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Dietary Habits and Oral Health: A Study in Kocaeli

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ABSTRACT

Objective: This study aimed to investigate the relationship between dietary habits and oral health among 169 patients who applied to a private dental clinic in Kocaeli, Turkey, with complaints of dental caries. **Materials and Methods:** The study included 56 adult men (33.1%) and 113 adult women (66.9%). Data were collected using a questionnaire, a three-day dietary food records, and the Oral Health Impact Profile (OHIP-14 TR). Participants also underwent an oral examination to determine the number of teeth affected by caries. **Results:** The participants' mean DMFT (Decayed, Missing, and Filled Teeth) score was 5.71 ± 2.74 . Body mass index (BMI) classifications showed that 66.9% were average weight, with a mean BMI of 23.38 ± 3.70 kg/m². The mean OHIP-14 SC and OHIP-14 A scores were 22.67 ± 6.24 and 5.85 ± 3.15 , respectively. Significant associations were found between protein intake and OHIP-14 SC scores, as well as between the frequency of dairy consumption and oral health scores ($p < 0.05$). Participants who consumed sugary foods and beverages had poorer oral health than those who did not ($p < 0.05$). **Conclusion:** Dietary habits can influence general and oral health. Maintaining good oral hygiene, regular dental check-ups, and attention to food choices and consumption frequency are essential for promoting and preserving oral health.

Keywords: Dental Caries, DMFT, Health, Nutrition, OHIP-14 TR, Oral Health.

Diyet Alışkanlıkları ve Ağız Sağlığı: Kocaeli’de Bir Çalışma

ÖZ

Amaç: Bu çalışma, Kocaeli, Türkiye’deki özel bir diş kliniğine diş çürüğü şikayetiyle başvuran 169 hasta arasında diyet alışkanlıkları ile ağız sağlığı arasındaki ilişkiyi araştırmayı amaçlamıştır. **Gereç ve Yöntemler:** Çalışma, 56 yetişkin erkek (%33.1) ve 113 yetişkin kadın (%66.9) katılımcısını içermiştir. Veriler, bir anket, üç günlük bir besin tüketimi kaydı ve Ağız Sağlığı Etkisi Profili (OHIP-14 TR) kullanılarak toplanmıştır. Katılımcılar ayrıca çürükten etkilenen diş sayısını belirlemek için bir ağız muayenesine tabi tutulmuştur. **Bulgular:** Katılımcıların ortalama DMFT (Çürük, Eksik ve Dolgulu Dişler) skoru 5.71 ± 2.74 idi. Vücut kütle indeksi (BMI) sınıflandırmaları, %66.9’unun ortalama kiloda olduğunu, ortalama BMI’nin 23.38 ± 3.70 kg/m² olduğunu gösterdi. Ortalama OHIP-14 SC ve OHIP-14 A skorları sırasıyla 22.67 ± 6.24 ve 5.85 ± 3.15 idi. Protein alımı ile OHIP-14 SC skorları arasında, süt tüketimi sıklığı ile ağız sağlığı skorları arasında anlamlı ilişkiler bulundu ($p < 0.05$). Şekerli yiyecek ve içecek tüketen katılımcıların ağız sağlığının, tüketmeyenlere göre daha kötü olduğu tespit edildi ($p < 0.05$). **Sonuç:** Beslenme alışkanlıkları genel sağlığı ve ağız sağlığını etkileyebilir. Ağız sağlığını sağlamak ve korumak için oral hijyen uygulamalarına dikkat edilmeli, düzenli ağız muayenesi yaptırılmalı ve besin seçimlerine ve tüketim sıklığına dikkat edilmelidir. **Anahtar Kelimeler:** Ağız Sağlığı, Beslenme, Sağlık, Diş Çürüğü, DMFT, OHIP-14 TR.

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INTRODUCTION

Adequate and balanced nutrition protects general health and treats existing diseases (P. Moynihan & Petersen, 2004). However, nutrition is also closely linked to oral and dental health, which remain significant public health problems worldwide (Benzian et al., 2022). The foods we consume in our daily diet are converted into organic acids by the microorganisms that form dental plaque on our teeth, causing demineralization of the enamel and dentin layers of the tooth (Benzian et al., 2022; Botelho et al., 2016).

When fermentable carbohydrates are converted into organic acids, the pH level in the mouth decreases. The tooth's hard tissue demineralizes when the pH level drops below 5.5. These events are the process of the formation of dental (Jurakova et al., 2023). Dental caries is a common and preventable disease that affects individuals throughout their lifetime. Dental caries can be defined as the localized destruction of the tooth's hard tissues caused by the acidic metabolites of the carbohydrates fermented by bacteria (MacHiulskiene et al., 2020). In addition, the etiology of dental caries is multifactorial. In addition to nutritional factors, factors such as oral hygiene habits and fluoride use also affect the formation of dental caries (Twetman, 2018).

Many studies have revealed that one of the leading causes of dental caries is the excessive consumption of sugar (P. J. Moynihan, 2005). It is accepted that sucrose is the type that most supports the development of *Streptococcus mutans* and causes the most dental caries. Recent studies show that reducing the amount of sucrose consumed in the diet and choosing sweeteners that plaque bacteria cannot ferment in the daily diet can effectively reduce caries formation (Hamada, 2002).

The aim of this study was to investigate the relationship between dietary habits and oral health in adults attending a private dental clinic. Our hypothesis was that individuals with balanced and healthy diets would present better oral health, whereas those with irregular and inadequate diets would show higher prevalence of dental caries and periodontal problems.

MATERIALS AND METHODS

Study type, location, time, and sample selection

This cross-sectional study was conducted at a private oral health clinic in Kartepe, Kocaeli, from August to September 2023. The study included volunteers over 18 years old without chronic diseases who visited the clinic for dental caries complaints. Approval was obtained from the Ethics Committee (08/09/2021, decision no: 19) and permission from the private dental clinic. Participants signed informed consent forms. A total of 300 individuals were assessed for eligibility. Of these, 131 participants were excluded due to being under 18 years of age, pregnancy, breastfeeding, having chronic or systemic diseases, or

presenting with complaints other than dental caries. Consequently, 169 participants were included in the study. The sample size was calculated using the OpenEpi software (version 3.01). With a 95% confidence level ($\alpha = 0.05$), a power of 80% ($\beta = 0.20$), and an assumed effect size of 0.5 with 50% prevalence, the minimum required sample size was determined as 169 participants.

Data collection

Participants were asked to complete a questionnaire prepared by the researcher. The first section of the questionnaire collected demographic information (age, gender, health status, education level, occupation, marital status, social security) (Table 1). The second section examined oral hygiene habits (tooth brushing, use of mouthwash, frequency of dental visits) (Table 1). The third section investigated dietary habits (number of main and snack meals, types of snacks). The classification of snack foods and beverages was based on approaches commonly used in the literature. Accordingly, items were grouped as cariogenic (e.g., sugary snacks, cakes, biscuits, sweetened beverages), anti-cariogenic (e.g., milk and dairy products, fibrous fruits and vegetables), or neutral foods. This categorization has been widely applied in previous studies examining the relationship between diet and oral health (P. J. Moynihan, 2005; P. Moynihan & Petersen, 2004; Serdar Eymirli et al., 2019; World Health Organization, 2011). The final section assessed the frequency of dairy product consumption. The frequency of dairy product consumption was not determined by a validated food frequency questionnaire. Instead, each participant was asked to complete a 3-day consecutive food consumption record, which is considered a reliable method for dietary assessment. These records were used to analyze dietary intake, and daily energy, macro-, and micronutrient values, including dairy product intake, were calculated using the BeBiS Nutrition Data System (version 9) (Table 2).

To assess participants' oral health, the Oral Health Impact Profile-14 (OHIP-14), adapted into Turkish by Burak Yılmaz, Lale Karaağaçlıoğlu, and Mehmet Esat Başol, was used. The scale consists of 14 questions with responses rated as "never," "rarely," "sometimes," "often," and "very often." OHIP-14 covers seven dimensions: functional limitations, physical pain, psychological discomfort, physical disability, social disability, psychological disability, and handicap. The evaluation was done using OHIP-14 SC (simple count) and OHIP-14 A (additive) (Başol et al., 2014b). Higher total scores indicate more severe oral health problems and lower quality of life. The scale's reliability was high, with a Cronbach's alpha coefficient of 0.913 (Table 3-6).

Clinical examination and anthropometric measurements

A specialist dentist conducted clinical examinations, and the number of decayed, missing, and filled teeth

(DMFT) was recorded. The researcher took anthropometric measurements; height was measured using a wall-mounted stadiometer, and weight was measured using a portable scale with 100-gram sensitivity. Body mass index (BMI) was calculated according to the World Health Organization classification (World Health Organization, 2011) (Table 3-6).

Statistical analysis

Descriptive statistics (count, percentage, mean, standard deviation, minimum, maximum, median) were provided. The reliability of the scale was tested. The normality assumption was checked using the Shapiro-Wilk test. When normality was not met, the Mann-Whitney U test was used for two-group comparisons, and the Kruskal-Wallis test was used for three or more groups. Post Hoc Bonferroni tests were conducted to identify specific group differences. Spearman correlation was used for relationships between continuous variables, and Fisher's Exact test for categorical variables when sample size assumptions were unmet. Analyses were performed using IBM SPSS 25. A p-value of <0.05 was considered statistically significant.

Ethical approval

This study was conducted in accordance with the principles of the Helsinki Declaration. All participants were informed about the purpose of the study and their rights, and written informed consent was obtained prior to their inclusion. The study ensured the confidentiality and anonymity of all participants throughout the research process.

RESULTS

The study evaluated the sociodemographic characteristics, dietary habits, oral care practices, and their relationships with oral health outcomes among participants. Average daily nutrient intakes of the participants are presented in Table 2. The mean daily energy intake was 1769.02 ± 432.43 kcal/day, with an average intake of 189.16 ± 66.44 g/day carbohydrates, 74.96 ± 18.55 g/day protein, and 76.64 ± 20.66 g/day fat. This corresponds to approximately 43.4% of energy from carbohydrates, 17.6% from protein, and 38.9% from fat. The mean daily fiber intake was 14.72 ± 4.93 g, while cholesterol intake was 415.82 ± 217.21 mg. Average water consumption was 1301.66 ± 248.75 g/day. Vitamin and mineral intakes are also detailed in Table 2. Most participants were aged 26–44, predominantly female, with a mean BMI of 23.7 ± 7.4 kg/m². According to BMI categories, the majority of participants were classified as overweight. Most had a university education, and a significant portion reported being unemployed. Dietary analysis revealed high snack consumption and low awareness of oral health issues. Notably, a strong positive correlation existed between DMFT and OHIP-14 scores, indicating that poorer oral health significantly impacts quality of life. Moreover, education level and dietary habits influenced oral health behaviors, with significant differences observed across various education and BMI categories ($p > 0.05$).

Table 1. Demographic characteristics and dietary habits of participants, along with their oral health impact, are discussed.

Characteristic	n(%)	Characteristic	N(%)
Age(years)		Education level	
18-25	39(23.1%)	Literate	8(4.7%)
26-44	126(74.6%)	Primary school	1(0.6%)
45-59	4(2.4%)	Middle school	3(1.8%)
		High school	26(15.4%)
		University	131(77.5%)
Gender		Occupation	
Female	113(66.9%)	Civil servant	32(18.9%)
Male	56(33.1%)	Worker	8(4.7%)
Marital Status		Self-employed	14(8.3%)
Single	59(34.8%)	Unemployed	115(68.0%)
Married	109(64.3%)	Social security	
BMI (kg/m²)		SGK	26(15.4%)
Underweight	10(5.9%)	Private Insurance	107(63.3%)
Normal weight	113(66.9%)	None	36(21.3%)
Overweight	37(21.9%)	Diagnosed disease	
Obese	9(5.3%)	None	169(100%)
Oral health questions		n(%)	
Tooth brushing status	Yes	166(98.2%)	
	No	3(1.8%)	
Frequency of brushing	Once a day	43(25.9%)	
	Twice a day	114(68.7%)	
	Three times a day	9(5.4%)	
Mouthwash usage	Yes	73(43.2%)	
	No	96(56.8%)	

Table 2. Demographic characteristics and dietary habits of participants, along with their oral health impact, are discussed. (continues)

Oral Health Questions		n(%)
Frequency of mouthwash	Once a day	41(57.7%)
	Twice a day	29(40.8%)
	Three times a day	1(1.4%)
Flossing with brushing	Yes	71(42.0%)
	No	98(58.0%)
Frequency of dental visits	Once or twice a year	29(17.2%)
	When there is a complaint	140(82.8%)

Table 3. Meal frequency, snack and drink consumption patterns, participants' dairy consumption, nutrient intake, and oral health data.

Characteristic		n(%)		Characteristic		n(%)	
Main Meals per Day			Most Frequently Consumed Snacks				
Once		0(0.0%)		Sweets, Chocolate, Wafers		28(16.6%)	
Twice		4(2.4%)		Cakes, Cookies, Biscuits		14(8.3%)	
				Nuts		3(1.8%)	
Thrice		165(97.6%)		Fruits and Fresh Juices		28(16.6%)	
Snacks per Day			None		85(50.3%)		
			Other		11(6.5%)		
Once		138(81.7%)		Most Frequently Consumed Drinks			
Twice		27(16.0%)		Cola, Sodas		4(2.4%)	
				Packaged Juices		5(3.0%)	
				Tea/Coffee		95(56.2%)	
Thrice		4(2.3%)		Tea/Coffee(with sugar)		17(10.1%)	
				Milk/Yogurt Drink/Kefir		5(3.0%)	
				Flavored/Sweetened Milk		0(0.0%)	
				None		23(13.6%)	
				Other		20(11.8%)	
Dairy Products		Daily	3-5 Times /Week	1-2 Times /Week	Once /Two Weeks	1-2 Times /Month	Never
Milk(%)		27(16.0%)	6(3.6%)	22(13.0%)	22(13.0%)	92(54.4%)	27(16.0%)
Cheese(%)		93(55.4%)	32(19.0%)	15(8.9%)	10(6.0%)	18(10.7%)	93(55.4%)
Yogurt(%)		46(27.2%)	45(26.6%)	46(27.2%)	14(8.3%)	18(10.7%)	46(27.2%)
Yogurt Drink(%)		43(25.4%)	43(25.4%)	40(23.7%)	9(5.3%)	34(20.1%)	43(25.4%)
Kefir(%)		28(16.6%)	2(1.2%)	12(7.1%)	11(6.5%)	116(68.6%)	28(16.6%)
Nutrient		Min	Max	Mean	SD	Median	
Energy(kcal/day)		1001.75	3303.17	1769.02	432.43	1704.84	
Water(g/day)		766.23	2006.82	1301.66	248.75	1286.99	
Protein(g/day)(%)		38.62(11.0%)	140.61(32.0%)	74.96(17.63%)	18.55(3.27%)	72.52(18.0%)	
Fat(g/day)(%)		38.93(23%)	127.60(57.0%)	76.64(38.89%)	20.66(6.41%)	73.19(39.0%)	
Carbohydrate(g/day)(%)		83.60(22.0%)	449.13(63.0%)	189.16(43.4%)	66.44(8.1%)	172.21(43.0%)	
Fiber(g/day)		5.61	29.05	14.72	4.93	13.61	
Polyunsaturated Fat(g/day)		4.29	38.99	12.92	5.97	11.49	
Cholesterol(mg/day)		57.90	1120.55	415.82	217.21	391.03	
Vitamin A(µg/day)		320.70	2097.44	995.80	336.60	983.57	
Vitamin E(m/day g)		2.56	43.47	12.28	6.49	10.67	
Vitamin B1(mg/day)		0.36	1.51	0.78	0.21	0.74	
Vitamin B2(mg/day)		0.68	2.78	1.42	0.39	1.37	
Vitamin B6(mg/day)		0.49	2.21	1.12	0.36	1.05	
Folic Acid(µg/day)		115.45	480.05	255.92	71.11	258.63	
Vitamin C(mg/day)		18.80	319.43	103.77	52.42	94.30	
Sodium(mg/day)		1397.37	7459.90	3576.35	1140.28	3430.47	
Potassium(mg/day)		1211.63	4201.40	2227.47	529.48	2162.65	
Calcium(mg/day)		329.55	1930.80	765.82	241.75	737.78	
Magnesium(mg/day)		114.65	407.23	226.64	56.67	218.05	
Phosphorus(mg/day)		550.30	1816.88	1084.94	255.98	1027.60	
Iron(mg/day)		3.93	16.28	8.90	2.55	8.40	

Table 4. Examination scores, and related factors.

Sub-Dimension		n	Min	Max	Mean	SD	Median
Functional Limitations		169	3	10	4.56	1.95	4
Physical Pain		169	3	10	4.42	1.31	4
Psychological Discomfort		169	2	6	2.46	0.84	2
Physical Disability		169	2	8	4.17	1.28	4
Social Disability		169	3	8	4.38	1.26	4
Psychological Disability		169	1	2	1.01	0.08	1
Handicap		169	1	3	1.69	0.73	2
Score		n	Min	Max	Mean	SD	Median
OHIP-14 SC		169	15	40	22.67	6.24	21
OHIP-14 A		169	1	13	5.85	3.15	5
DMFT		169	2	12	5.71	2.74	5
Oral Health Scores		DMFT			Oral Health Scores		
OHIP-14 SC		r= 0.737, p<0.001*			OHIP-14 SC		
OHIP-14 A		r=0.826, p<0.001*			OHIP-14 A		
Oral Health Questions		Literacy	Primary & Middle School	High School	University	X ²	p
Brushing teeth	Yes	7(87.5%)	4(100.0%)	24(92.3%)	131(100.0%)	11.598	0.011*
	No	1(12.5%)	0(0.0%)	2(7.7%)	0(0.0%)		
Frequency of brushing	1 time	5(71.4%)	3(75.0%)	17(70.8%)	18(13.7%)	41.907	<0.001*
	2 times	2(28.6%)	1(25.0%)	7(29.2%)	104(79.4%)		
	3 times	0(0.0%)	0(0.0%)	0(0.0%)	9(6.9%)		
Daily mouthwash use	Yes	2(25.0%)	1(25.0%)	4(15.4%)	66(50.4%)	12.882	0.002*
	No	6(75.0%)	3(75.0%)	22(84.6%)	65(49.6%)		
Frequency of mouthwash	1 time	0(0.0%)	1(100.0%)	3(75.0%)	37(57.8%)	3.428	0.338
	2-3 times	2(100.0%)	0(0.0%)	1(25.0%)	27(42.2%)		
Flossing every time	Yes	2(25.0%)	0(0.0%)	1(3.8%)	68(51.9%)	9.923	<0.001*
	No	6(75.0%)	4(100.0%)	25(96.2%)	63(48.1%)		
Dentist visits	1-2 times	0(0.0%)	0(0.0%)	2(7.7%)	27(20.6%)	3.838	0.220
	When needed	8(100.0%)	4(100.0%)	24(92.3%)	104(79.4%)		

Table 5. Demographic and dietary characteristics of study participants with ohip-14-sc and ohip-14-a scores.

		OHIP 14-SC			OHIP 14-A		
		Mean±SD	H	p	Mean±SD	H	P
Education Level	Literate	29.75±9.72	48.692	0.001	8.63±4.27	37.424	0.001
	Primary & Middle	31.50±6.86			8.75±2.63		
	High School	29.62±6.00			8.81±2.19		
	University	20.60±4.20			5.00±2.75		
Age (years)	18-25	22.36±6.71	5.022	0.081	5.85±3.29	1.336	0.513
	26-44	22.50±5.87			5.78±3.08		
	45-59	31.25±8.38			8.00±4.08		

Table 6. (Continued) Demographic and dietary characteristics of study participants with ohip-14-sc and ohip-14-a scores.

		OHIP 14-SC			OHIP 14-A		
		Mean±SD	H	p	Mean±SD	H	p
BMI (kg/m²)	Underweight	23.70±7.39	4.451	0.217	5.60±3.13	9.469	0.024
	Normal	22.20±6.12			5.48±2.97		
	Overweight	22.84±5.72			6.32±3.44		
Questions About Eating Habits		OHIP 14-SC			OHIP 14-A		
		Mean±SD	U/H	p	Mean±SD	U/H	p
Number of main meals consumed per day	2 times	25.75±4.92	194.5 ^a	0.160	7.50±1.73	204.0 ^a	0.190
	3 times	22.60±6.26			5.81±3.17		
Number of snacks consumed per day	Once	22.30±6.06	2.523 ^b	0.283	5.64±3.10	4.142 ^b	0.126
	Twice	24.19±6.45			6.93±3.11		
	Thrice	25.5±10.12			5.75±4.35		
Most often used as a snack between meals	Candy, Chocolate, wafers etc.	28.32±6.80	37.608 ^b	<0.001*	8.79±2.97	41.198 ^b	<0.001*
	Cakes, cookies, biscuits, etc.	28.79±8.36			8.43±2.41		
	Nuts	25.67±9.50			6.67±5.03		
	Fruits and fresh fruit juices	21.71±5.30			5.25±2.74		
	None	20.39±3.97			4.74±2.59		
	Other	19.82±3.28			4.91±2.70		
The most commonly consumed drinks as snacks between meals	Cola drinks, sodas	30.75±7.41	47.479 ^b	<0.001*	9.50±1.73	52.612 ^b	<0.001**
	Ready-made fruit juices	24.00±2.35			9.20±2.05		
	Tea/coffee varieties	21.22±5.43			4.95±2.71		
	Tea/coffee varieties (with sugar)	33.18±5.28			10.24±2.05		
	Plain milk/buttermilk/kefir	21.60±1.67			3.80±1.64		
	None	22.17±3.77			6.65±2.85		
	Other	19.55±3.59			4.40±2.30		

*p<0.05,^a: Mann Whitney U test (U), ^b: Kruskal Wallis test (H)**Table 7. Demographic characteristics and dietary patterns of participants.**

Dairy Product	Frequency	OHIP-14-SC Mean±SD	H	p	OHIP-14-A Mean±SD	H	p
Milk	Daily	22.24±6.40	23.884	<0.001*	5.91±3.25	14.921	0.005*
	3-5 times/week	25.95±6.50			7.23±2.89		
	1-2 times/week	25.55±5.49			6.50±2.72		
	Biweekly	22.00±6.16			4.33±3.01		
	Monthly	19.30±3.62			4.30±2.74		
	Never	19.39±3.01			4.56±2.75		
Cheese	Daily	20.80±3.46	34.463	<0.001*	5.90±2.69	25.056	<0.001*
	3-5 times/week	26.27±6.54			8.33±3.13		
	1-2 times/week	27.34±6.20			7.47±2.77		
	Biweekly	21.33±5.89			5.12±3.02		
	Monthly	19.28±3.51			4.50±2.66		
	Never	21.64±5.60			6.07±3.38		
Yogurt	Daily	27.65±7.58	43.952	<0.001*	7.91±3.22	31.151	<0.001*
	3-5 times/week	22.87±4.64			5.76±2.68		
	1-2 times/week	19.15±3.14			4.33±2.48		
	Biweekly	20.97±4.02			5.97±3.24		
	Monthly	19.11±2.32			4.22±1.99		
	Never	27.75±7.48			7.83±3.17		

Table 8. (Continued) Demographic characteristics and dietary patterns of participants.

Ayran	Daily	23.51±6.19	36.531	<0.001*	5.93±3.13	26.829	<0.001*
	3-5 times/week	19.21±3.00			4.16±2.08		
	1-2 times/week	22.65±6.63			6.05±3.34		
	Biweekly	26.45±5.61			6.73±2.41		
	Monthly	26.17±5.13			6.50±3.15		
	Never	18.50±0.71			4.50±0.71		
Kefir	Daily	20.11±3.58	16.753	0.002*	4.46±2.27	7.334	0.119
	3-5 times/week	22.24±6.40			5.91±3.25		
	1-2 times/week	25.95±6.50			7.23±2.89		
	Biweekly	25.55±5.49			6.50±2.72		
	Monthly	22.00±6.16			4.33±3.01		
	Never	19.30±3.62			4.30±2.74		

The groups were compared using the Kruskal-Wallis test, and Bonferroni post-hoc tests were applied to identify the source of significant differences. Groups denoted with different superscript letters (a, b, c) differ significantly from each other

*p<0.05, ^a: Mann Whitney U test (U), ^b: Kruskal Wallis test (H).

Table 9. The correlation of nutrient intake with OHIP-14-SC and OHIP-14-A scores is presented, along with an examination of oral health practices and their impact on OHIP-14-SC and OHIP-14-A scores.

Nutrients		OHIP-14-SC	OHIP-14-A	Nutrients	OHIP-14-SC	OHIP-14-A
Energy (kcal)		r=0.261	r=0.106	Vitamin E (mg)	r=0.145	r=-0.008
		p=0.001*	p=0.171		p=0.060	p=0.914
Water (g)		r=0.051	r=0.042	Vitamin B1 (mg)	r=0.192	r=0.052
		p=0.507	p=0.588		p=0.012*	p=0.499
Protein (g)		r=0.056	r=0.027	Vitamin B2 (mg)	r=-0.054	r=0.014
		p=0.470	p=0.725		p=0.488	p=0.856
Protein %		r=-0.245	r=-0.100	Vitamin B6 (mg)	r=0.196	r=0.136
		p<0.001*	p=0.198		p=0.011*	p=0.079
Fat (g)		r=0.147	r=0.081	Folic Acid (µg)	r=0.081	r=0.087
		p=0.057	p=0.292		p=0.296	p=0.261
Fat %		r=-0.122	r=-0.031	Vitamin C (mg)	r=0.056	r=0.012
		p=0.115	p=0.690		p=0.466	p=0.875
Carbohydrate (g)		r=0.277	r=0.092	Sodium (mg)	r=-0.068	r=-0.088
		p<0.001*	p=0.233		p=0.378	p=0.257
Carbohydrate %		r=0.215	r=0.081	Potassium (mg)	r=0.233	r=0.177
		p=0.005*	p=0.296		p=0.002*	p=0.021*
Fiber (g)		r=0.214	r=0.110	Calcium (mg)	r=0.021	r=0.078
		p=0.005*	p=0.156		p=0.788	p=0.313
Polyunsaturated Fat (g)		r=0.179	r=0.016	Magnesium (mg)	r=0.278	r=0.171
		p=0.020*	p=0.833		p<0.001*	p=0.026*
Cholesterol (mg)		r=-0.088	r=-0.041	Phosphorus (mg)	r=0.153	r=0.134
		p=0.258	p=0.597		p=0.047*	p=0.082
Vitamin A (µg)		r=0.009	r=0.037	Iron (mg)	r=0.182	r=0.061
		p=0.907	p=0.635		p=0.018*	p=0.434
Oral Health-Related Questions	OHIP 14-SC	U/H	p	OHIP 14-A	U/H	p
Tooth brushing status						
Yes	22.48±6.08	39.0 a	0.012*	5.79±3.14	103.5 a	0.081
No	33.67±5.51			9.00±2.00		
If yes, the frequency of tooth brushing						
Once	29.21±6.27	68.621 b	<0.001*	9.12±2.35	66.429 b	<0.001*
Twice	20.40±3.86			4.81±2.48		
Thrice	16.56±1.13			2.33±0.87		

Table 10. (Continued) The correlation of nutrient intake with OHIP-14-SC and OHIP-14-A scores is presented, along with an examination of oral health practices and their impact on OHIP-14-SC and OHIP-14-A scores.

Oral Health-Related Questions	OHIP 14-SC	U/H	p	OHIP 14-A	U/H	p
Daily use of mouthwash						
Yes	19.08±3.21	1322.0 a	<0.001 *	3.59±1.79	885.5 a	<0.001 *
No	25.41±6.59			7.56±2.87		
If yes, the frequency of mouthwash use						
Once	20.32±3.49	273.5 a	<0.001 *	4.12±1.83	315.5 a	<0.001 *
Twice and thrice	17.37±1.88			2.80±1.47		
Use of dental floss with each brushing						
Yes	18.49±2.52	944.5 a	<0.001 *	3.63±1.90	988.0 a	<0.001 *
No	25.7±6.38			7.45±2.90		
Frequency of visiting the dentist						
Once or twice a year	18.62±2.70	1036.0 a	<0.001 *	3.38±1.88	862.0 a	<0.001 *
When there is a complaint	23.51±6.43			6.36±3.12		

*p<0.05,^a: Mann Whitney U test (U), ^b: Kruskal Wallis test (H), X2: Fisher's Exact test, r: Correlation Coefficient

DISCUSSION

Oral and dental diseases impact millions globally, causing pain and nutritional and speech difficulties, significantly affecting the quality of life (Smits et al., 2020). Various determinants, including social, economic, biological, and cultural factors, influence oral health (Ekmekçi Güner & Çilingiroğlu, 2020). Education is a critical social determinant, with higher education levels correlating positively with better oral health due to increased dental services and greater awareness of oral health practices (Karabekiroğlu et al., 1999). Individuals prioritizing tooth brushing are also more likely to use mouthwash and attend dental check-ups (Yalnız & Gönder, 2021). A study of 109 adult males showed that higher education levels are associated with greater importance given to oral health (Şahin et al., 2009).

Higher education correlates with better oral hygiene practices, including increased tooth brushing and mouthwash use (Eren Halıcı et al., 2023). Socioeconomic status also impacts oral health, with higher socioeconomic groups showing better outcomes (Addo-Yobo et al., 1991; Villalobos-Rodelo et al., 2007). Proper nutrition and oral health practices are crucial at all life stages, and higher education levels are linked to better oral health indicators and fewer dental caries (Karabekiroğlu et al., 1999; Karaoğlu et al., 2018). This study found that higher education levels improved OHIP 14-SC and OHIP 14-A scores.

Age, body weight, and BMI affect general and dental health. Higher BMI values are linked to poorer oral health (Bener et al., 2013). This study found

significant relationships between BMI and OHIP 14-SC and OHIP 14-A scores, with higher scores in obese and overweight groups.

Nutrition impacts oral health at all life stages. Poor nutrition can lead to periodontal and oral diseases. Among dietary factors, the frequent consumption of cariogenic foods such as sugar, confectionery, sweetened beverages, and refined carbohydrates plays a central role in the development of dental caries. These foods provide fermentable carbohydrates for oral bacteria, resulting in acid production, enamel demineralization, and increased caries risk (Peker & Bermek, 2008). In our study, participants with higher intake of sugary snacks and sweetened drinks had significantly higher OHIP scores, indicating poorer oral health. Similar findings have been reported in previous studies, where cariogenic food consumption was strongly associated with higher DMFT scores and reduced oral health-related quality of life (Bernabé et al., 2014; Larsson et al., 1992). Therefore, reducing the frequency of cariogenic food intake and replacing them with protective or anti-cariogenic alternatives, such as dairy products, fibrous fruits, and vegetables, is crucial for promoting oral health.

Better oral health is linked to healthier eating habits (Larsson et al., 1992). Frequent sugary snack and drink consumption is associated with higher OHIP scores, indicating poorer oral health. Sugary drinks increase dental caries risk (Bernabé et al., 2014; Larsson et al., 1992). This study found higher OHIP scores among those consuming sugary tea/coffee, reinforcing sugar's negative impact on oral health.

Dairy consumption inversely relates to oral health issues (Al-Zahrani, 2006). Regular milk consumers have better oral health, and those with dental caries consume less milk (Serdar Eymirli et al., 2019). Dairy products enhance saliva's buffering effect and promote remineralization (Kashket & DePaola, 2002). Increased dairy consumption improves OHIP-14 scores, indicating better oral health (Yilmaz, 2021).

Our study found higher dairy consumption, especially milk, cheese, yogurt, ayran, and kefir, is associated with lower OHIP 14-SC and OHIP 14-A scores. Conversely, sugary tea/coffee drinkers had higher scores. Preventive oral health measures like regular tooth brushing are crucial. Increased brushing frequency reduces cavities (Ünlü et al., 2014). However, toothpaste and toothbrush consumption in Turkey is still low compared to other developed countries (Akar, 2014).

Participants who did not brush their teeth or use mouthwash or dental floss had higher OHIP 14-SC scores. Those visiting the dentist only for pain had higher scores than those with regular check-ups. Brushing once daily resulted in higher OHIP 14-SC scores than brushing twice or thrice daily, with similar trends for OHIP 14-A scores.

Regular dental check-ups, tooth brushing, mouthwash, and dental floss are crucial for maintaining oral health and reducing the risk of cavities (Lütfioğlu, 2023). This study supports the importance of these practices, showing that individuals who do not maintain regular dental visits or oral hygiene have higher OHIP-14 A scores. Moreover, increased frequency of tooth brushing was associated with lower OHIP-14 A scores, indicating improved oral health.

Regular dental check-ups, tooth brushing, mouthwash, and dental floss are essential for maintaining oral health and reducing cavities (Lütfioğlu, 2023). Our study supports these practices, showing that individuals who do not maintain regular dental visits or oral hygiene have higher OHIP 14-A scores. Increased tooth brushing frequency is associated with lower OHIP 14-A scores, indicating improved oral health.

Study Limitations and Strengths

One limitation of this study is its cross-sectional design, which allows for the identification of associations but does not permit causal inferences. Another limitation is the use of a convenience sample of individuals who visited a private dental clinic with complaints of dental caries, which may limit the generalizability of the findings to the wider population. Additionally, dietary intake was self-reported using a three-day food record, which may be subject to recall bias and reporting inaccuracies.

The strengths of this study include the use of validated tools for oral health assessment (OHIP-14 TR) and standardized clinical examination protocols

(DMFT index). Moreover, the analysis incorporated both dietary and oral hygiene behaviors, providing a comprehensive view of factors influencing oral health. Ethical approval was obtained, and the study followed rigorous methodological procedures to ensure data quality and reliability.

CONCLUSION

This study evaluated the relationship between the nutritional habits of patients visiting a dental clinic and their oral health. A total of 169 participants (66.9% female, 33.1% male) were included. The findings demonstrated that dietary habits, oral health practices, and sociodemographic factors significantly influence oral health. In particular, the frequent consumption of cariogenic foods such as sugar, sweets, and sweetened beverages was strongly associated with poorer oral health outcomes and higher OHIP scores, reflecting the negative impact of these foods on quality of life. Conversely, the intake of anti-cariogenic foods, including dairy products, fibrous fruits, and vegetables, together with maintaining a balanced diet, contributed to better oral health.

Balanced and adequate nutrition is therefore crucial for maintaining oral health and preventing tooth decay. Early-life nutrition directly affects both general and oral health, emphasizing the importance of proper meal planning and healthy snack choices. Reducing the frequency of cariogenic food intake, combined with consistent oral hygiene behaviors such as regular tooth brushing, flossing, mouthwash use, and routine dental check-ups, should be encouraged as preventive measures.

The results of this study highlight that individuals may benefit from being more careful in their dietary choices, especially by limiting cariogenic foods and preferring healthier alternatives, in order to protect and improve their oral health.

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Conflict of Interest

The authors declare no conflicts of interest, financial or otherwise.

Author Contributions

Plan, Design, Material, Methods and data collection: DT, HK; **Data analysis and comments:** DT; **Writing and corrections:** HK.

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Ethical Approval

Institution: İstanbul Okan University Ethics Committee.

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