Caries experience in relation to the tea consumption and salivary parameters among the smokers and non-smokers patients

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Abstract:

This study was conducted to evaluate the caries experience, saliva pH, salivary flow rate and tea consumption in smokers and non-smokers patients.

The samples were composed of 60 subjects divided into two main groups 30 male for non-smokers and other 30 male for smokers. They asked about smoking behaviors, the dietary habits including frequency of tea consumption per day and the quantity of the sugar intake, and oral health behaviors for both groups. The dental caries was assessed using DMFT index and the saliva pH and the salivary flow rate were measured. Student t -Test and correlation coefficient were used for statistical comparisons.

The results indicated that the DMFT and the salivary flow rate were decreased with exception that there was no significant difference between saliva pH between the smokers and non-smokers groups. In addition to the frequency of tea consumption was higher in smokers than in non-smokers and with increased frequency of tea consumption the DMFT decreased. The conclusion of this study indicated the long term use of the tobacco smoking affects the dental caries and the salivary flow rate but does not affect on the saliva pH. It is possible to increase the frequency of tea consumption but with less amount or free from sugar.

الخلاصة :

أجريت هذه الدراسة لتقييم نخرَ الأسنان، قاعدية اللعاب ، نسبة تدفقِ اللعابيةِ واستهلاك الشاي لدى المرضى المدخنين وغير مدخنينِ.

العينات كَانتْ متكوّنة من ستين شخص من الذكور قسّمتْ بالتساوي إلى مجموعتين رئيسيتينِ اثنتين مجموعة متكونة من ثلاثين من الذكور لغير المدخنين والأخرى من ثلاثين من الذكور للمدخنين. سَئلوا عن سلوك التدخينِ، العادات الغذائية التي تضمنت كمية استهلاك الشاي بِاليوم وكميةِ استهلاك السكرَ لكلتا المجموعتين. قُيّمَ نخر الأسنان باستعمال دليلِ DMFT و قِيستْ قاعدية اللعاب ونسبة التدفقِ اللعابيةِ. أشارتْ النتائج ان دليل DMFT كَانَ أعلى في المدخنين من الغير مدخنينِ ونسبة التدفقِ اللعابيةِ نقصت مع عدم وجود فرق معنوي في قاعدية اللعابِ بين المدخنينِ و الغير مدخنينَ. بالأضافة إلى انَ زيادة استهلاك الشاي كان أعلى في المدخنين مِنْ الغير مدخنينِ مع زيادة استهلاك الشاي هنالك نقصان في دليل .DMFT .

تبين من النتائج ان المدى البعيدَ من تدخين التبغ له تأثير على نخرِ الأسنان ونسبةِ التدفقِ اللعابيةِ لكن لا تُحدثَ تغيير في قاعدية اللعابِ . كذلك من الممكن زيادَة استهلاك الشاي لكن مَع كمية أقل من السكر.

Introduction:

The use of tobacco is a wide world problem and the traditional method of tobacco is smoking cigarettes, which is the most certainly associated with an increased caries rate but the causes and effect relationship is still not proven [(1)]. Dental caries is a progressive and subsurface demineralization of teeth and it one of the most common of all 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 effecting by salivary PH and flow rate of saliva,

sugar and fluoride intake and other variables [2]. Because the Saliva is lubricating, cleansing, remineralizing, antibacterial, and buffering actions, so it is consider an important protective factor for both dentition and soft tissue as well as prevention of the dental caries [3], and it is one of the essential factors in maintenance of oral health so the salivary parameters are taken when assessing caries risk factors [4]. Therefore salivary PH as well as changes in salivary flow rate can be utilized to assist in diagnosis oral diseases and dental caries [5]. The salivary PH can be defined as the negative logarithm of the hydrogen ions concentration, it may be considered the master variable in equilibrium between the calcium phosphate of tooth and surrounding lipid phase[6]. As well as, salivary flow rate is highly important in cleaning cariogenic foods from mouth and increasing the buffering power so with deficient of the salivation there is high incidence of the caries activity [2, 7] . On the other hand, the association between diet and the development of dental caries it is more appropriate with high sugars consumption habits over time that related to changes in dental caries experience. Many studies have shown a significant relationship between caries development and sugars intake [8,9]. Several studies showed frequency and amount of sugars consumption which indicated that caries experience increases markedly when the frequency of sugars intake exceeds four times a day [10,11]. Therefore there is strong correlation between both the amount and frequency of sugars consumption and dental caries that has been demonstrated by several investigators [12]. As well as, numbers of beneficial effects have been attributed to tea consumption, including the prevention of oral cancer and tooth decay [13,14]. In several animal experiments and human trials, green tea and black tea have been shown significantly reduce plaque scores and caries index [15-17]. The aim of this study was to investigate and evaluate the dental caries experience and salivary factors such as the saliva pH and salivary flow rate SFR and tea consumption in smokers and non-smokers patients.

Materials and Methods:

In this study, the samples were composed of 60 subjects of males. Those subjects were randomly selected from the students of kerbala technical institute with age range from 20-30 years old. They had non history of any systemic disease, not under medication therapy, no orthodontic treatment or wearing any prsothodontic appliance. Those subjects divided into two groups: smokers group had 30 males and non-smokers group (control group) had other 30 males. They first asked about smoking behaviors including duration and number of cigarettes per day, also they asked about the dietary habits including frequency of tea consumption per day and the quantity of the sugar intake. The quantity of sugar include: two and less of teaspoonfuls of sugar regarded as usual quantity while using more than two teaspoonfuls considered as high sugared quantity. They also asked about oral health behaviors including frequency and number of tooth brushing per day for both groups.

The diagnosis of the dental caries was measured by oral examination that was carried by using dental mirror and dental probe under light source. The dental caries was assessed using DMFT index according to the criteria of WHO [18] (which is a count of the number of teeth in a person's mouth that are decayed, missing or filled as a result of caries in permanent dentition).

The salivary samples were obtained from the subjects about 2 hours after breakfast, the stimulated saliva was collected by using Arabic chewing gum for 2minutes and then the saliva was collected in sterile capped plain tubes for 10 minutes[19]. Then the saliva pH and the salivary flow rate were measured within the first half an hour after taken the samples. The saliva pH was estimated using the pH meter (type CG 701, W. Germany). The salivary flow rate was calculated by measuring the volume in cubic centimeter (cc) and the flow rate expressed as milliliters per minute (ml/min). The results were analyzed using the students T-test to compare between the caries experience, salivary parameters, and tea consumption among the smokers and control group. The correlation coefficient was used to assess the relation between the study variables.

Results :

The descriptive analysis of the results are presented in (Table 1). The caries experience and its components showed the mean of DT component was (3.27) for non-smokers group which lower than the mean for the smokers (5.10), while the mean of MT component for the non-smokers was (0.40) and (0.73) for smokers, and the mean of the FT component (0.53) for non-smokers and (0.67) for smokers group, while the mean of the DMFT for non-smokers was (4.07) that lower than those for the smokers group (6.47). The mean values of the saliva pH for the non-smokers group was (8.253) and (8.173) for smokers group. The mean of the salivary flow rate for non-smokers was higher than 1ml/min about (1.126) while for smokers group less than 1ml/min about (0.826).The mean values of the frequency of the tea consumption for non-smokers group was (2.333) which less than for smokers group was (5.000) (Table 1).

Table (1): Mean, standard deviation, standard error, minimum and maximum values of studied variables in smokers and non smokers.

Studied variables		No.	mean	Std. dev	Std. error	Mini. value	Maxi. value
Caries experience	DT non-smokers	30	3.27	2.180	0.398	1.00	10.00
	DT smokers	30	5.10	2.820	0.515	1.00	12.00
	MT non-smokers	30	0.40	0.770	0.141	0.00	3.00
	MT smokers	30	0.73	1.015	0.185	0.00	3.00
	FT non-smokers	30	0.53	1.106	0.202	0.00	4.00
	FT smokers	30	0.67	0.922	0.168	0.00	4.00
	DMFT non-smokers	30	4.07	2.766	0.505	1.00	11.00
	DMFT smokers	30	6.47	3.560	0.650	1.00	14.00
Salivary variables	pH non-smokers	30	8.253	0.530	0.096	7.3	9.00
	pH smokers	30	8.173	0.597	0.109	6.9	9.00
	Flaw rate (ml/min) non-smokers	30	1.126	0.428	0.078	0.43	2.14
	Flaw rate (ml/min) smokers	30	0.826	0.357	0.065	0.22	1.57
Tea consumption	Frequency of tea drinking non-smokers	30	2.333	1.347	0.246	0.00	5.00
	Frequency of tea drinking smokers	30	5.000	4.646	0.848	0.00	20.00

The statistical comparison of studied variables between the non-smokers and smokers showed that there was highly significant differences of the caries experience DT and DMFT between the smokers and control groups except that there was no significant difference of MT and FT among smokers and control group ($P>0.05$) (Table 2). The statistical comparison of saliva pH showed that there was non significant difference ($P>0.05$) between the smokers and non-smokers groups in contrast the result of the salivary flow rate showed highly significant difference ($P<0.01$) among both groups. The result showed there was highly significant difference in frequency of tea consumption among smokers and non-smokers groups ($P<0.01$) (Table 2).

Table (2): Student t-test to compare of studied variables among smokers and non smokers.

Studied variable		T- value	df	P- value	Sig.
DT non-smokers	DT smokers	2.413	29	0.012	Highly sig. (p<0.01)
MT non-smokers	MT smokers	1.284	29	0.209	Non sig. (p>0.05)
FT non-smokers	FT smokers	0.559	29	0.580	Non sig. (p>0.05)
DMFT non-smokers	DMFT smokers	2.543	29	0.010	Highly sig. (p<0.01)
pH non-smokers	pH smokers	0.505	29	0.617	Non sig. (p>0.05)
Salivary flaw rate non-smokers (ml/min)	Salivary flaw rate smokers (ml/min)	2.900	29	0.007	Highly sig. (p<0.01)
Frequency of tea drinking non-smokers	Frequency of tea drinking smokers	2.962	29	0.007	Highly sig. (p<0.01)

The correlation between the smoking behaviors and dental caries experience DMFT and its component is presented in (Table 3) which is showed highly significant correlation between the duration of smoking and dental caries DT, while there is no significant relation between the duration of smoking and missing teeth MT, filling teeth FT and DMFT. Highly significant relation was found between the number of cigarettes per day and the DMFT and all components with exception there was no significant relation between the number of cigarettes per day and the DT component. The result showed there was highly significant correlation between the frequency of tea drinking and MT and DMFT, while there was no significant relation DT and FT components.

Table (3): Correlation between smoking behavior and caries experience.

Caries experience	Duration of smoking	No. of cigarettes /day	Frequency of tea drinking
DT	0.658	0.193	0.344
MT	0.362	0.960	0.720
FT	0.335	0.768	0.451
DMFT	0.430	0.639	0.879

The correlation between the smoking behaviors and salivary variable is presented in (table 4) which is showed highly significant correlation between all the smoking behavior and both saliva pH and saliva flow rate.

Table (4): Correlation between smoking behavior and salivary variables.

Salivary variables	Duration of smoking	No. of cigarettes /day	Frequency of tea drinking
Saliva pH	0.618	0.774	0.880
Salivary flow rate	0.991	0.611	0.779

The correlation between the saliva pH, salivary flow rate, DMFT, and frequency of tea consumption among non-smokers and smokers groups was presented in (Table 5) which is showed highly significant correlation between the saliva pH and salivary flow rate in non-smokers group and also with frequency of tea consumption in smokers group, while there is no significant relation between the saliva pH and DMFT among non-smokers and smokers groups. In relation to the saliva pH and salivary flow rate in non-smokers group and smokers groups the result showed the saliva flow rate was increased with the increased the saliva pH (Figure 1).

As wall as the results showed there is strong relation between the frequency of tea and other studied variable in both smokers and non-smokers groups. In relation to caries experience and the frequency of tea consumption the results showed that mean values of DMFT of the subjects were decreased with the increased of the frequency of the tea consumption in both groups (Figure 2).

Table (5): Correlation between Saliva PH, Saliva flow rate, DMFT, and Frequency of tea consumption in non-smokers and smokers groups.

Non-smokers Group	Saliva pH	Saliva flow rate	DMFT	Frequency of tea consumption
Saliva pH	----------	0.849	0.302	0.582
Saliva flow rate	0.849	---------	0.249	0.857
DMFT	0.302	0.249	---------	0.974
Frequency of tea consumption	0.582	0.857	0.974	---------
Smokers Group				
Saliva pH	----------	0.533	0.259	0.881
Saliva flow rate	0.533	---------	0.431	0.730
DMFT	0.259	0.431	---------	0.870
Frequency of tea consumption	0.881	0.730	0.870	---------

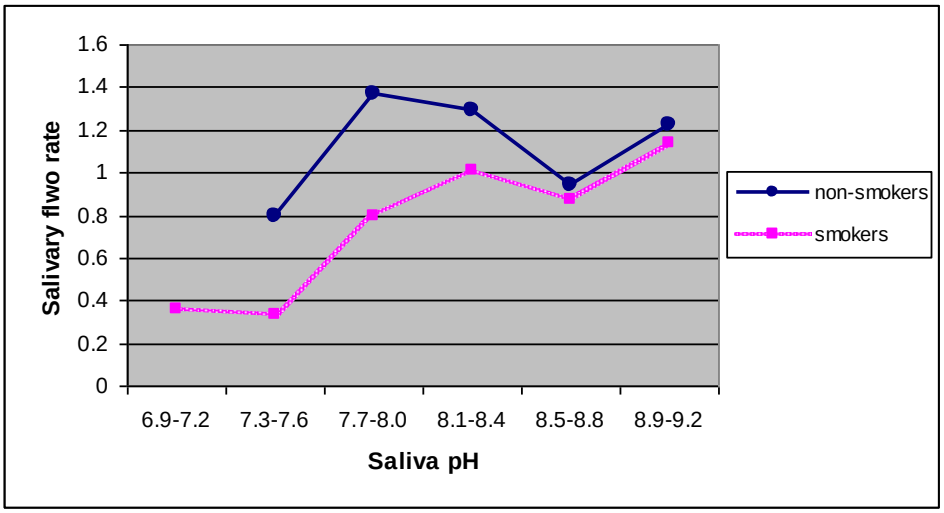

Figure 1: Relation between the saliva Ph and salivary flow rate.

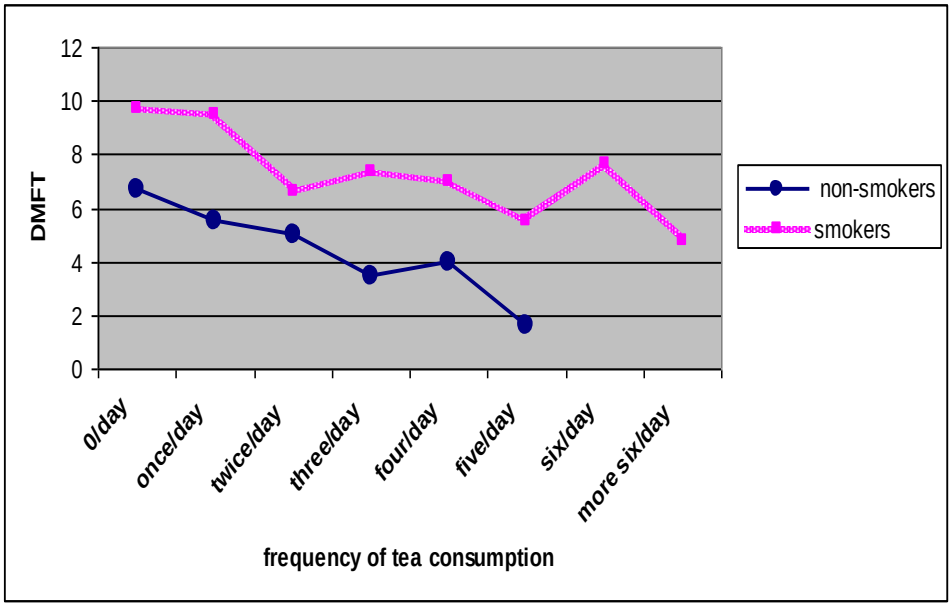

Figure 2: Relation between the caries experience (DMFT) and the frequency of the tea consumption.

On the other hand, in relation to caries experience and the quantity of the sugar consumption the results showed that mean values of the subjects who drank usual sugar tea ($\leq$ 2 tea spoonfuls) had DMFT less than those who drank high sugared tea (>2 tea spoonfuls). The statistical comparison showed that there was a highly significant difference between DMFT and the quantity of sugar consumption in smokers group, while there was a non significant difference in non-smokers group, (Table 6).

Table (6): Caries experience (DMFT) in relation to quantity of sugar consumption in smokers and non-smokers groups.

Quantity of sugar consumption	Caries experience (DMFT)			
Non-smokers group	mean	t-value	P- value	Sig.
≤ 2 tea spoonfuls	3.850	1.346	0.194	Non sig. (p>0.05)
> 2 tea spoonfuls	4.950			
Smokers group				
≤ 2 tea spoonfuls	4.889	3.654	0.002	Highly sig. (p<0.01)
> 2 tea spoonfuls	8.611			

The result of the oral health behavior was illustrated in (Figure 3). That showed with increased brushing frequency the dental caries experience (DMFT values) was decreased among both smokers and the control group.

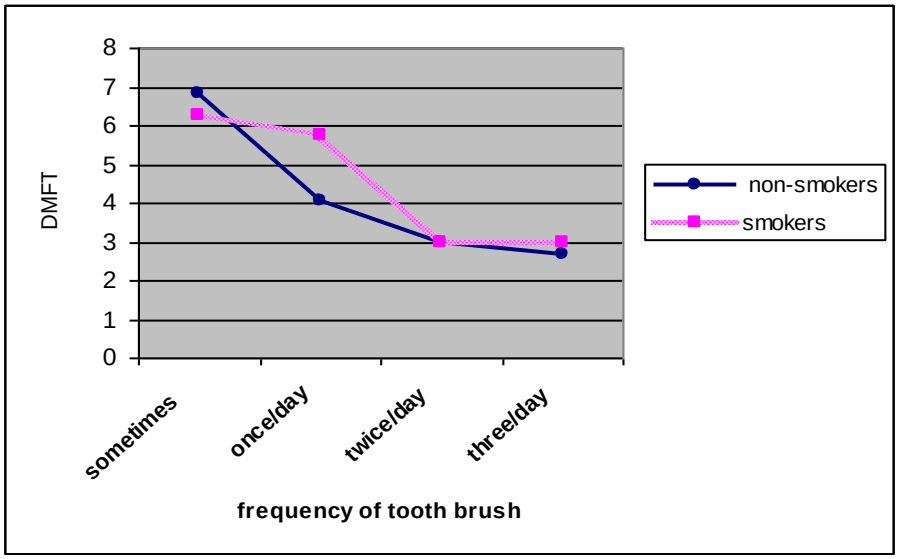

Figure 3: Relation between the caries experience (DMFT) and the frequency of the tooth brushing.

Discussion:

The results of this study demonstrates that caries experience DMFT and DT of the studied group (smokers group) was higher than the control group (non-smokers) which is in agreement with other studies [20-22] . This could be attributed to the possible lower salivary pH and buffering power, and the fact that there is a shift of the bacterial population towards lactobacillus and the cariogenic streptococci in smokers might all argue for increased dental caries [23,24].as well as deficient in the salivary flow rate which is high important in clearing the cariogenic food from the mouth and neutralizing effect [2,3,7].

The results showed that saliva pH had non significant difference between the smokers and non-smokers groups this in agreement with other studies who report no difference [25,26], and disagreement with other studies who found the longer time periods smokers have a lower pH in stimulated saliva [23], in contrast the result of the salivary flow rate showed lower in smokers group than the non-smokers which is disagreed with other studies showed no difference between smokers and non-smokers [27,28]. The result showed frequency of tea consumption in smokers groups higher than non-smokers this agreed with the other study [29].

Duration of smoking and dental caries DT had significant correlation this in agreement with other study [20]. The number of cigarettes per day and DMFT and all components except DT had significant relation this agreed with other studies [30,31].
The correlation between the saliva pH and salivary flow rate showed positive correlation that increased when the saliva pH increased this come in accordance with others [5,32].
In relation to caries experience and the frequency of tea consumption the results showed DMFT of the subjects were decreased with the increased of the frequency of the tea consumption in both groups that agreed with previous studies who showed the that black tea reduces the cariogenicity this may attributed to black tea extract increased plaque fluoride concentration[33, 34]. As well as the tea contain Catechins and theaflavins, polyphenolic compounds that reported to have a wide range of biological activities including prevention of tooth decay and oral cancer [35].
The consumption of high sugar in smokers group was found to be associated with increased with DMFT that agreed with other study [29, 36]. This attributed to the more sugar metabolized in the cariogenic bacteria to produce energy required for their growth and metabolism [37].

Conclusions:

Within the limitations of this study, long term use of the tobacco smoking reverse effect on the dental caries and cause decreased in the salivary flow rate but not effect on the saliva pH. It is possible to increase the frequency of tea consumption but with less amount or free from sugar.

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