Dietary habits and oral health related behaviors in relation to DMFT indexes of a group of young adult patients attending a dental school

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Abstract

Objectives: The aim of the present study was to investigate the dietary habits and oral health related behaviors in relation to the dental health status in terms of decayed, missing and filled teeth (DMFT index) of a group of young adults attending to a dental school located in a major city in Turkey.

Study Design: A total of 416 young adults (247 females and 169 males) with an age range of 18-25 (Mean 23.2 sd 0.97) attending the Oral Diagnosis department participated in the study. The patients completed a questionnaire including questions about demographic factors, dietary habits and oral health related behaviors. Subsequently, the DMFT index and plaque index was calculated. Descriptive statistics, Mann Whitney U/ Kruskal Wallis Variance analysis, Chi-square/ Fisher's Exact tests and multiple linear regression analysis were used for statistical analysis of the data when applicable.

Results: According to the results of the study, approximately 70% of the patients had regular main meals and a very high snacking rate (76.9%) was present. Although not at a high rate, most of the patients brushed their teeth regularly twice a day (44.2%) and approximately half used other hygiene aids in addition to brushing (43.8%). The median of the DMFT index was 5 and a majority of the patients had moderate plaque accumulation which could be seen with the naked eye (45.0%). Dental plaque had the most significant effect on the DMFT index.

Conclusion: In conclusion, advice, including importance of regularity of main meals, decrease in snacking frequency, regular brushing twice a day and the use of other oral hygiene aids for the elimination of dental plaque would be helpful to enhance the dietary habits and oral health related behaviors of young adult Turkish patients.

Key words: Diet, caries, oral health behaviors, DMFT.

Introduction

Eating patterns, nutrient composition, improper oral health related behaviors and dental plaque accumulation (1) all interact and play an important role in caries development (2).
Eating patterns and the frequency of consumption are seen to be the most significant factors which contribute the cariogenicity of the diet. Frequent sugar intake between meals can increase the incidence of caries in individuals with poor oral hygiene (3).

Prevention from caries could be done with diminishing the intake of sugar consumption between meals and performing proper oral hygiene for the elimination of the dental plaque. The most important oral hygiene behavior is regular tooth brushing twice a day with toothpastes containing fluorides (4,5). The use of dental floss is also advised as the dental plaque could not be adequately removed from the approximal surfaces of the teeth with only brushing (6).

As nowadays prevention of dental caries focuses on individuals' dietary habits and oral health related behaviors, (2) description of current habits is crucial. Therefore, the aim of the present study was to investigate the dietary habits and oral health related behaviors in relation with the DMFT index among young adults attending to a dental school in Turkey.

Subjects and Materials

A total of 416 healthy, non-medicated young adults which consisted of 247 females and 169 males with an age range of 18-25 (Mean 23.2 sd 0.97) randomly selected out of patients attending to the Oral Diagnosis and Radiology Department of Gazi University Dental School to receive dental examination participated in the study. The criteria for inclusion was to be a young adult who at least once attended to receive dental treatment to the dental school with a moderate income level (family income level/patients own income level) to keep the patient attendance and income level constant.

An explanation was given about the aim and procedure of the study and patients were invited to participate in the study. Written consent was taken before the completion of the questionnaire. The income levels and dental visit patterns of the patients were assessed and patients providing the criteria were included in the study.

The patients completed a questionnaire including questions about age, sex, visit frequency of dentist, dietary habits and oral health related behaviors. The dietary habits were assessed as regularity and contents of breakfast, lunch, dinner, drinks, and snacking habits. Breakfast, lunch, dinner, drinks and any snacking habits were queered in three separate items according to frequency as almost always, sometimes, and very seldom or never during one year period. Oral health related behaviors were evaluated according to the answers given to the questions, including tooth brushing routines as well as the use of dental floss, toothpicks, mouth rinses and chewing gum.

After completion of the questionnaire, two experienced dentists performed intraoral examinations according to the routine procedure used in the oral diagnosis clinic. After the anamnesis and extra-oral examination, intra-oral examination was performed. The dental plaque was scored according to the items of the index developed by Silness and Löe described elsewhere (7). After this, the teeth were cleaned and dried with compressed air from the unit water syringe and examined under unit light with a standard dental mirror without magnification.

Subsequently, bitewing radiographs were taken from the patients who required bitewing radiographic examination for assessment of dental caries. The radiographs were taken with Ektaspeed Plus films, with an x-ray machine (Trophy CCX. France) operating at 70 kVp, 8 mA, having 2.5 eq aluminum filtration and a 0.8*0.8mm focal spot, according to the manufactures exposure recommendations

and were processed with fresh chemicals in an automatic roller transport processor machine (Velopex Extra-X Medivance Instruments Limited, England). The radiographs were evaluated by the dentists who performed the clinical examinations.

Teeth having carious lesions localized in dentine (according to clinical and radiographic examination), teeth which had been extracted due to caries (according to the history taken from the patient) and teeth having restorations were accepted as decayed, missing and filled teeth. The DMFT index was calculated as the summation of the decayed, missing and filled teeth. The third molars were not included to the index. This index was used in the present study because it was used in similar studies worldwide (8,9,10).

Data analysis was performed by using the SPSS program (Windows, version 11.5). Continuous variables were shown as median (minimum – maximum range) and qualitative data were presented as percentages. The medians were compared by using the Mann Whitney U or the Kruskal Wallis Variance analysis according to the number of independent groups. Kruskal Wallis multiple comparison test was used for the determination of the differing group in cases in which significant difference was present. Chi-square or Fisher's Exact test were used for categorical comparisons, where applicable. Multiple Linear Regression analysis was applied for the determination of the best predictors among age, gender, plaque, brushing, snack/sweet and the use of other oral hygiene aids on the DMFT index. The coefficient of regression and 95% CI's were calculated for each independent variable. The significance level was sated as $p < 0.05$.

Results

According to the analysis of the data, with regard to dietary habits approximately 70% of the participants had regular breakfast, lunch and dinner. No significant difference was found between the regularity of main meals between genders (p>0.05). There was a high rate of snacking in the total of the sample (76.9%). The frequency of snacking ranged between 1 and 8 with a mean value of 2.12 (sd1.59) and did not differ among genders (p: 0.343).

With respect to oral health related behaviors, although not at a high rate, most of the participants brushed their teeth regularly twice a day with fluoridated toothpaste (44.2%) and approximately half of them used other oral hygiene aids in addition to brushing (43.8%). The use of other hygiene aids, including dental floss (20.7%), tooth pick (11.5%), mouth rinse (7.7%) and chewing gum (3.9%), was low in the total of the sample. The oral hygiene habits differed among females and males. Irregular tooth brushing with fluoridated tooth paste was more frequently seen among males (p<0.001). Females tended to use other oral hygiene devices in addition to brushing more commonly than males. A majority of both females and males visited

a dentist irregularly and in the presence of a complaint (82.9%, P=0.204).

The median of the DMFT index was calculated as 5 for the total of the sample. No significant difference was present between the DMFT index values of females and males (P=0.591). A majority of the patients had moderate plaque accumulation within the gingival pocket, gingival margin or tooth which could be seen with naked eye (45.0%). A higher level of plaque accumulation was observed in males compared to females (P=0.003). Details of the total of the sample are shown in Table 1 and, details according to gender are shown in Table 2.

The consumption rate of tea and coffee was higher than milk and fruit juice. Patients consumed pastry, sandwiches and toast more frequently rather than, egg, olive, cheese,

Table 1. Demographic characteristics, dietary habits, visit frequency, oral health related behaviors, DMFT indexes and plaque amount of the patients.

Age	22 (18 – 25) [a]
Sex	
Male	169 (40.6)
Female	247 (59.4)
Regular Breakfast	288 (69.2)
Regular Lunch	314 (75.5)
Regular Dinner	316 (76.0)
Snacking*	320 (76.9)
Visit frequency	
Irregular-Only in the presence of complaint	345 (82.9)
6 months	47 (11.3)
1 year	24 (5.8)
Brushing	
Rarely	3 (0.7)
Sometimes	78 (18.8)
Regularly once	128 (30.8)
Regularly twice	184 (44.2)
Regularly more than twice	23 (5.5)
Other Aids	
No	234 (56.3)
Yes	182 (43.8)
Dental floss	**86 (20.7)**
Tooth pick	**48 (11.5)**
Mouth rinse	**32 (7.7%)**
Chewing gum	**16 (3.9)**
DMFT	5 (0 – 19) [a]
Plaque	
No plaque	29 (7.0)
Only with probe	138 (33.2)
Visible medium plaque	187 (45.0)
High plaque	62 (14.9)

a: median (minimum - maximum)
*Snacking: Includes intakes of sweets, sweetened drinks, patisseries, chips etc.

Table 2. Correlation of dietary habits, visit frequency, oral health related behaviors, DMFT index and plaque amount according to genders.

Variables	Female (n=247) N %	Male (n=169) N %	p[a]	p[b]
Regular Breakfast	169(68.4)	119(70.4)	0.665	
Regular Lunch	192(77.7)	122(72.2)	0.197	
Regular Dinner	184(74.5)	132(78.1)	0.397	
Snacking*	194 (78.5)	126 (74.6)	0.343	
Visit frequency				
In the presence of complaint	204 (82.6)	141 (83.4)	0.204	
6 months	25 (10.1)	22 (13.0)		
1 year	18 (7.3)	6 (3.6)		
Brushing				
Rarely or Sometimes	36 (14.6)	45 (26.6)	0.005	<0.001
Regularly once	71 (28.7)	57 (33.7)		0.179
Regularly twice	123 (49.8)	61 (36.1)		0.016
Regularly more than twice	17 (6.9)	6 (3.6)		0.171
Other Aids				
No	128 (51.8)	106 (62.7)	0.028	
Yes	119 (48.2)	63 (37.3)		
Dental floss	49 (41.2)	37 (58.7)		0.024
Toothpick	30 (25.2)	18 (28.6)		0.624
Mouth rinse	29 (24.4)	3 (4.8)		<0.001
Chewing gum	11 (9.2)	5 (7.9)		0.767
DMFT	5.7±3.26	5.8±3.42	0.591	
Plaque				
No plaque	19 (7.7)	10 (5.9)	0.038	0.554
Only with probe	89 (36.0)	49 (29.0)		0.223
Visible medium plaque	112 (45.4)	75 (44.4)		0.871
High plaque	27 (10.9)	35 (20.7)		0.003

a General test result
b Multiple comparison test results

Table 3. The consumption frequency and contents of nutrients and drinks in breakfast, lunch and dinner.

	Nutrients and drinks	Almost Always N %	Sometimes N %	Rarely or never N %
Breakfast	*Tea*	**127 (30.6)**	**81 (19.5)**	**30 (7.2)**
	Coffee	**83 (19.9)**	**53 (12.7)**	**42 (10.1)**
	Fruit juice	60 (14.4)	239 (57.5)	117 (28.1)
	Milk	57 (13.7)	207 (49.8)	152 (36.5)
	Cereals	75 (18.0)	183 (44.0)	158 (38.0)
	Egg l bread*	115 (27.6)	218 (52.4)	83 (20.0)
	Other (pastry, sandwich etc.)	171 (41.1)	172 (41.3)	73 (17.5)
Lunch	*Vegetables*	126 (30.3)	268 (64.4)	22 (5.3)
	Fast food	33 (7.9)	261 (62.7)	122 (29.3)
	Fish l meat	101 (24.3)	237 (57.0)	78 (18.8)
	Fruit	142 (34.1)	214 (51.4)	60 (14.4)
	Desert	31 (7.5)	208 (50.0)	177 (42.5)
Dinner	*Vegetables*	306 (73.6)	87 (20.9)	23 (5.5)
	Fast food	12 (2.9)	178 (42.8)	226 (54.3)
	Fish l meat	111 (26.7)	261 (62.7)	44 (10.6)
	Fruit	153 (36.8)	208 (50.0)	55 (13.2)
	Desert	31 (7.5)	264 (63.5)	121 (29.1)
Drinks	*Water*	319 (76.7)	66 (15.9)	31 (7.5)
	Fruit juice	25 (6.0)	243 (58.4)	148 (35.6)
	Soft Drinks	34 (8.2)	196 (47.1)	186 (44.7)
	Alcohol	-	16 (3.8)	400 (96.2)
	Teal Coffee	69 (16.6)	124 (29.8)	223 (53.6)

*Egg/bread etc: Egg/jam/ham/sausage/olive/cheese/bread/tomato/butter/honey etc.

Table 4. The effect of plaque, snacking, brushing habits, the use of other oral hygiene aids and gender on the DMFT index.

Variables	DMFT	p
Plaque		
No plaque	2.1±1.46	<0.001
Only with probe	4.8±2.43[a]	
Visible medium plaque	6.0±2.75[a,b]	
High plaque	9.2±4.09[a,b,c]	
Snack/Sweet		
No	5.2±3.59	0.022
Yes	5.9±3.23	
Brushing		
Rarely	10.7±4.93	<0.001
Sometimes	7.4±3.94	
Regularly once	5.9±2.67[e]	
Regularly twice	5.0±3.11[d,e,f]	
Regularly more than twice	5.3±3.43[e]	
Other aids		
No	6.4±3.35	<0.001
Yes	5.0±3.15	
Gender		
Female	5.7±3.26	0.591
Male	5.8±3.42	

a The difference between no plaque group was statistically significant (p<0.001).
b The difference between only with probe group was statistically significant (p<0.001).
c The difference between visible medium plaque group was statistically significant (p<0.001).
d The difference between rarely group was statistically significant (p<0.05).
e The difference between sometimes group was statistically significant (p<0.05).
f The difference between regularly once group was statistically significant (p<0.01).

Table 5. The plaque amount and brushing habits among patients having snacking habits (yes) and not (no).

Variables	No (n=96) N %	Yes (n=320) N %	pª	pᵇ
Plaque				
No plaque	18 (18.8)	11 (3.4)	<0.001	<0.001
Only with probe	27 (28.1)	111 (34.7)		0.231
Visible medium plaque	38 (39.6)	149 (46.6)		0.228
High plaque	13 (13.5)	49 (15.3)		0.669
Brushing				
Rarely	2 (2.1)	1 (0.3)	0.098	
Sometimes	14 (14.6)	64 (20.0)		
Regularly once	36 (37.5)	92 (28.8)		
Regularly twice	37 (38.5)	147 (45.9)		
Regularly more than twice	7 (7.3)	16 (5.0)		

a General test result
b Multiple comparison test results

Table 6. Factors having an effect on the DMFT index according to multiple linear regression analysis.

Independent Variables	B 1	Std. Error	B 2	p	95% Confidence Interval for B	
					Lower Bound	Upper Bound
Constant	0.681	0.272	-	0.013	0.146	1.215
Age	0.018	0.007	0.104	**0.017**	0.003	0.033
Gender	-0.121	0.058	-0.090	**0.037**	-0.235	-0.007
Only with probe	0.672	0.124	0.482	**<0.001**	0.429	0.916
Medium plaque	0.917	0.124	0.695	**<0.001**	0.674	1.161
High plaque	1.320	0.153	0.715	**<0.001**	1.019	1.621
Rarely brushing	0.273	0.365	0.035	0.455	-0.445	0.990
Sometimes brushing	0.011	0.149	0.007	0.938	-0.281	0.304
Regularly once	0.069	0.132	0.048	0.605	-0.192	0.329
Regularly twice	-0.018	0.125	-0.014	0.885	-0.264	0.228
Snack/sweet (yes)	0.090	0.070	0.058	0.197	-0.047	0.227
Other aids	0.007	0.066	0.005	0.921	-0.123	0.136

B 1: Unstandardized coefficients
B 2: Standardized coefficients

butter, jam, bread etc. in breakfast. Fast food intake was lower than from vegetable and fish/chicken/meat intake at lunch and dinner. Water was found to have the highest ratings between drinks consumed at lunch and dinner. Frequent consumption of soft drinks and fruit juice was not at a high rate. Details are given in Table 3. Females tended to intake more vegetables than males (P=0.000) and males tended to intake more fish/meat/ chicken and fruits (P=0.005) in lunch. No significant difference was found between the intake of fast food and desserts between females and males (p>0.05). Males tended to eat more fruit and desserts than females in dinner (p<0.05). Soft drink, tea, coffee consumption was more frequent among males (p<0.05) at lunch and dinner (These data are not tabulated).

Plaque level, snacking and brushing habits had an impact on the DMFT index. The DMFT values increased with an increase in plaque accumulation, presence of snacking and irregular brushing (p<0.05). Compared to other brushing routines, regular brushing twice a day resulted in a significant decrease in the DMFT index. Details are given in Table 4.
Plaque accumulation was lower in patients who did not have snacking habits and significant difference was observed between absence of plaque accumulation among patients who did not snack (p<0.001). The brushing routines of patients having snacking habits did not differ significantly from the patients who did not have such a habit (p>0.05). Details are shown in Table 5.

According to Multiple Linear Regression analysis plaque, age and gender were found to be the most significant factors related with the DMFT index. Details are shown in Table 6.

Discussion

A history concerning food intake patterns, diet adequacy, consumption of fermentable carbohydrates and regular brushing is an important key of the strategy for health professionals to use to determine the diet related caries risk habits of people (2).

Age and gender have impact on the dietary habits, oral health related behaviors and DMFT index. There are a high number of studies evaluating these habits among children in different populations but studies evaluating these topics among young adults are limited. Therefore, the dietary habits, oral health related behaviors, DMFT indexes and the possible relationships between them were evaluated in the current study.

According to the questionnaire, including items of dietary habits, approximately one third of the patients had irregular breakfast, lunch and dinner and the regularity patterns of main meals did not differ significantly between genders. The snacking rate was found to be very high also and no significant difference was present between genders. Findings emphasize the importance of maintaining the regularity of main meals. Bruno-Ambrosisus et al (11), reported an association between omitting main meals and an increase in caries risk. It could be argued that omitting main meals could lead to an increase in consumption of light meals and snacks rich of sugar during the day (11-13), and lead to an increase in the caries incidence. Therefore, a proper and balanced diet is probably a key factor in keeping snacking frequency at a moderate level (11,14).

In the present study, snacking habits were assessed but the amount of total sugar in the diet was not evaluated therefore; the total consumption amount of sugar was not evaluated in the present study. This is a limitation of the study.

Besides the unfavorable effects of some dietary habits in relation with demineralization, diet and nutrition may favor remineralization when their content is high in calcium, phosphate and protein (2). In addition, polyphenols, such as tannins in coffee and tea, may reduce the cariogenic potential of foods. As tea and coffee may reduce the cariogenic potential of foods and soft drinks have a high cariogenic potential the high consumption rate of tea and coffee and low consumption rate of soft drinks could favor against caries development (15,16).

It is important to emphasize that diet is not only difficult to study but also very complex (1). In the present study we only grouped the foods under general topics and did not evaluate details, such as amount of the daily sugar, calcium, phosphate etc. intake. Further research could be conducted to investigate detailed contents and quantity of food and drinks to assess nutritional adequacy, total amount of exposed sugar, calcium, phosphate and fluoride.

Reduction of plaque accumulation is an important issue for prevention of dental caries. Plaque accumulation was found to be the factor having the most significant effect on the DMFT index in the present study. Regular brushing twice a day and flossing is recommended as they are easy, effective and low cost dental self care procedures for the removal of dental plaque (17). A considerable proportion of the young adult patients did not brush their teeth on a daily biases with fluoridated toothpaste, and the use of dental floss was lower than tooth brushing. In most studies it was reported that the rate of tooth brushing twice a day was higher than the use of dental floss (18-20). Our results show consistency with these results. The current study showed that, not only the regularity of brushing twice a day with fluoridated toothpaste, but also the use of dental floss should be encouraged.

Oral hygiene related behaviors could differ among genders. It is reported that females' exhibits higher rates of regular brushing and flossing (21). Regular brushing twice a day was more common among young female adults in the present study, showing consistency with previous research. The preventive focus should vary by gender since irregular brushing and the use of other oral hygiene aids differed among genders.

A majority of the patients visited the dentist only in presence of a complaint and visits for regular preventive check up were very low. Similar patterns for dentist visit frequency were present for both females and males. Young adult patients should be encouraged to visit a dentist not only in compliance but for regular check up.

The DMFT index ranged between 0-19 with a median of 5, indicating most subjects had a total of 5 missing, filled and extracted teeth. The World Health Organization (WHO) defined the acceptable dental health status in terms of DMFT index for adults as 4 at age 18 years and 6 for 35-44 years old (22). The median DMFT index found in the present study is near to the acceptable range for young adults.

Plaque accumulation, age, snacking and brushing habits had an impact on the DMFT index. An increase in the DMFT index occurred with plaque existence underlying the importance of efficient plaque control in caries prevention.

The DMFT index values significantly increased with age indicating there was difference between indexes of young adults aged between 18 and 25.

Patients who had snacking habits had higher DMFT indexes compared to patients who did not have such a habit. Several studies have found significant associations with frequent exposures to sugared foods (23-25), while some others were not able to replicate this association or found only weak relationships with dental caries (26,27).

Tooth brushing with fluoridated toothpaste has lead to a decline in dental caries worldwide (28). It is an expected result that frequent tooth brushing was associated with a lower DMFT index compared to the irregular brushing group. One reason of a higher DMFT indexes for patients having snacking habits could be related with the fact that the oral health related behaviors of these patients did not differ significantly from patients who do not have such habit. This is an important finding. The interaction between snacking and removal of the plaque with oral health related behaviors in respect to caries should be explained to these patients and they should be encouraged to decrease snacking frequency and enhance their oral health related behaviors. Some previous studies reported that DMFT scores did not differ significantly, despite a higher intake of sugar and a greater snack frequency as oral hygiene was found to be the dominant variable related with the index (29,30).

The patients participating in the study were selected out of patients who had admitted at least once to the dental school in past but no information was collected about the knowledge of the patients of the cariogenic potential of foods, drinks, the importance of regular eating patterns, and dental hygiene habits recommended for the maintains of good oral health. Patients attending to this dental school receive information about the relationship between diet and caries and oral health related behaviors, but as this information was not given under standard procedure in the current study there is no standard. This is a limitation of the study. Further longitudinal studies could be conducted on patients who had received instructions about proper dietary habits and oral health related behaviors and the effect on these instructions on further dietary habits, oral health related behaviors and DMFT index.

Conclusion

The results of the present study showed that approximately one third of the young adult patients did not have regular main meal patterns and snacking was common. In addition, oral hygiene related behaviors were not properly performed by approximately half of the patients and a majority had visible dental plaque. Patients having snacking habits did not put much pressure on the oral health related behaviors. Plaque amount, improper main meal patterns, snacking, plaque accumulation and oral health related behaviors were found to be in relation with the DMFT index. Therefore, oral health promotion for young adults should be directed toward the regularity of main meals, elimination of snacking and include recommendations for proper oral health related behaviors to obtain adequate plaque control.

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