێن پدییا دناف قوتابییێن دواناوەندیا لدهوکێ – هەرێما کوردستان

پێشەکی: کریمبونا ددانا ونەساخیێن پیدیا ئەو ژئاریشێن سەرەکی نە بو ساخلەمیا دەڤی ونیشانێن بارگرانیا تەندروستیا دەڤی نە لەەمی جیهانێ" هندیکە رولێ تەئکسیدێ توشبوی ب ئەگەران وئەگەرە بو گەلەك نەساخیێن دەڤی" ژوان نەساخیان کرمیبونا ددانان ونەساخیێن پیدیا، دهێتە هژمارتن بیروکسیدێ دوەنی وئەکسیدێ پروتینا وبارودوخێ دژی ئەکسیدی ژنیشانێن پترتر ئەوێن دهێنە دیار کرن ودوبارە بوە بەشداریکرنا وئستیانا ئەکسیدی.

ئارمانج: ئارمانجا ئەڤێ خواندنێ بو هەلسەنگاندنا رولی ئەکسیدیێ دە ور وبەرێن دادانێن کلور بوی ونەساخیێن پیدیا لدەف قوتابییێن قوتابخانێن دواناڤنجیا لباژێرێ دهوکێ.

رێکێن ڤەکولینێ: پارچەك ژڤێ دیفچونێ بسەرڤەی ئەم گەهاندینە هەر ژ809 قوتابیان لڤان قوتابخانەییێن دواناڤنجی (395 مێ و414 نێر) کو ژیێ وانا دکەڤیتە دناڤ بەرا 14–20 سالیی دهەشت قوتابخانەییێن دواناڤنجی بکار ئینانا چاڤەکێ بسەرڤەی دچەند قوناغاندا لـ 4 بارەگایین باژێرێ دهوکێ ژ دسیمبرا 2018 بو مایویا 2019 دیفچون یا بو هاتیەکرن ژلایی Malondialdehyde (MDA) و (TAC)، هندیکە یاریپێکرنە نە پالدەرن هەمی بدوماهیك دهیتن بپیڤانا شیانن کومکری بو دژاتیا ئەکسیدی ودوماەیك هاتنا پیڤانا بارودوخێ پیدیا (DMFT) بپشکنینا بزیشکی، ئەڤ پیڤەرە بدوماهیك دهێتن ببارودوخێ کلوربونا ددانان دماوێ نیشانێن کلوربونی ونەمان وتژیبونا ددانان. پشتی ڤێ دێ دبەشکرنا وان بو کلوربونا بلند ≤ 5 وکومەك ژکلوربونا نزم <5 گونجای دگەل بارودوخی (PI) وئاماژەیا بلاك (GI) بکارئینانا ئاماژەیی پیدیێ وکلور بونا ددانان. سەرەرای ڤێژی دابەشبونا وانا دوماهیك دهیتن بگونجانیا بارودوخێ پیدیا بو قوتابیی توشبوی بئیلتیەابا پیدیی تەندروست / سڤك وقوتابییێن توشبوی بئیلتیەابا پیدیێ ناڤنجی / دژوار.

ئەنجام: ئەنجامێن ڤەکولینێ ئاماژەیێ ددەنە نەبونا جێوازیەکا رەوشتی ودەرونی دناڤەندا ئاستاندا TAC ئەوێن گرێدای ببارودوخێ رزیاتیێ ونەساخیێن پیدیا، چ دناڤ بەرا رەگەزێ مێ بتنێدا بیت (p= 0.057) ودناڤ بەرا رەگەزێ نێردا بتنێ (p= 0.110) یان نیشاندنا تمام (p= 0.741). وەختەکێ گرێدای بـMDA وبارودوخێ شروڤەکری، ئەوا ناڤنجی یا بلند ئەوێن لدەف وانا هەین DMFT بقەبارەیێ 5 برێژەیا ئەوێن لدەف وانا هەین DMFT <5 دنیشاندانەکا تمامدا ونەساخیا نێرا. ددەمەکێدا کو جێوازی دناڤبەرا مێیاندا نە جێوازیەکا رەوشتی ودەرونی یە دناڤ بەرا هەردوو کوماندا (p = 0.473 DMFT).

وهەر وەکی وان ئەو دناڤنجی نە MDA بلندترین شیانێن دەرونی (P <0.001) دناڤ بەرا توشبوییێن ئیلتیەابا پیدیا ئەوێن ناڤنجی یان دژوار وبەراوردکرنا وانا بتوشبوییێن ئیلتیەابا سڤك یا پیدیا چ دناڤ بەرا رەگەزێ مێدا بتنێ بیت یان نیشادانا تمام، بەلێ پا جێوازی نەیا شیانێن دەرونی یە دناڤ رەگەزێ مێدا(p = 0.890)

دەرئەنجام: هندیکە ئاستێن MDA بلندترین ئاستن دناڤ بەرا قوتابیاندا ژکوما بلندترین ئاستێن کلور بوییێن ددانا یان نەساخیێن پیدیا، یا ئیشارەت کریە بو وەستیانا ئەکسیدی یا گرێدای بکارێ کلور بونا ددانا ڤە ونەساخیێن پیدیا.

الخلاصة

دور التأكسد في تسوس الأسنان وأمراض اللثة لدى عينة من طلبة المرحلة الثانوية في مدينة دهوك – إقليم كوردستان

الخلفية والأهداف: تسوس الأسنان واضطرابات اللثة هي المشاكل الرئيسية لصحة الفم ومؤشرات عبء صحة الفم في جميع أنحاء العالم. لقد كان الإجهاد التأكسدي متورطًا في المسببات والتسبب في العديد من أمراض الفم ، بما في ذلك تسوس الأسنان وأمراض اللثة. تعتبر بيروكسيد الدهون وأكسدة البروتين وحالة مضادات الأكسدة من أكثر المؤشرات التي يتم اختبارها بشكل متكرر لتفاعلات الإجهاد التأكسدي.

الهدف: تهدف الدراسة إلى تقييم مؤشرات الإجهاد التأكسدي اللعابي حول تسوس الأسنان وأمراض اللثة لدى طلاب المدارس الثانوية في مدينة دهوك.

طرق البحث: أجريت دراسة مقطعية على عينة عشوائية من 809 من طلاب المدارس الثانوية (395 إناث و 414 ذكور) تتراوح أعمارهم بين 14–20 سنة من ثماني مدارس ثانوية باستخدام عينات عشوائية متعددة المراحل في 4 أرباع مدينة دهوك من ديسمبر 2018 إلى مايو 2019. كان اللعاب غير المحفز تم جمعها لتقييم القدرة الإجمالية لمضادات الأكسدة (TAC) و Malondialdehyde (MDA) ، متبوعًا بالفحص السريري. تم تقييم حالة تسوس الأسنان من خلال مؤشر التسوس والمفقود والمملوء / الأسنان (DMFT) وتم تقييم حالة اللثة باستخدام مؤشر اللثة (GI) ومؤشر البلاك (PI).بعد ذلك تم تقسيمهم إلى تسوس مرتفع ≤ 5 ومجموعة تسوس منخفضة <5 وفقًا لحالة تسوس الأسنان ، علاوة على ذلك تم تقسيمهم وفقًا لحالة اللثة إلى طلاب مصابين بالتهاب لثة صحي / خفيف وطلاب مصابين بالتهاب لثة متوسط / شديد.

النتائج: أشارت نتائج الدراسة إلى عدم وجود فرق في متوسط مستويات TAC فيما يتعلق بحالة تسوس الاسنان وأمراض اللثة. سواء بين الإناث فقط (p = 0.057) ، بين الذكور فقط (p = 0.110) ، أو في العينة بأكملها (p = 0.741). فيما يتعلق بـ MDA والحالة المتحللة ، كان المتوسط أعلى في أولئك الذين لديهم DMFT بمقدار 5 بالنسبة لأولئك الذين لديهم DMFT <5 في العينة بأكملها والمرضى الذكور. في حين لم يكن هناك فرق بين الإناث بين مجموعتيDMFT p= 0.473. وبالمثل كانت متوسطات MDA أعلىً (P <0.001) بين المصابين بالتهاب اللثة المعتدل أو الشديد مقارنة مع المصابين بالتهاب اللثة الخفيف سواء بين الذكور فقط أو في العينة بأكملها ، لكن الفرق لم يكن ملحوظا بين الإناث . (p = 0.890)

وبالمثل كانت متوسطات MDA أعلى معنوياً (P <0.001) بين المصابين بالتهاب اللثة المعتدل أو الشديد مقارنة مع المصابين بالتهاب اللثة الخفيف سواء بين الذكور فقط أو في العينة بأكملها ، لكن لم توجد فروق بين الإناث (p = 0.890)

الخلاصة: كانت مستويات MDA أعلى نسبيًا بين الطلاب من مجموعة تسوس الأسنان العالية وأمراض اللثة ، مما يشير إلى أن الإجهاد التأكسدي مرتبط بعملية تسوس الأسنان و وأمراض اللثة.