# **Original Research Article**

# The Effects of Nutritional Habits on Oral Health: A Survey Study

Beslenme Alışkanlıklarının Ağız Sağlığı Üzerindeki Etkileri: Anket Çalışması

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## ABSTRACT

**Aim:** To evaluate nutritional status and oral health awareness in a sample of Turkish population and to determine the relationship between nutritional status, oral health, and oral hygiene habits.

**Materials and Method:** This study was a cross-sectional survey. Using the World Health Organization's Oral Health Assessment Questionnaire, 16 questions were asked about demographic characteristics, oral hygiene practices, daily dietary habits, smoking and alcohol consumption, and current oral health. Following intraoral examinations of the volunteers, any caries, and, filled and missing teeth were recorded. The relationship between potential variables and oral health was evaluated using descriptive statistics.

**Results:** A total of 200 participants were included in the study. There was no significant difference in the distribution of caries, filled and missing teeth scores, and Decayed-Missing-Filled-Teeth (DMF-T) index between the genders. It was, however, found that female participants brushed their teeth more frequently and flossed more frequently. Taking time off from work due to oral health problems was more common in female participants than males. There was a significant increase in the frequency of missing teeth and caries in participants who consumed sweet foods and beverages.

**Conclusion:** Results displayed that female participants pay more attention to oral hygiene practices than male participants. A correlation was found between the frequency of consumption of fermentable sugar-containing foods and the DMF-T index. It was concluded that healthy eating habits play a significant role in maintaining oral health and preventing dental diseases.

**Keywords:** DMF-T; Feeding behavior; Oral health; Oral hygiene; Turkish patients

#### ÖZET

Amaç: Bir grup Türk popülasyonunda beslenme düzeyini ve ağız sağlığı farkındalığını değerlendirerek, beslenme durumu ve ağız sağlığı ile oral hijyen alışkanlıkları arasındaki ilişkiyi belirlemektir.

Gereç ve Yöntem: Bu çalışma kesitsel bir anket çalışmasıdır. Dünya Sağlık Örgütü'nün Ağız Sağlığı Değerlendirme anketi kullanılarak, demografik veriler, oral hijyen uygulamaları, günlük beslenme alışkanlıkları, sigara ve alkol tüketimi ile mevcut ağız sağlığı hakkında 16 soru yöneltilmiştir. Gönüllülerin intraoral muayenesini takiben çürük, dolgulu ve eksik dişler kayıt altına alınmıştır. Potansiyel değişkenler ile ağız sağlığı arasındaki ilişki tanımlayıcı istatistikler eşliğinde değerlendirilmiştir.

Bulgular: Çalışmaya toplam 200 katılımcı dahil edilmiştir. Farklı cinsiyet gruplarında çürük, dolgulu, eksik diş skoru ve DMF-T indeksi dağılımları açısından anlamlı bir fark bulunamamıştır. Ancak, kadın katılımcıların erkeklere oranla daha sık dişlerini temizlemekte ve diş ipi kullanmakta olduğu saptanmakla birlikte; ağız sağlığı problemleri nedeniyle işten izin alma durumunun kadın katılımcılarda erkeklere nazaran daha fazla olduğu görülmüştür. Cinsiyetten bağımsız olarak şekerli yiyecek ve içecek tüketen katılımcılar arasında ise sıklık derecesine göre çürük diş skorunda ve eksik diş sayısında anlamlı bir artış olduğu tespit edilmiştir.

Sonuç: Kadınlar erkeklere oranla oral hijyen uygulamalarına daha fazla özen göstermektedir. Fermente olabilen şeker içeren gıdaların tüketim sıklığı ile DMF-T indeksi arasında bir korelasyon bulunmaktadır. Sağlıklı beslenme alışkanlıklarının ağız sağlığını korumada ve diş hastalıklarını önlemede kritik bir rol oynadığı anlamlı olarak saptanmış bulunmaktadır.

Anahtar Kelimeler: Ağız hijyeni; Ağız sağlığı; Beslenme davranışı; DMF-T; Türk hastalar

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# INTRODUCTION

Oral diseases are among the most common non-contagious diseases as a serious public health problem in developed and developing countries.<sup>1</sup> According to the latest Global Burden of Disease report (2019), oral diseases, including dental caries, periodontal disease, tooth loss, and oral mucosal lesions, affect more than 44.5% of the global population.<sup>2</sup> The impairments caused by oral diseases can directly lead to pain, sepsis, prolonged schooling in childhood, reduced work productivity in adults, and reduced overall quality of life.<sup>3</sup> Although oral diseases are largely preventable, they continue to be a neglected problem.<sup>1</sup>

Oral health is an integral part of general health and supports individuals' ability to engage with society and realize their potential. Bevond basic life functions such as eating, breathing, and speaking, oral health has psychosocial impacts, contributing to self-confidence, well-being, socialization, and painfree living, thus holding a significant place in human life.<sup>5</sup> It directly affects nutrition and general health status and is similarly influenced by them<sup>1</sup>. The World Health Organization (WHO) lists oral health as one of the top 10 standards for healthcare problem and suggests that oral diseases are a key factor in determining quality of life.<sup>6</sup> Demographic, economic, and educational changes also impact dental caries, periodontal disease, and diseases like oral cancer.7 Therefore, the severity of oral diseases varies by region, ethnicity, age, and gender. The rising prevalence of oral diseases in many undeveloped and developing countries remains a concern.<sup>2</sup>

Nutrition is a critical part of health and development. Better nutrition is associated with improved infant, child, and maternal health, stronger immune systems, safer pregnancies and births, lower risk of non-contagious diseases (such as diabetes and cardiovascular disease), and longer life spans.<sup>3</sup> Nutrition, which is the foundation of human development, requires a balanced and adequate intake of carbohydrates, proteins, fats, vitamins, minerals, and water throughout life. There is a multifactorial relationship directly linked to nutrition and oral health. Inadequate nutrition can directly affect growth and development, as well as cause various disorders on all orofacial components. These disorders can be listed as dental caries, various periodontal diseases (gingivitis, periodontitis), and oral mucosal diseases (aphthous stomatitis, glossitis, cheilitis, and angular stomatitis). On the other hand, poor oral health conditions, such as missing teeth, acute periapical infections, and oral mucosal diseases, may negatively affect individuals' daily diets.<sup>4</sup>

Understanding the role of nutrition in overall health is crucial. Therefore, determining and managing oral health conditions and nutritional issues are important to improve the health and quality of life of affected individuals. This study was designed to clarify the factors influencing the impact of nutritional habits on oral health in a sample of Turkish patients. The aim of the study was to evaluate the nutritional status and oral health awareness of the group of Turkish patients and determine the relationship between nutritional status, oral health, and oral hygiene habits.

## MATERIALS AND METHOD

This study was designed as a cross-sectional survey. Volunteers recruited from patients who applied to Kütahya Health Sciences University University Oral and Dental Health Application and Research Center due to dental complaints in June and July 2024. Volunteers who agreed to participate in the study were asked to answer the survey questions. Volunteers over 18 years of age who had no medical condition that would prevent oral examination were included in the study. Volunteers with absorption and digestive disorders were excluded from the study.

The WHO Oral Health Assessment Questionnaire was used for this study.5 Through this survey, 16 questions about demographic data (age, gender, rural/urban life, education level, occupation, average monthly income level), oral hygiene habits, daily nutrition habits, smoking and alcohol consumption, and current oral status were asked. A full oral examination was conducted for all volunteers who completed the survey, and a record was made with a table showing decayed, filled, and missing teeth to calculate the Decayed-Missing-Filled-Teeth (DMF-T) index. Teeth with both fillings and decay were considered decayed, while teeth with crowns were counted as filled. For each volunteer, the DMF-T score was calculated as the total number of decayed, filled, and missing teeth, and the mean DMF-T for the study group was calculated as the Total DMF-T / examined number of volunteers. The survey form given to the participants was filled face-to-face in the Oral and Maxillofacial Surgery clinic without any time limitation. To ensure data quality before the survey, all participants were informed that they should answer all the questions completely and that each question should have only one answer. To ensure participant confidentiality, volunteers' identity was not included in the survey form.

#### **Data Analysis**

Following the completion of the survey forms, the collected data was transferred to the computer environment and the answers of the participants to each question were shown with their percentages in tables. Some descriptive statistics regarding the participants' dietary habits (e.g. frequency of consumption of certain foods and beverages) were presented through graphs. The analysis of the relationships between dietary patterns and oral health outcomes (such as the frequency of decay, filled, or missing teeth) was presented through tables. Potential confounding variables (e.g. oral hygiene practices, socioeconomic status) and their effects on the relationship between nutrition and oral health were assessed.

#### **Statistical Analysis**

The proportions were assessed for statistically significant differences by the Chi-squared test. In RxC contingency tables for more than 10% cells with expected values <5, we used the result of Fisher's exact test instead of chi-squared. If all the observed values were >25 and expected values >5, Chisquared test result was used.

#### **Ethical Approval**

This study was approved by the Kütahya Health Sciences University University Non-Interventional Clinical Research Ethics Committee (Decision date: 17/05/2024, Approval no: 2024/07-12).

#### **Informed Consent Form**

The volunteers were informed about the study design and objectives by the researchers. Volunteers were not provided with any incentive to participate in the study, and they were informed about their right to withdraw at any time without any pressure. A signed informed consent form was obtained from the volunteers who were informed and participated in the study voluntarily.

# RESULTS

#### Demographic Characteristics of Volunteers

A total of 225 volunteers participated in the study of which 25 were excluded due to missing data. The mean age of the participants was  $36.5\pm14.3$  years. Demographic characteristics of the participants are shown in Table 1 as frequencies and percentages. The results revealed that the frequency of smoking (p<0.001) and alcohol use (p=0.002) was higher among male than female patients.

# Participants' oral hygiene habits and problems they experienced

Table 2 presents the statistical analysis findings of oral health practices of the volunteers. A significant difference was found between the distribution of the frequency of the participants' brushing their teeth in gender groups (p<0.001). Female participants cleaned their teeth more frequently than male participants (Figure 1). Awareness of whether toothpastes contain fluoride displayed no statistically significant difference between gender groups (p=0.65). Apart from flossing, there was no statistically significant difference in the distribution of agents used for tooth cleaning (e.g., toothbrush, toothpick, miswak, etc.) between gender groups (p>0.05). There was a difference in the use of dental floss between genders (p=0.005); females used floss more frequently than males. The distribution of agents used by participants for cleaning their teeth is shown in Figure 2. Of the participants, 98.5% (n=197) used toothpaste for cleaning their teeth, but 67% (n=134) did not know whether their toothpaste contained fluoride. Only 26.5% (n=53) of the participants used toothpaste that contained fluoride. In terms of recent dental visits, 42% (n=84) of the participants reported that their last dental visit was within the past 6 months, and 24.5% (n=49) reported visiting within the past 6 to 12 months. The primary reason for visiting the dentist was for pain or discomfort in teeth, gums, or mouth (60%, n=121), followed by visits for treatment or follow-up (31%, n=62). Responses to questions assessing how participants perceived their oral and gum health showed no statistically significant difference between genders (p=0.57 and p=0.46). However, a significant difference was found between gender groups regarding the response to the question "Have you experienced any pain or discomfort in your teeth and/or mouth in the last year?" (p=0.03). Females reported experiencing dental problems more frequently than males in the past year. Despite this, the association between the frequency of dental visits and the DMF-T score did not reach statistical significance in this sample (p=0.08).



Figure 1. Participants' frequency of tooth brushing

Demographic characteristics	Answers	Number	Percentage	
Gender	Female	118	59	
	Male	82	41	
Marital Status	Married	80	40	
	Single	115	57.5	
	Widow	5	2.5	
Region of residence	Province	180	90	
	District	18	9	
	Quarter	1	0.5	
	Village	1	0.5	
Education level	Illiterate	4	2	
	Literate	33	16.5	
	Primary School	20	10	
	Secondary School	50	25	
	High School	86	43	
	University	7	3.5	
	Master's/Doctorate	0	0	
Occupation	Housewife	48	24	
	Employee	33	16.5	
	Civil Servant	32	16	
	Tradesman	4	2	
	Self-employed	17	8.5	
	Retired	15	7.5	
	Unemployed	11	5.5	
	Student	40	20	
Monthly income	Low income	64	32	
	Low-middle income	15	7.5	
	Middle income	27	13.5	
	High-middle income	22	11	
	High income	20	10	
	Very high income	52	26	
Smoking	Yes	56	28	
	No	125	62.5	
	Quit	19	9.5	
Alcohol use	Yes	37	18.5	
	No	163	81.5	

# Table 1. Sociodemographic characteristics of the participants

Oral health practices	Answers	Total		Fe	Female M		lale	<b>D</b> +		
		n	%	n	%	n	%	Ρ^		
Frequency of brushing	Never	3	1.5	0	0	3	1.5			
	Once a month	5	2.5	0	0	5	2.5			
	2-3 times a month	5	2.5	2	1	3	1.5			
	Once a week	14	7	9	4.5	5	2.5	p< 0.001		
	2-6 times a week	19	9.5	10	5	9	4.5			
	Once a day	65	32.5	33	16.5	32	16			
	Twice a day or more	89	44.5	64	32	25	12.5			
Agents used for tooth brushing	Toothbrush	199	99.5	118	59	81	40.5			
	Wooden toothpick	47	23.5	24	12	23	11.5			
	Plastic toothpick	3	1.5	0	0	3	1.5			
	Dental floss*	45	22.5	35	17.5	10	5	p>0.05		
	Black pencil	1	0.5	0	0	1	0.5			
	Miswak	11	5.5	5	2.5	6	3			
Use of fluoride toothpaste	Yes	53	26.5	34	17	19	9.5			
	No	13	6.5	7	3.5	6	3	p= 0.65		
	l don't know	134	67	77	38.5	57	28.5			
Defining teeth and gum condition	Teeth condition									
	Excellent	1	0.5	1	0.5	0	0			
	Very good	5	2.5	2	1	3	1.5			
	Good	34	17	21	10.5	13	6.5			
	Average	88	44	52	26	36	18	p= 0.57		
	Bad	38	19	24	12	14	7			
	Very bad	26	13	12	6	14	7			
	l don't know	8	4	6	3	2	1			
	Gum condition									
	Excellent	2	1	2	1	0	0			
	Very good	7	3.5	4	2	3	1.5			
	Good	43	21.5	29	14.5	14	7	. 0.40		
	Average	72	36	38	19	34	17	p= 0.46		
	Bad	47	23.5	30	15	17	8.5			
	Very bad	15	7.5	8	4	7	3.5			
	l don't know	14	7	7	3.5	7	3.5			
Use of removable denture	Partial denture	11	5.5	7	3.5	4	2			
	Lower total denture	3	1.5	2	1	1	0.5	*p=0.67		
	Upper total denture	9	4.5	5	2.5	4	2			
Any pain/discomfort in your teeth and/	Yes	154	77	97	48.5	57	28.5			
or mouth in the last year?								n= 0.032		
	No	44	22	21	10.5	23	11.5	P 0.002		
	l don't know	2	1	0	0	2	1			

#### Table 2. Oral health practices and oral health status by gender.

\*p values are for comparison of responses by male and female participants in RxC tables as a single omnibus test.

Frequency of problems experienced in the last year	Тс	otal	Fe	male		Male	р
	n	%	n	%	n	%	
Difficulty in biting food							p= 0.35
Very often	24	12	12	6	12	6	
Often	25	12.5	18	9	7	3.5	
Sometimes	56	28	35	17.5	21	10.5	
No	95	47.5	53	26.5	42	21	
Difficulty chewing food			10	-	10	0.5	p= 0.083
Very often	23	11.5	10	5	13	6.5	
Otten	36	18	27	13.5	9 17	4.5 9 E	
Someumes	43	21.5	20 55	13 27 5	17	0.0	
No Difficulty in speaking/ propouncing words	90	45	55	21.5	43	21.5	n= 0.97
Very often	6	3	3	15	3	15	p= 0.97
Offen	18	9	J 11	5.5	7	3.5	
Sometimes	22	5 11	12	6	, 10	5	
No	152	76	91	45.5	61	30.5	
l don't know	2	1	1	0.5	1	0.5	
Dry mouth							p= 0.26
Very often	5	2.5	3	1.5	2	1	
Often	14	7	11	5.5	3	1.5	
Sometimes	54	27	27	13.5	27	13.5	
No	124	62	76	38	48	24	
l don't know	3	1.5	1	0.5	2	1	
Embarrassment of the appearance of teeth							p= 0.091
Very often	24	12	13	6.5	11	5.5	
Often	33	16.5	22	11	11	5.5	
Sometimes	25	12.5	9	4.5	16	8	
No	1	0.5	1	0.5	0	0	
l don't know	117	58.5	73	36.5	44	22	
Feeling nervous due to dental or oral problems							p= 0.56
Very often	22	11	14	7	8	4	
Often	26	13	16	8	10	5	
Sometimes	51	25.5	27	13.5	24	12	
No	100	50	61	30.5	39	19.5	
I don't know	1	0.5	0	0	1	0.5	
Avoiding smiling due to teeth							p= 0.40
Very often	25	12.5	14	7	11	5.5	
Often	26	13	17	8.5	9	4.5	
Sometimes	25	12.5	11	5.5	14	7	
No	123	61.5	75	37.5	48	24	
I don't know	1	0.5	1	0.5	0	0	
Frequent interruption of sleep							p= 0.52
Very often	7	3.5	6	3	1	0.5	
Often	18	9	12	6	6	3	
Sometimes	33	16.5	18	9	15	7.5	
No	140	70	81	40.5	59	29.5	
I don't know	2	1	1	0.5	1	0.5	* 0.000
Taking time off from work*	2	4 6	•	0	2	4 5	^p= 0.036
Offen	3	1.0	0	0	ა ი	1.0	
Somotimos	0	J 13 5	4 11	2	2 16	ι Q	
Someumes	27	13.5	102	5.5	60	30 0	
l den't know	2	1	102	0.5	1	30 0 5	
Difficulty in performing general activities	2	1	1	0.5	1	0.5	n = 0.48
Very often	14	7	7	35	7	35	p= 0.40
Often	23	, 11 5	13	6.5	, 10	5	
Sometimes	162	81	98	49	64	32	
No	1	0.5	0	0	1	0.5	
Decreased tolerance for people around		0.0	5			5.0	p= 0.54
Very often	2	1	1	0.5	1	0.5	p 0.01
Often	16	8	8	4	8	4	
Sometimes	21	10.5	- 11	5.5	10	5	
No	160	80	98	49	62	31	
l don't know	1	0.5	0	0	1	0.5	
Decrease in willingness to participate in social activities		-	-			-	p= 0.33
Very often	5	2.5	1	0.5	4	2	
Often	13	6.5	9	4.5	4	2	
Sometimes	18	9	9	4.5	9	4.5	
No	162	81	98	49	64	32	
I don't know	2	1	1	0.5	1	0.5	

\* p<0.05, Fisher's Exact Test

Table 3 presents the statistical findings on issues experienced within the last year due to conditions of teeth or mouth in the study sample. Participants were questioned about the presence and frequency of issues such as difficulty in biting or chewing food, difficulty in talking/pronouncing words, dry mouth, feeling embarrassed by the appearance of teeth, feeling tense due to oral discomfort, sleep interruptions, difficulty in general activities, reduced tolerance towards others, and decreased desire for social interactions. No statistically significant relationship was found between these variables and gender groups. However, fthe frequency of taking time off work due to oral problems was significantly higher among female participants than male participants (p=0.036).

#### Analysis of answers regarding nutritional habits

The distribution of the frequency of consuming the specified foods regarding nutritional habits is shown in Figure 3. No statistically significant difference was found in the distributions of fresh fruit, biscuits, cakes, sweet pies, buns, jam/honey, sugary gum, sugary drinks, and sugary tea/coffee consumption between gender groups (p>0.05). There was no difference between the frequency of fresh fruit consumption and the distribution of decayed teeth (p=0.19), filled teeth (p=0.37), missing teeth (p=0.48) scores and DMF-T



**Figure 2.** Distribution of the substances used by the participants for teeth cleaning [It is strange to see to see a 9% value in the pie chart and it is not possible to work out which category it refers to. It is best to remove that category from the list and not to show a 0% value in the pie chart. Whichever category it is, it can be mentioned in the legend.

index (p=0.82). There was a significant relationship between the consumption of biscuits, cakes, and cream cakes and decayed and missing teeth scores. (p=0.021). When the frequency of consumption was analyzed, a statistically significant association was found between decayed teeth scores for those consuming certain items a few times a month and those consuming them several times a day (p=0.001). A significant association was also observed in missing teeth scores between those consuming these items



Figure 3. Percentage Distribution of Specified Food Consumption by Dietary Habits.

a few times a week and those who never consumed them (p=0.001). The DMF-T index was significantly higher among daily consumers compared to those who never consumed these items (p=0.001). However, no significant difference was found between the frequency of sweet pie or pastry consumption and scores for decayed (p=0.18), filled (p=0.63), or missing teeth (p=0.38). Additionally, the frequency of jam or honey consumption was not significantly associated with scores for decayed (p=0.91), filled (p=0.97), or missing teeth (p=0.23). Similarly, no significant difference was observed between the frequency of sugar-containing gum consumption and decays (p=0.65), filled (p=0.31), or missing teeth scores (p=0.07). The frequency of sweets or sugar consumption did not show a significant difference for decayed (p=0.88) or filled (p=0.89) teeth scores; however, there was a significant difference for missing teeth (p=0.012) and the DMF-T index (p=0.023). The DMF-T index was statistically significantly higher in groups that consumed sweets or sugar a few times a week compared to those who rarely or never consumed them (p=0.014).

No significant difference was found between the frequency of lemonade, cola or other soft drinks consumption and the number of decayed teeth although it was close to significance level (p=0.056), filled teeth (p=0.590) and DMF-T index (p=0.361); however, a significant relationship was detected with missing teeth score (p=0.018). The number of missing teeth was found to be significantly higher in participants who consumed lemonade, cola, or other soft drinks every day compared to the group who rarely/never consumed them (p=0.038). No significant difference was found between the frequency of sweetened tea consumption and the number of decayed (p=0.52), filled (p=0.67) or missing teeth (p=0.198), and the DMF-T index (p=0.377). No significant difference was found between the frequency of sweetened coffee consumption and the number of filled (p=0.60) or missing (p=0.84) teeth, as well as the DMF-T index (p=0.73). However, those who consumed sweetened coffee several times a day had a statistically significantly higher number of decayed teeth compared to those who consumed it several times a month (p=0.048).

#### Analysis of answers regarding oral health

The average number of decayed teeth was 3.2±3.2, the average number of filled teeth was 3.7±3.6, the average number of missing teeth was 6.4±7.3 and the average DMF-T index value was 13.2±7.5. No significant difference was found in terms of decayed, filled, and missing teeth scores and the DMF-T index distributions in gender groups (p>0.05). No statistically significant relationship was found between cigarette consumption and DMF-T index distributions (p=0.25). However, there was a statistically significant difference in the distribution of the DMF-T index between alcohol users and non-users (p=0.018). When the answers given to the question about the frequency of brushing the teeth were examined, a significant difference was found between the DMF-T indices of females and males (p=0.009). There was a significant relationship between oral problems experienced in the last year and the DMF-T index distributions (p<0.001). There was also a significant difference in the DMF-T index distributions between the groups reporting the most common complaint of difficulty in chewing foods as 'sometimes' and 'very often' (p=0.027).

#### DISCUSSION

In this survey, the nutritional habits, oral hygiene practices, and their potential relationship with the oral and dental health of adult patients who applied to the oral and maxillofacial surgery clinic were evaluated. We observed that regardless of the demographic characteristics, when sugar and sugary foods were predominant ingredients of the diet, it did negatively affect dental health. Studies evaluating the effects of eating habits on oral health have been conducted on samples in different populations. A study carried out on a large sample in Saudi Arabia evaluated the awareness of participants about the effect of diet on dental caries and showed that more than half of the participants knew about the relationship between diet and dental caries.<sup>6</sup> In a study conducted in India where the effects of nutrition on oral and dental health were evaluated among students of the nutrition and dietetics department, it was emphasized that the participants' awareness and knowledge on the subject were insufficient. The lack of knowledge about the effects of nutrition on oral and dental health has been pointed out as a major problem even among healthcare professionals.<sup>7</sup> A systematic review including 70 articles evaluating the knowledge of oral and dental health workers and dietitians also showed that health workers had insufficient knowledge about the effects of nutrition on oral and dental health.<sup>8</sup> In another study conducted in Nigeria, it was emphasized that there is a need for dietitians and health professionals to improve ways in which they can help to prevent poor oral health resulting from malnutrition and poor eating habits.<sup>9</sup>

In our study sample, no statistically significant difference was found in the answers regarding eating habits between gender groups (p>0.05). It was, however, found that female participants paid more attention to oral hygiene practices than male participants (Table 2). Considering the data obtained in our study, females were exposed to more dental problems in the last year and had to take leave from work due to oral health problem (Table 3). According to the literature, women have higher nutritional awareness compared to men.<sup>10,11</sup> The fact that women are more knowledgeable about nutrition and have better oral hygiene practices compared to men suggests that women may be more concerned about nutrition and oral health than men.<sup>12</sup> However, this situation may vary in different countries. For instance, in Malaysia and Palestine, there was no statistically significant difference between males and females in terms of nutritional knowledge and awareness levels regarding the effects of nutritional knowledge on oral / dental health.<sup>11,13</sup> In another study carried out among parents in Italy, it was demonstrated that there were no significant differences in mentally and behaviorally among parents regarding their own and children's oral hygiene.14

Dental caries is one of the most common non-contagious diseases and remains a significant public health concern. Although it has a multifactorial etiology, increased sugar consumption is directly related to the risk of caries. <sup>15</sup> Dental caries is a dynamic process involving susceptible tooth surfaces, cariogenic bacteria primarily Streptococcus mutans and a fermentable carbohydrate source. Sucrose is the most common dietary sugar and is considered the most cariogenic carbohydrate. Frequent consumption of carbohydrates in simple sugar form increases the risk of caries. <sup>16</sup> Fermentable sugars are the primary energy source for cariogenic bacteria and, over time, cause the pH on tooth surfaces to drop, leading to demineralization of the hard tissue of teeth. Therefore, individuals with a diet rich in mono- and disaccharides have a high risk of caries. Sticky foods such as chocolate, cookies, and cakes tend to lodge in tooth pits and fissures, thereby increasing the risk of caries. Additionally, liquid sugars in sugary tea/coffee, fruit juices, and sugary acidic drinks may have a more pronounced effect on the risk of caries. <sup>16</sup> With recent lifestyle changes, the consumption of sugar-sweetened beverages has been on the rise.<sup>16</sup> In this cross-sectional study conducted on a sample of Turkish patients, no significant difference was found in the frequency of sugar and sweetened product consumption between gender groups. However, a relationship was found between current sugar consumption habits and the DMF-T index, which could contribute to understanding the role of sugar intake in caries development. In women living in low-income areas of Texas, USA, the correlation between nutrition knowledge, socioeconomic factors, and caries development was evaluated using the Dental Nutrition Knowledge Competency (DNKC) scale to assess knowledge and the DMF-T index to evaluate caries experience. Results indicated that knowledge about the impact of diet on caries development was limited among participants. It also demonstrated a relationship between demographic variables and both nutrition knowledge and dental caries. It was emphasized that public health interventions aimed at reducing caries, especially in low-income populations, should include strategies to improve nutrition knowledge and promote behavioral change.17

Nutritional knowledge can directly influence an individual's oral health and, through parents, also affect their children's oral health. In a related study evaluating the knowledge and awareness about proper eating habits that could be passed down through generations, it was reported that Polish mothers lacked correct nutrition knowledge, adversely impacting their children's oral health.<sup>17</sup> Another study showed that Jordanian adults had low levels of knowledge regarding periodontal disease, suggesting the need for more educational programs to raise awareness of oral health.<sup>17</sup>

The effects of alcohol and tobacco use on dental health are more complex. While alcohol's effect is generally considered weak, the association between smoking and periodontal disease is more apparent. Similar to the study by Tanner *et al.*<sup>18</sup>, smoking was reported to be statistically significantly associated with high caries experience and increased gum bleeding. In contrast, alcohol consumption was not found to be related to caries or periodontal disease. In our study, while no statistically significant relationship was found between smoking and the DMF-T index, participant who has got high alcohol consumption had significantly higher scores of DMF-T index. The effects of alcohol and tobacco use on caries appear to be independent of socioeconomic status and geographical factors.

The DMF-T index is a scale widely adopted worldwide and frequently used in epidemiologic studies to assess oral and dental health status. This index identifies the number of decayed, treated, and missing teeth. In this study, a significant relationship was found between the frequency of brushing and the DMF-T index.<sup>19</sup> In addition to chewing and speech difficulties, dry mouth and aesthetic concerns were significantly higher in individuals with higher DMF-T index. Particularly, those who frequently had trouble with chewing had a statistically significantly higher DMF-T index than those who sometimes had difficulty. In addition to fermentable sugar consumption and oral hygiene practices, age and gender also impact the DMF-T index. The DMF-T index ranges from 5 to 20, with a median value of 13, indicating that most individuals have a total of 13 missing, filled, or extracted teeth. The World Health Organization defines an acceptable dental health condition for adults aged 35-44 having DMF-T index between 9 and 13.9, while individuals having a DMF-T index above 13.9 considered as having high caries risk.<sup>20</sup> The median DMF-T index found in this study was within an acceptable range for adults, but it was close to a high caries risk level.

Certain cariogenic bacteria responsible for dental caries, such as Streptococcus mutans and Lactobacillus, are found in dental plaques.<sup>21</sup> Brushing teeth is an effective mechanical method for removing dental plaque.<sup>22</sup> Significant decreases in caries experience have been observed in many countries due to the widespread use of fluoride, resulting in substantial improvements in oral health.<sup>23</sup> Therefore, in the present study, regular brushing at least once a day was, as expected, associated with a lower DMF-T index compared to the irregular brushing group. In this sample, no significant difference was found between gender groups in terms of awareness of whether toothpastes contain fluoride (Table 2). In cases where DMF-T scores displayed no significant difference despite the higher sugar consumption and snack frequency, oral hygiene practice was explained as the dominant variable associated by the index. Individuals with optimal oral hygiene will have a lower DMF-T score.<sup>24</sup> Consequently, especially in individuals with a high DMF-T index, the positive interaction between dietary control for caries and oral hygiene practices should be well-explained, and individuals should be advised to reduce the frequency of fermentable carbohydrate intake and improve oral health-related habits.

This study did not collect data on participants' knowledge of the cariogenic potential of foods and beverages, the importance of dietary habits and recommended oral hygiene practices to maintain oral health. Furthermore, this study was limited to a single-center design with a specific time frame and a limited number of participants. Limitations of the study include subjective responses in the questionnaire and a limited sample group that could be overcome with more comprehensive and detailed studies. More comprehensive studies can be conducted on patients who have been informed about proper eating habits and oral health behaviors, and it may be more meaningful to examine their effects on the DMF-T index in the light of the information obtained from these studies.

#### CONCLUSION

This survey assessed the impact of dietary habits on oral health. The findings show that foods and beverages, especially those high in sugar, have a detrimental effect on oral health. The study reveals the critical role of healthy eating habits in maintaining oral health and preventing dental disease. These findings emphasize the importance of interventions focusing on diet and nutrition to improve oral health. Future studies with larger and more diverse sample groups may help us better understand this relationship. It is also crucial to develop strategies to improve dietary habits to maintain oral health. In conclusion, increasing individuals' awareness of the importance of personal dietary habits on oral health will significantly contribute to the prevention of many oral health problems they may face in the future.

#### **CONFLICT of INTEREST**

Authors declare no conflicts of interest.

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