

## The role of smoking with some salivary parameters, dental caries and gingivitis

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### Key words

Smoking,  
DMFS, caries,  
gingival index  
(GI), salivary pH  
and flow rate.

### Abstract

**Back ground:** The aim of this study was to evaluate the effects of smoking on oral health including the caries rate and gingival conditions, and salivary parameters.

**Materials and Methods:** This study done on 50 healthy volunteers, 25 smokers and 25-non-smokers. Dental caries was recorded using DMFS (Decayed, Missed, and Filled) surfaces index teeth and gingival parameter recorded by G.I (gingival index). Stimulated saliva was collected before clinical measurement then salivary pH estimated by using pH meter.

**Results:** The statistical analysis for the DMFS in both smokers and non smokers groups showed no significant difference in mean 0.48 ( $P>0.05$ ). This is corresponds with the salivary pH and flow rate in both smokers and non- smokers groups 0.75, 0.91 respectively ( $P>0.05$ ) and similar to the result of GI between both groups 0.37 ( $P>0.05$ ).

**Conclusion:** the long term use of the tobacco smoking have not any effect on the dental caries and not cause any changes in the salivary flow rate and salivary pH, and not give rise to any remarkable gingival changes.

### Introduction

Oral diseases are clearly related to behavior. The prevalence of dental caries and periodontal diseases have decreased with improvements in oral hygiene and a decrease in the consumption of sugary products<sup>(1)</sup>.

Dental caries is a progressive and subsurface demineralization of teeth and it is one of the most common diseases that consider the major cause of tooth loss which is developed in the presence of several interacting variables such as bacteria, diet, susceptible surface and the time that affected by salivary pH and flow rate of saliva, sugar and fluoride intake and other variables (2).

While gingivitis can be defined as an

Inflammation of the marginal gingival tissues which is a common condition and its extent and severity can be variable. Gingivitis can be modified by systemic and local influences and induced by plaque, it can be reversed if improved oral hygiene measures are introduced (3).

Tobacco smoking is an addictive habit first introduced into Europe. Smoking is now recognized as the most important cause of preventable death and disease.

Hundreds of different compounds have been identified in tobacco smoke and some occur in concentrations judged to be harmful to health (4). Some of these substances are indisputably carcinogenic, and smoking has been implicated in the etiology of oral neoplasia (5).

Cigarette smoking is most certainly associated with an increased caries rate but that a cause and effect relationship is still not proven (6), nicotine from cigarette stimulates the sympathetic ganglia to produce neurotransmitters including catecholamines (7). These affect the alpha-receptors on blood vessels which in turn causes vasoconstriction. The vasoconstriction of peripheral blood vessels caused by smoking can also affect on the periodontal tissue (8) as smokers have less overt signs of gingivitis than nonsmokers and clinical signs of gingival inflammation such as redness, bleeding and exudation are not as evident in smokers. The vasoconstrictive actions of nicotine may be responsible for the decreased gingival blood flow (9). The aim of this study was to evaluate the effects of smoking on oral health including the caries rate, gingival conditions, and salivary parameters.

## Material and Methods

The study was conducted on students of College of Dentistry/ Tikrit University, Iraq, started from December 2011 till April 2012. Fifteen males healthy-looking dental students were accepted to participate in study, aged between 18-25 years old, they subdivided into 25 smokers and 25 non-smokers.

Stimulated saliva was collected by chewing 0.5 g of Arabic gum for at least 10 minutes. The saliva collected by spitting in a calibrated sterile labeled screw capped test tube (at room temperature). The salivary pH was estimated by pH meter Immediately after collection. While salivary flow rate (ml/min) was estimated by dividing saliva volume (ml) to the fixed collected time (5 min). The oral and dental examination including (dental caries and gingival inflammation) estimated by using dental explorer, blunt probe with mirrors. Gingival inflammation was assessed using Gingival Index (10), while Dental caries was measured following WHO (World Health Organization) criteria (11). for statistical analysis Student's t-test was used.

## Results

The result shows the numbers and the mean values and standard deviations (mean  $\pm$  SD) and the statistical analysis (p-values) of caries- experience measured according to DMFS indices among both groups (smoking and non – smoking), and the numbers and the (mean  $\pm$  SD) for all three fragments of the indices (DS, MS, FS) (Decayed, Missed, and Filled) surfaces, in both study and control group. Results showed that there was no statistically significant differences between the two groups ( $P > 0.05$ ) as shown in table (1).

The result shows the mean values and standard deviations (mean  $\pm$  SD) and the statistical analysis (p-values) of the salivary pH and the flow rate among both groups (smoking and non – smoking), there was no statistically significant differences between both groups the ( $P > 0.05$ ) as shown in table (2).

The result shows the mean values and standard deviations (mean  $\pm$  SD) and the statistical analysis (p-values) of the gingival index for both groups (smoking and non – smoking), and the results found that there was no statistically significant differences between both groups the ( $P > 0.05$ ) as shown in table (3).

The result shows the correlation between the salivary pH, salivary flow rate, DMFS, and GI among non-smokers and smokers groups, the results showed no significant relation between salivary pH, salivary flow rate, DMFS, and GI in both non-smokers and smokers groups as shown in table (4)

## Discussion

The caries experience DMFS, DS and MS of the study group (smokers) was higher when compared with that in control group (non-smokers) but not significantly difference, which is disagreement to other studies (Hirsch, etal (12), Al-Weheb(13)), Its important to take into consideration other contributing factors to dental caries development, such as age, tobacco habits other than smoking, oral hygiene habits, eating habits, preventive visits to dentist

(dental recalls) and overall health standards, and also the level of dental care education (here the sample were the students of college of dentistry who had well oral health attitude and behavior). Therefore elucidating the exact strength of dental caries in relation to smoking is difficult to identify(Jindra, etal(14)). Also the results found that salivary pH had no significant difference between the smoking and non-smoking groups this results agree with other who fined that there was no significant difference(Courant(15)), and disagree with other who reported that long periods of smoking had a low salivary pH (Parvinen(16)), for the salivary flow rate the result showed no significant difference between both groups this is agreement with other finding (Khan, etal(17)) and disagreement with the results which found that the salivary flow rate showed lower in smokers group than the non-smokers (Hawraa (18)). However, the reduction in the salivary flow rate will normally explained increasing in salivary hydrogen concentration(Hunt (19)). For the gingival index (GI) the results report no significant difference between both groups, this could be due to the fact that the effect of prolonged and heavy

smoking on reducing the gingival bleeding because the tar in the smoke exerted a direct irritating effect on the gingiva giving rise to gingivitis, and that nicotine could caused contraction of the capillaries which lead to mask the clinical marker of bleeding on probing often used by dentists to monitor the gingival health (Ana, etal (9)) . This results agree with other study who results showed that smoker had less bleeding on probing in comparison to non-smoker (Lekaa (20)).

### Conclusions

The long term use of the tobacco smoking not have any effect on the dental caries and not cause any changes in the salivary flow rate and salivary pH, and not give rise to any remarkable gingival changes.

### Suggestions

1. More studies should be done for other salivary parameters and there relation with smoking and dental caries, periodontal disease and oral lesions.
2. Experimental study deals with the relation of nicotine and caries lesion on tooth in vitro.

**Table (1) No., Mean and standard deviation values of caries experiences DMFS, DS,MS,FS in smoking and non- smoking groups**

Non-smoking	Smoking		Non- smoking		p-values
	No.	(mean± SD)	No.	(mean± SD)	
<i>DS</i>	117	4.6±4.6	117	4.6±4.6	0.79
<i>MS</i>	17	0.6±1.9	17	0.6±1.9	0.52
<i>FS</i>	72	2.8±5.4	72	2.8±5.4	0.45
<i>DMFS</i>	206	8.2±6.1	206	8.2±6.1	0.48

P>0.05

**Table (2) Mean and standard deviation values of salivary pH and flow rate in smoking and non-smoking groups**

	smoking	Non- smoking	p-values
	(mean± SD)	(mean± SD)	
<i>pH</i>	7.2±0.43	7.3±0.33	0.75
<i>Salivary flow rate</i>	4.7±1.42	5.9±1.63	0.91

P>0.05

**Table (3)** Mean and standard deviation values of GI in smoking and non- smoking groups

	smoking (mean± SD)	Non- smoking (mean± SD)	p-values
<b>GI</b>	<b>1.1±0.68</b>	<b>0.05±0.05</b>	<b>0.37</b>

P>0.05

**Table (4):** Correlation between Salivary pH, Salivary flow rate, DMFS, and GI in non-smokers and smokers groups.

Non-smokers Group	Saliva pH	Saliva flow rate	DMFS	GI
<i>Saliva pH</i>	-----	<b>0.34</b>	<b>-0.02</b>	<b>-0.05</b>
<i>Saliva flow rate</i>	<b>0.34</b>	-----	<b>0.18</b>	<b>-0.26</b>
<i>DMFS</i>	<b>-0.02</b>	<b>0.18</b>	-----	<b>-0.08</b>
<i>GI</i>	<b>-0.05</b>	<b>-0.26</b>	<b>-0.08</b>	-----
<b>smokers Group</b>				
<i>Saliva pH</i>	-----	<b>0.15</b>	<b>0.036</b>	<b>-0.11</b>
<i>Saliva flow rate</i>	<b>0.15</b>	-----	<b>0.16</b>	<b>0.12</b>
<i>DMFS</i>	<b>0.036</b>	<b>0.16</b>	-----	<b>0.11</b>
<i>GI</i>	<b>-0.11</b>	<b>0.12</b>	<b>0.11</b>	-----

P>0.05

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