Tooth Wear in Relation to Selected Salivary Variables among a Group of Older Adults

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ABSTRACT

Background: Tooth wear is one of the most concerning problems of the current dental practice especially among older subjects. The aim of this study is to determine the severity of tooth wear and its relation with selected salivary variables (salivary pH and vitamin C level) among a group of older adults in Mosul city/Iraq.

Materials and methods: All subjects (30 subjects) of both gender tookpart in the current study; sixteen of them were older adults (55-65 years) and compared with fourteen middle-aged adults (30-40 years) at Textile factory in Mosul city/Iraq. Unstimulated salivary samples were collected and salivary pH was immediately measured. Salivary vitamin C level was determined colormetrically. Severity of tooth wear was determined according to Hansson and Nilner (1975) classification.

Results: Results showed that all severity scores of tooth wear revealed higher percentage among older adults than middle-aged adults. Also all tooth segment types revealed higher percentage of tooth wear among older adults than middle-aged adults. Moreover regarding the highest score of tooth wear by subjects, higher percentage of tooth wear was found among older adults than middle-aged adults. Concerning the total sample results disclosed that wear of enamel only revealed higher percentage than one or more teeth worn into dentine and one or more teeth worn up to 1/3 of the crown. Also in the total sample the incisor region showed higher percentage of tooth wear while the least tooth wear percentage was found in the molar region. In both age groups no significant correlations were found between salivary pH and vitamin C with the highest score of tooth wear.

Conclusion: Tooth wear is more severe among older subjects. Further study is needed with larger sample size and more precise index that measure the etiology of tooth wear.

Key words: tooth wear, salivary PH, salivary vitamin C level. (J Bagh Coll Dentistry 2016; 28(3):167-171).

INTRODUCTION

Tooth wear is non-carious irreversible loss of tooth structure and it is the fourth dimension risk factor for esthetic, function and longevity of human dentition after acute trauma, caries and periodontal disease [(1)]. Tooth wear is a multifactorial process and depending on its cause it appears in several forms that include attrition (loss of dental hard tissues as a result of tooth - to-tooth contact during normal or parafunctional masticatory activity without the intervention of foreign substance) [(2-4)], abrasion (pathological wear of dental hard tissues through abnormal bio-mechanical frictional processes, in other words it involves foreign objects that are repeatedly introduced to the mouth and contact teeth), erosion (loss of dental hard tissues by chemical dissolution of enamel and dentin through the action of non-bacterial acid from dietary or gastric sources) [(5)], and abfraction (is loss of dental hard tissues from eccentric occlusal forces leading to compressive and tensile stresses) [(4)].

Tooth wear could be physiological or pathological. Physiological one is normal process that is incremental with age and is macroscopically irreversible [(6)]. Whereas pathological tooth wear is severe degree of tooth loss that is disproportionate for individual age [(3)].

The composition of saliva, dietary habits, digestive disturbances and environmental pollutants all were found to influence tooth wear [(7-9)].

Saliva is the most relevant biological factor for the prevention of tooth wear especially dental erosion [(10)]. It acts through its flow rate that helps in diluting and clearing acids, buffering system, formation of the acquired pellicle that prevents the contact of acids with the tooth surfaces, and also through mineral content saliva can prevent demineralization and enhance remineralization [(11,12)]. However, saliva produced at low flow rates presents low pH and a reduced buffering capacity [(13)] that increases the risk of dental erosion as reported by other studies [(14-16)].

Vitamin C is considered as deminerlizing agent and leads to significant tooth wear if its consumption is frequent and prolonged [(17,18)] since chewable vitamin C tablets have been reported to have a pH of 2.3 that is lower than the critical point (5.5) at which enamel dissolves [(19)]. Meurman and Murtomaa [(20)] found that vitamin C products caused distinct erosion and disclosure of dentine in specimens (bovine tooth specimens immersed for 100 hr in 100 ml of the test vitamin C solutions). Also Touyz [(21)] found that excessive consumption of fruit juices lead to dental erosion, attrition, and dentinal hypersensitivity.

Several studies have been done around the world on tooth wear with wide age range [(22-25)]. In Iraq few studies have been carried out among children to investigate tooth attrition and its

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relation with tempromandiular joint problems and other risk factors [26-28]. Only one Iraqi study could be found conducted among older adults (50-89 years) to determine the prevalence and severity of tooth wear and its relation to tempromandiular joint problems and other selected risk factors [29]. According to the mentioned above it was decided to conduct this study among a group of older adults (55-65 years) in Mosul city/Iraq to determine the severity of tooth wear and its relation with selected salivary variables (salivary pH and vitamin C level) in comparison to 30-40 year-old adults. In addition to determine the severity of tooth wear according to tooth type.

MATERIALS AND METHODS

The study participants consisted of all subjects (30 subjects) of both genders who fitted the criteria of the study at Textile factory in Mosul city. Sixteen of them were older adults aged 55-65 years and compared with fourteen middle-aged adults aged 30-40 years. They were examined in the period from 26th of March 2007 till the end of June 2007.

They were non-smoker, with no medical history that compromises salivary secretary mechanism (depending on medical report supplied by the medical unit at the factory), shouldn't take any medications with xerogenic effect or any nutritional supplementation, and shouldn't wear any fixed or removable dental prostheses. The collection of unstimulated salivary samples was performed according to the instructions cited by Tenovuo and Lagerlöf [30].

Salivary pH was immediately measured using an electronic pH meter. Then salivary samples were taken to the laboratory for biochemical analysis at the College of Veterinary and College of Dentistry, University of Mosul. Salivary vitamin C was determined colometrically using 2,4-dinitrophenyl hydrazine (DNPH) method [31] by using the spectrophotometer (Cecil Instrument Limited CE 1021, England). The severity of tooth wear was determined according to Hansson and Nilner (1975) [32] classification:

0=No wear.
1=Wear of enamel only.
2=One or more teeth worn into dentine.
3=One or more teeth worn up to 1/3 of the crown.
4=Extensive wear of one or more teeth more than 1/3 of the crown.

Data analysis was conducted through the application of the SPPS (version 18). Statistical tests used in this study are: Fisher's exact test and Spearman's correlation coefficient (r). The confidence limit was accepted at 95% ($P<0.05$).

RESULTS

Distribution of the total sample by age group and gender is shown in Table 1. From Table 2 results showed that all scores of tooth wear severity (wear of enamel only, one or more teeth worn into dentine, and one or more teeth worn up to 1/3 of the crown) were higher among older adults than middle-aged adults in whom score 3 (One or more teeth worn up to 1/3 of the crown) was completely absent. In addition in the total sample wear of enamel only revealed higher percentage (55.77%) than one or more teeth worn into dentine (38.46%) and one or more teeth worn up to 1/3 of the crown (5.77%). Only one or more teeth worn into dentine severity score showed significant association with age ($P<0.05$).

It is worth to mention that extensive wear of one or more teeth more than 1/3 of the crown was not found in both age groups. Concerning segment type (Table 3) results showed that all segment types revealed higher percentage of teeth with wearing among older adults as compared with middle-aged adults. In the total sample the incisor region showed higher percentage of tooth wear (32.61%) while the least tooth wear percentage was in the molar region (10.87%).

Also results showed that there is highly significant ($P<0.01$) association between tooth wear and age in the molar region. Regarding the distribution of the subjects with highest score of tooth wear, Table 4 revealed that wear of enamel only showed higher percentage among middle-aged adults (80%) than older adults (20%), while one or more teeth worn into dentine (score 2) and one or more teeth worn up to 1/3 of the crown (score 3) were higher among older adults (64.71%, 100% respectively) than middle-aged adults (35.29%, 0.00% respectively). Also the highest score of tooth wear showed significant association with age ($P<0.05$). Table 5 showed that in both age groups no significant correlations were found between salivary pH and vitamin C with the highest score of tooth wear ($P>0.05$).

Table 1: Distribution of the total sample by age group and gender

Gender	Age group				Total	
	Middle-aged adults		Older adults			
	No.	%	No.	%	No.	%
Male	7	50	13	81.25	20	66.67
Female	7	50	3	18.75	10	33.33
Total	14	100	16	100	30	100

Table 2: Frequency distribution of tooth wear scores according to severity of tooth wear by age group

Age group	Wear of enamel only		One or more teeth worn into dentine		One or more teeth worn up to 1/3 of the crown	
	No.	%	No.	%	No.	%
Middle-aged adults	14	48.28	6	30	0	0
Older adults	15	51.72	14	70	3	100
Total	29	55.77	20	38.46	3	5.77
Fisher's Exact Test	0.91		6.70		2.92	
df	1		1		1	
P-value	1.00		0.019*		0.23	

*significant

Table 3: Frequency distribution of tooth wear scores according to segment type by age group

Age group	Incisors		Canines		Premolars		Molars	
	No.	%	No.	%	No.	%	No.	%
Middle-aged adults	14	46.67	11	40.74	10	40	0	0
Older adults	16	53.33	16	59.26	15	60	10	100
Total	30	32.61	27	29.35	25	27.17	10	10.87
Fisher's Exact Test	-		3.81		2.68		14.25	
df	-		1		1		1	
P-value	-		0.09		0.16		0.00**	

**Highly significant

Table 4: Frequency distribution of subjects according to the highest score of tooth wear by age group

Age group	Wear of enamel only		One or more teeth worn into dentine		One or more teeth worn up to 1/3 of the crown		Total	
	No.	%	No.	%	No.	%	No.	%
Middle-aged adults	8	80	6	35.29	0	0	14	46.67
Older adults	2	20	11	64.71	3	100	16	53.33
Total	10	33.33	17	56.67	3	10	30	100
Fisher's Exact Test	7.97						-	
df	2							
P-value	0.017*							

*Significant

Table 5: Relation of the highest score of tooth wear (by Subjects) with salivary pH and vitamin C level by age group.

Age group	Tooth wear	Salivary PH		Vitamin C	
		r	P-value	r	P-value
Middle-aged adults	Highest score	0.21	0.47	-0.26	0.38
Older adults	Highest score	-0.47	0.07	-0.03	0.92

DISCUSSION

There is a wide range of tooth wear indices and a universally applicable tooth wear measuring system is still lacking. In addition variation of the diagnostic criteria, sampling technique and age range differences; all makes comparison of results among studies very difficult [33-35].

Results of the current study showed that wear of enamel only, one or more teeth worn into dentine and one or more teeth worn up to 1/3 of the crown revealed higher percentages among older adults than middle-aged adults. Also segment types (incisors, canines, premolars and molars) showed higher percentage of tooth wear among older adults compared with middle-aged adults. This is further supported by another finding of this study which showed that the percentage of subjects (with highest score of tooth wear) with one or more teeth worn into dentine and one or more teeth worn up to 1/3 of the crown was higher among older adults than middle-aged adults. This is probably because tooth wear is an accumulative process throughout life and it is an age-related phenomenon [36,37].

The increased teeth exposure to environmental factors (Local or systemic, erosive, attritive, or abrasive factors) may cause more tooth wear rather than age per say [38]. This finding was inconsistent with Al-Azawi study [29].

Regarding the total sample results revealed that wear of enamel only showed higher percentage while extensive wear of one or more teeth more than 1/3 of the crown didn't found in the current sample this is probably because physiological rather than pathological tooth wear is more prevalent in old age people [39].

Also results showed that the incisor region showed higher percentage of tooth wear followed by canines and premolars while molar region revealed the least percentage. This is probably because the incisor or anterior region may be affected by personal habits (cigarette or pipe smoking) or occupational habits (holding pins or nails in the mouth), also canines are used for tearing and biting, thus showed more severe tooth wear while premolars and molars are used for chewing only [40,41].

In addition non-dietary uses of anterior teeth and thin incisal edges compared to occlusal surfaces of posterior teeth all decrease the risk of posterior teeth wear but increase the chance of anterior teeth wear [42, 43]. Moreover location of the incisors and canines in the oral cavity predisposed them to erosive factors like extrinsic acids [44]. This result was nearly the same to that found by Mohammad and Garib [35] and Saerah et al [34] studies who found that the incisal edges were the mostly affected surfaces, but contradicted with David and Bhat [45] and Al-Azawi [29] findings who found that canines were the mostly affected teeth by tooth wear than incisors. In spite of there is no index that could diagnose the causes of tooth wear separately (attrition, abrasion, or erosion) and also it is clinically very challenging to diagnose the etiology of tooth wear form the appearance of the lesion without comprehensive dietary and dental history [46] ; but the index used in the current study measure tooth wear on the incisal and occlusal surfaces which is mostly due to attrition and/or abrasion not erosion (which is due to the action of acid) that might explain the non-significant correlations found between tooth wear with salivary pH and vitamin C level.

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