ORIGINAL ARTICLE
DOI: 10.5152/EssentDent.2025.25022

ISTANBUL UNIVERSITY CERRAHPASA

Exploring Gender and Age Differences in Oral Health: Insights from Panoramic Radiographs in a Retrospective Study

Leyla Kerimova Köse, Ruhsan Müdüroğlu Adıgüzel, Sevgi Güngör, Neslihan Arhun

Department of Restorative Dentistry, Başkent University Faculty of Dentistry, Ankara, Türkiye

Cite this article as: Kerimova Köse L, Müdüroğlu Adıgüzel R, Güngör S, Arhun N. Exploring gender and age differences in oral health: insights from panoramic radiographs in a retrospective study. *Essent Dent.* 2025; 4, 0022, doi: 10.5152/EssentDent.2025.25022.

Abstract

Background: The primary objective of this study was to assess the influence of age and gender on changes in oral health, specifically focusing on the variations in the number of decayed, missing, and restored teeth (DMFT) over time.

Methods: Panoramic radiographs from 2410 individuals aged 18–88 years were assessed using the DMFT index. The numbers of decayed (D), missing (M), and restored (F) teeth were recorded at 2 distinct time points. The total DMFT score was calculated for each individual, considering the quadrants and left/right sides of the mouth. Changes in DMFT scores were analyzed across various age groups and between genders. Due to the non-parametric data, statistical analyses were performed using Quade's Rank ANCOVA test to control for covariates such as time, age, and gender, and to evaluate group differences independently. Post-hoc analyses were performed to further explore the impact of demographic variables ($P < .05$).

Results: The analysis, which compared genders irrespective of age, revealed significant differences in all quadrants concerning the number of decayed, missing, and restored teeth, as well as the DMFT scores, between men and women, with changes observed over time ($P < .05$). Similarly, statistical significance was found among different age ranges ($P < .05$). Additionally, within each age group, gender effects were observed ($P < .05$). When considering score changes for the whole mouth (left and right sides together) there was no statistical significance between genders regarding D ($P = .349$) and F ($P = .645$) scores.

Conclusion: The median DMFT score increased over time, and there is a direct association with gender and age.

Keywords: Dental caries, dental health, DMF Index, oral health

What is already known on this topic?

- *Determining the current oral health status by assessing the changes in DMFT scores across different age groups could be helpful in shaping governmental health policies and designing effective preventive programs.*
- *The results of existing studies comparing the tendencies to caries formation between women and men are controversial.*

What this study adds on this topic?

- *Age has an impact on the number of decayed, missing, and restored teeth, as well as changes in the total DMFT score. These nuances should be considered when designing effective preventive programs.*
- *Women showed significantly higher scores in decayed and missing teeth compared to men, while no significant difference was found in filled teeth. Nevertheless, the total DMFT scores were significantly higher in women, suggesting a greater overall burden of dental disease.*

INTRODUCTION

Dental caries is a multifactorial condition influenced by the interplay of biological, behavioral, psychosocial, and environmental factors.[1] Dental caries is characterized by the demineralization of the inorganic component and the degradation of the organic component, resulting in a progressive lesion of the dental hard tissues. This process is influenced by numerous factors.[2] Carious lesions, which represent the prevailing chronic bacterial infection worldwide affecting a large part of the world population, present a considerable public health concern.[3] The Global Burden of Disease (GBD) 2017 study showed that the prevalence of dental caries in permanent teeth ranked first among 328 diseases. It is reported that 2.3 billion of the global population have untreated caries in

Corresponding author: Ruhsan Müdüroğlu Adıgüzel
e-mail: ruhsanm@gmail.com

Received: February 8, 2025
Revision Requested: March 18, 2025
Last Revision Received: March 4, 2025
Accepted: March 18, 2025
Publication Date: May 12, 2025

permanent teeth, and more economically developed countries have the lowest burden of untreated dental caries and the highest burden of total tooth loss.[4]

The DMF index is widely recognized in the dental community as a standard tool for assessing the severity and prevalence of dental caries. This method describes the caries experience by using mean decayed, missing, and filled (restored) tooth or surface numbers. It is documented that the lifetime prevalence of caries experience has declined in the last 40 years in many developed countries.[5,6] On the other hand, a recent study projected that the age-standardized prevalence rate of untreated caries in permanent teeth may increase until 2049.[7] Therefore, it could be suggested that dental caries remain an important concern for the global population.

Untreated caries can lead to significant pain and discomfort. If the condition progresses to the dental pulp, it may result in infection, necrosis, and tooth loss, potentially exacerbating or triggering systemic diseases.[8] Integrating the prevention of non-communicable diseases and oral health can reduce mortality related to cardiovascular diseases, cancer, and diabetes. Therefore, particular attention is given to universal dental care, representing basic services accessible to all segments of the population, and the integration of dental care with other health services at the international level.[4,9] Additionally, the treatment of carious dental lesions imposes a major financial burden on families and medical systems. Subsequently, preventing the formation of new carious lesions and improving oral health can help to significantly reduce the burden on individuals and medical systems.[10] Determining the current oral health status is a critical factor in shaping governmental health policies and designing effective preventive programs. By doing so, individuals and communities are empowered to take proactive measures to maintain oral health, reduce the incidence of oral diseases, and improve overall well-being.

This retrospective study aimed to assess changes over a minimum period of 48 months in the number of decayed, missing, and restored teeth among individuals attending the clinics of Başkent University Faculty of Dentistry, with consideration given to age and gender factors.

MATERIALS AND METHODS

This study qualifies for a waiver of informed consent as it involves a retrospective analysis of existing, anonymized panoramic radiographs of the participants. Obtaining consent is impractical due to the long study period (2009-2019) and the inability to re-contact individuals. The research has been approved by the local ethics committee (D-KA 24/31).

Panoramic radiographs taken between January 01, 2009, and July 01, 2019, were retrospectively examined for radiographic evaluations of individuals over the age of 18 who visited the Department of Oral, Dental, and Maxillofacial Radiology at Başkent University Faculty of Dentistry for dental examinations on 2 occasions, with at least a 4-year interval between the visits. A minimum 4-year interval between dental examinations was established, referring to previous longitudinal studies.[11-13]

Only diagnostically acceptable panoramic radiographs without artifacts that would interfere with assessment were included in the study. The presence of a recent, high-quality, clear panoramic radiograph was the main inclusion criterion. Radiographs that were unclear or had distortion, overlapping, or positioning errors were excluded from the study.

The total number of decayed (D), missing (M), and restored (F) teeth in the panoramic radiographs taken at the individuals' initial (T0) and subsequent visits (T1) was identified and recorded separately for the entire mouth and each quadrant by a Restorative Dentistry specialist with 20 years of clinical and research experience (NA). Third molars were excluded from the study. Care was taken to ensure that there was at least a 48-month period between T0 and T1 for the radiographs included in the study. The differences between recorded DMFT scores were calculated using the difference formula in Excel (LKK). The distributions of the obtained data were evaluated, and comparisons between the groups were made based on the changes between T0 and T1. To assess the age factor, patients were divided into 4 age groups (18-34, 35-44, 45-65, and 66 and above), based on previous studies.[14,15]

Statistical Analysis

All statistical analyses were conducted using SPSS version 25.0 software for Windows (IBM SPSS, Chicago, IL, USA). Due to the violation of the normality assumption, Quade's Rank ANCOVA test (Quade Test) was employed as the primary method of analysis. This non-parametric approach is particularly suitable for evaluating group differences while controlling the effects of covariates in scenarios where parametric assumptions cannot be met.

In this study, the Quade test was used to assess differences in DMFT (Decayed, Missing, Filled Teeth) scores across various groups by adjusting for the influence of covariates such as time, age, and gender. Measurements were taken at multiple time intervals, and the influence of the time variable was carefully controlled to ensure that group differences in DMFT scores were evaluated independently of time-related effects or biases.

The primary objective of the Quade test was to identify differences between DMFT groups, rather than to calculate relative risks, odds ratios, or hazard ratios. This approach allowed the study to focus on understanding the relationships between the variables of interest while minimizing the impact of potential confounders.

In addition to the Quade test, post-hoc analyses were performed to further explore the impact of demographic variables, including age and gender, on DMFT scores. These analyses provided deeper insights into the interplay of these factors, enhancing the validity and reliability of the findings. By controlling for time and other covariates, the study ensured robust and meaningful conclusions regarding the differences in DMFT scores across groups.

RESULTS

A total of 2410 radiographs from participants aged 18 to 88 years (1389 women and 1021 men) were included in the baseline (T0) phase and they were re-evaluated after a subsequent time period (T1).

Radiographic data were categorized according to age ranges specified in the methodology, resulting in 4 age groups: 809 individuals aged 18-34, 494 individuals aged 35-44, 894 individuals aged 45-65, and 213 individuals aged 66 and above. The average age of the participants was "43." The average DMFT scores by age group were as follows: 1.9 for individuals aged 18-34, 2.1 for those aged 35-44, 2.2 for those aged 45-65, and 2.5 for those aged 66 and older.

Since the data were non-parametric, Quade's Rank ANCOVA test (Quade Test) was used as the main analysis method. The minimum, maximum, and median values of the changes in DMFT scores over time in the whole mouth for women and men in different age ranges were represented, Table 1 and all of the median values were "1".

The median values of the changes in DMFT scores over time for the entire mouth categorized by age groups were as follows: 3 for individuals aged 18-34, 5.5 for those aged 35-44, 1 for those aged 45-65, and 1 for those aged 66 and above, encompassing all genders (Table 2).

The median values of the changes in DMFT scores over time across the entire mouth are 6.5 for women and 5 for men, covering all age groups (Table 3). According to the findings of the present study, the effect of gender differed between the right and left sides of the mouth. However, when considering the F and D scores for the entire mouth, no significant difference was found between genders. Nevertheless, in terms of M and DMFT scores for the whole mouth, greater maximum score changes were observed among women.

The average changes in decayed (D), missing (M), and filled (F) teeth numbers over time across different quadrants were as follows: in the first quadrant, D=−0.1, M=0.4, F=0.3; in the second quadrant, D=−0.1, M=0.4, F=0.3; in the third quadrant, D=−0.1, M=0.3, F=0.3; and in the fourth quadrant, D=−0.1, M=0.3, F=0.3.

The average changes in DMFT scores over time in the quadrants were as follows: 0.6 in both the first and second quadrants, and 0.5 in both the third and fourth quadrants. For the right and left sides, the average changes in D, M, and F values were as follows: D=−0.2, M=0.7, F=0.6, and D=−0.2, M=0.7, F=0.6, respectively. The average of total DMFT score changes on both the left and right sides was 1.1. The median values of the changes in DMFT scores over time were 0 for the left side and 1 for the right side of the mouth.

Post-hoc tests indicated statistically significant differences in all quadrants and sides for changes over time in D, M, and F values, as well as DMFT scores, across age groups, regardless of gender ($P < .05$). Additionally, within each age group, gender effects were observed ($P < .05$).

The analysis performing comparisons between genders regardless of age revealed significant differences in all quadrants and sides in terms of D, M, and F values, as well as DMFT scores, between men and women ($P < .05$). However, when considering score changes for the whole mouth (left and right sides together) there was no statistical significance between genders regarding D ($P=.349$) and F ($P=.645$) scores.

The average DMFT score changes for both women and men were 2.1, with the average score change across the total study population also being 2.1 over the study period. The average number of decayed teeth decreased from 1.3 to 0.9, while the average number of missing teeth increased from 3.5 to 4.8, and the average number of filled teeth increased from 6.6 to 7.8. Consequently, the average DMFT score rose from 11.4 to 13.5 over the study period.

DISCUSSION

The control of dental caries formation is essential for interrupting the restorative replacement cycle, which is the result of the continuous progression of caries. Restorations that are replaced with more extensive ones ultimately lead to dental pulp involvement and endodontic treatment, followed by the replacement of crowns, and finally resulting in the loss of teeth.[16]

Previous studies have documented that people with low income are at a higher risk of suffering from untreated caries lesions.[7,17] The socioeconomic status of patients seeking dental treatment at the Faculty of Dentistry clinics is relatively higher compared to that of patients in public hospitals. Therefore, this close relationship between dental caries and socioeconomic status should also be considered while interpreting the results of the present study, as limited access to affordable dental care may exacerbate disparities in dental caries in studies involving low-income individuals.[18,19] Moreover, differences exist in oral health knowledge, beliefs, and practices between urban and rural populations, with urban residents showing a deeper understanding of oral disease prevention compared to rural participants.[20]

Table 1. DMFT Score Changes According to Different Genders and Age Groups

Quadrant (q)	Gender	Score Change	Age 18-34			Age 35-44			Age 45-65			Age over 66		
Q1	Women		Min	Max	Median- IQR	Min	Max	Median- IQR	Min	Max	Median- IQR	Min	Max	Median- IQR
		D	−3	4	0-1	−5	2	0-0	−4	5	0-0	−2	3	0-0
		M	−1	2	0-0	−1	5	0-0	−5	7	0-1	0	5	0-1
		F	−2	5	0-1	−5	5	0-1	−4	5	0-1	−5	5	0-1
		T	−1	5	0-1	0	6	0-1	−1	6	0-1	−1	5	0-1
	Men	D	−5	3	0-1	−2	4	0-0	−3	3	0-3	−2	4	0-0
		M	−2	3	0-0	0	7	0-0	0	7	0-1	−6	4	0-1
		F	−4	4	0-1	−4	4	0-1	−5	4	0-0	−4	5	0-2
		T	0	4	0-1	0	6	0-1	−1	5	0-1	0	6	0-1
Q2	Women		Min	Max	Median- IQR	Min	Max	Median- IQR	Min	Max	Median- IQR	Min	Max	Median- IQR
		D	−4	3	0-1	−3	3	0-0	−4	2	0-0	−4	2	0-0
		M	−1	3	0-0	0	6	0-0	−2	7	0-1	0	4	0-1
		F	−2	5	0-1	−4	5	0-1	−5	5	0-0	−4	5	0-1
		T	−1	5	0-1	−1	7	0-1	−1	5	0-1	0	5	0-1
	Men	D	−4	3	0-1	−4	2	0-1	−4	3	0-0	−2	2	0-0
		M	−3	3	0-0	−1	5	0-1	−1	7	0-1	−2	4	0-1
		F	−2	5	0-1	−3	3	0-1	−5	4	0-1	−3	4	0-1
		T	−1	5	0-1	−1	4	0-1	−1	5	0-1	0	5	0-1
Q3	Women		Min	Max	Median- IQR	Min	MaX	Median- IQR	Min	Max	Median- IQR	Min	Max	Median- IQR
		D	−4	2	0-0	−3	2	0-0	−3	3	0-0	−3	5	0-0
		M	0	2	0-0	−1	6	0-0	−1	7	0-1	0	6	0-1
		F	−1	6	0-1	−3	7	0-1	−6	5	0-0	−6	5	0-1
		T	−1	6	0-1	−1	7	0-1	−3	6	0-1	−1	5	0-1
	Men	D	−3	2	0-0	−2	1	0-0	−4	5	0-0	−−3	3	0-0
		M	0	3	0-0	0	5	0-0	−4	7	0-1	−2	4	0-1
		F	−3	4	0-1	−4	4	0-0	−7	4	0-0	−3	4	0-1
		T	−1	4	0-0	−3	5	0-1	0	6	0-1	−2	3	0-1
Q4	Women		Min	Max	Median- IQR	Min	Max	Median- IQR	Min	Max	Median- IQR	Min	Max	Median- IQR
		D	−3	3	0-0	−2	4	0-0	−3	3	0-0	−2	3	0-0
		M	−1	3	0-0	−1	4	0-0	−1	7	0-1	0	5	0-1
		F	−2	5	0-1	−3	6	0-1	−5	5	0-0	−5	6	0-1
		T	0	5	0-1	−1	5	0-1	−1	6	0-1	−1	6	0-1
	Men	D	−3	3	0-1	−3	2	0-0	−4	2	0-0	−3	2	0-0
		M	0	3	0-0	−1	4	0-0	0	7	0-1	−2	5	0-1
		F	−2	4	0-1	−2	5	0-1	−6	4	0-0	−3	5	0-0
		T	0	4	0-1	−1	6	0-1	−1	6	0-1	−1	5	0-1

Right Side (Q1+Q4)	**Women**		**Min**	**Max**	**Median- IQR**	**Min**	**Max**	**Median- IQR**	**Min**	**Max**	**Median- IQR**	**Min**	**Max**	**Median- IQR**
		D	−5	6	0-1	−6	4	0-1	−5	5	0-0	−3	4	0-1
		M	−1	3	0-0	−1	8	0-0	−5	14	0-1	0	10	0-1
		F	−2	9	1-2	−5	9	0-1	−6	9	0-2	−10	8	0-2
		T	−1	6	1-1	−1	11	0-1	−2	10	0-1	−1	9	1-2
	Men	**D**	−5	4	0-1	−4	6	0-1	-4	4	0-0	−3	4	0-0
		M	−2	5	0-0	0	9	0-1	0	13	0-2	−6	8	1-2
		F	−4	6	1-2	−4	6	0-1	-10	7	0-1	−6	7	0-2
		T	0	6	1-2	−1	7	1-2	0	10	1-2	−1	8	0-2
Left Side (Q2+Q3)	**Women**		**Min**	**Max**	**Median- IQR**	**Min**	**Max**	**Median- IQR**	**Min**	**Max**	**Median- IQR**	**Min**	**Max**	**Median- IQR**
		D	−8	3	0-1	−4	3	0-1	−4	5	0-0	−5	5	0-0
		M	−1	4	0-0	−1	11	0-1	−2	13	0-1	0	9	1-2
		F	−3	10	1-2	−4	12	0-1	−7	7	0-1	−9	10	0-2
		T	−1	8	1-2	−1	12	0-2	−3	10	1-2	0	10	0-2
	Men	**D**	−6	3	0-1	−4	2	0-1	−6	6	0-0	−3	3	0-0
		M	−3	4	0-0	−1	9	0-1	−4	12	0-1	−1	5	1-1
		F	−3	8	1-2	−6	6	0-1	−9	5	0-1	−5	7	0-2
		−T	1	7	0-1	−3	7	1-1	−1	11	0-2	0	7	1-2
Total Mouth (Q1+Q2+Q3+Q4)	**Women**		**Min**	**Max**	**Median- IQR**	**Min**	**Max**	**Median- IQR**	**Min**	**Max**	**Median- IQR**	**Min**	**Max**	**Median- IQR**
		D	−5	8	0-1	−7	5	0-1	−9	9	0-1	−7	7	0-1
		M	−1	6	0-0	−1	19	0-1	−5	26	1-3	0	19	1-3
		F	−2	14	1-3	−8	21	1-2	−12	13	0-3	−19	18	0-3
		T	−1	14	1-3	−1	23	1-3	−3	20	1-3	−1	19	1-4
	Men	**D**	−10	4	0-2	−6	3	0-1	−9	9	0-1	−4	6	0-1
		M	−2	8	0-1	−1	18	0-1	−3	25	1-3	−5	11	1-3
		F	−3	12	2-4	−8	10	1-3	−19	10	0-3	−10	11	0-3
		T	−1	13	1-3	−1	14	1-3	0	19	1-3	0	14	1-3

Statistically significant differences mentioned with * ($P < .05$).
D, decayed; F, filled; M, missing; MAX, maximum value; MIN, minimum value; Q1, right maxillary quadrant; Q2, left maxillary quadrant; Q3, left mandibular quadrant; Q4, right mandibular quadrant.; T, total score; T0, initial visit; T1, subsequent visits.

Table 2. DMFT Score Changes in Right-Left Sides and All of the Mouth in Different Age Groups

		D			M			F			T		
		Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median
Right side score changes	**18-34**	−5	6	−2	−2	5	0	−4	9	2.5	−1	6	0.5
	35-44	−6	6	0	−1	9	0	−5	9	4	−1	11	4
	45-65	−5	5	0	−5	14	0	−10	9	0	−2	10	0
	>66	−3	4	0	−6	10	0	−10	8	0	−1	9	1
Left side score changes		D			M			F			T		
		Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median
	18-34	−8	3	−0.5	−3	4	0	−3	10	3	−1	8	2.5
	35-44	−4	3	0	−1	11	0	−6	12	1.5	−3	12	1.5
	45-65	−6	6	0	−4	13	0	−9	7	0	−3	11	0
	>66	−5	5	0	−1	9	1	−9	10	0	0	10	0
Total mouth score changes		D			M			F			T		
		Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median
	18-34	−10	8	−2.5	−2	8	10	−3	14	5.5	−1	14	3
	35-44	0	10	0.5	0	28	2	0	24	9.5	−1	23	5.5
	45-65	−9	9	0	−5	26	1	−19	13	0	−3	20	1
	>66	−7	7	0	−5	19	1	−19	18	0	−1	19	1

D, decayed; F, filled; M, missing; T, total score.

Table 3. DMFT Score Changes in Right-Left Sides and All of the Mouth in Different Genders

	Gender	D			M			F			T		
Right side score changes		Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median
	Women	−6	6	−0.5	−5	14	0	−10	9	2.5	−2	11	2
	Men	−5	6	−1	−6	13	2.5	−10	7	1.5	−1	10	3
	***P* value**		**<.001***			**<.001***			**<.001***			**< .001***	
Left side score changes		Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median
	Women	−8	5	−1.5	−2	13	1.5	−9	12	4.5	−3	12	4.5
	Men	−6	6	0	−4	12	2	−9	8	0	−3	11	2
	***P* value**		**<.001***			**< .001***			**< .001***			**< .001***	
Total Score Changes		Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median
	Women	0	11	0.5	0	28	3.5	0	26	20	−3	23	6.5
	Men	−10	9	−1	−5	25	4.5	-19	12	1.5	−1	19	5
	p value		**.349**			**.006***			**.645**			**<.001***	

Statistically significant differences mentioned with * (*P*< .05).
D, decayed; F, filled; M, missing; T, total score.

Advanced age is closely linked to increased medication use, which may elevate the risk of dental caries due to its effect on reducing saliva flow of saliva and causing oral dryness. Moreover, exposure of root surfaces due to age-related gingival recession leads to tooth surfaces becoming susceptible to caries formation.[21] Kassebaum et al. reported a prevalence peak of caries attacks at 70 years old, accompanied by root caries.[22] Older individuals commonly suffer from oral diseases and have low access to dental care services, so middle-aged and senior adults are at a greater risk for untreated caries lesions.[23] A recent review[24] has reported the caries experience in senior patients in 20 countries with mean DMFT scores of 14.6-25.8. The same study documented a trend between 1996 and 2016, demonstrating lower MT scores and higher FT scores during this period.[24] Similarly, the results of the present study demonstrated a directly proportional rise in DMFT score with age regardless of gender. On the other hand, in a study performed in Norway, it was reported that initial caries were particularly prevalent in the younger age groups, with a mean number of 4.7 for individuals in the age range of 19-24.[25] Similarly, in the present study, the number of initial caries was the highest among younger participants of both genders when the number of carious teeth (D score) is considered solely. Moreover, the number of carious teeth decreased in the present study, supporting the findings of previous studies where there was a decrease in caries prevalence over time.[16,25]

Hormonal fluctuations in women often lead to reduced salivary protection and flow rate, increasing their susceptibility to caries development.[26] Despite this, few studies have demonstrated a higher prevalence of caries in women.[27,28] On the other hand, some studies have reported associations between the decayed number of teeth and the male gender.[25,29] Mulic et al. documented higher DMFT among women who had significantly fewer decayed teeth, but a higher number of filled teeth than men.[29] The results of the present study demonstrated that gender has a partial effect on DMFT scores.

There is a limitation of the present study regarding interpreting the results. Decayed teeth can be extracted or "turned into" restored ones, providing a decrease in D scores and an increase in M and F scores. Hence, using the change between mean DMF scores separately does not accurately reflect the burden of disease and can be misinterpreted by dental professionals. Therefore, the total DMF score should be considered while constructing reports based on calculations performed using the DMFT index.

Another limitation of this study is its restricted patient population. Since the data were obtained from patient records of individuals who presented to the clinic of a university and were followed up for treatment, the study population may not fully represent the general community. Therefore, future research involving a broader population within the relevant field is warranted to enhance the generalizability of the findings. Furthermore, the authors believe that this study may serve as an inspiration for future research in public health and provide valuable insights for the development of community dental health programs. In addition, improved and more effective methods for caries prevention are needed for individuals with the highest caries experience to halt further progression in the future. Protecting individuals from new caries formation could save a substantial part of the budget and prevent inconvenient dental treatment and the suffering of many patients.

Numerous studies have evaluated DMFT scores at a single time point; however, research assessing changes in these scores over time remains limited. The present study enables repeated observations of the same individuals, allowing for the detection of long-term trends and individual trajectories. By examining how DMFT scores change over time, this study contributes to understanding the factors that increase or decrease the risk of caries. Additionally, the data obtained provides insights from multiple disciplines, such as psychology and public health, facilitating a better understanding of the bidirectional relationship between oral health and psychological well-being. Further longitudinal studies with extended time frames are needed to better assess the effectiveness of public health interventions, community dental health programs, and oral health education initiatives by monitoring outcomes before and after their implementation.

CONCLUSION

According to the findings of the present study, it could be suggested that age has an impact on the number of decayed, missing, and restored teeth and total DMFT score change. However, gender has a limited impact on the number of decayed, missing, and restored teeth and total DMFT score change.

Data Availability Statement: The data that support the findings of this study are available upon request from the corresponding author.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Başkent University (Date: 17.09.2024, Number: D-KA 24/31).

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – N.A.; Design – L.K.K., N.A.; Supervision – N.A.; Resources – N.A., S.G.; Materials – N.A.; Data Collection and/or Processing – L.K.K., R.M.A.; Analysis and/or Interpretation – L.K.K., N.A.; Literature Search – L.K.K., S.G., N.A.; Writing Manuscript – L.K.K., R.M.A.; Critical Review – N.A.

Acknowledgements: The authors would like to thank Dr. Esra Kutsal Mergen for her support in statistical analysis throughout this project.

Declaration of Interests: The authors declare that they have no competing interests.

Funding: The authors declared that this study has received no financial support.

REFERENCES

1. Machiulskiene V, Campus G, Carvalho JC, et al. Terminology of dental caries and dental caries management: consensus report of a workshop organized by ORCA and cariology research group of IADR. *Caries Res*. 2020;54(1):7-14. [CrossRef]
2. Kidd EA, Fejerskov O. What constitutes dental caries? Histopathology of carious enamel and dentin related to the action of cariogenic biofilms. *J Dent Res*. 2004;83(Spec No C):C35-C38. [CrossRef]
3. Shaffer JR, Polk DE, Feingold E, et al. Demographic, socioeconomic, and behavioral factors affecting patterns of tooth decay in the permanent dentition: principal components and factor analyses. *Community Dent Oral Epidemiol*. 2013;41(4):364-373. [CrossRef]
4. GBD 2017 Oral Disorders Collaborators, Bernabe E, Marcenes W, Hernandez CR, et al. Global, regional, and national levels and trends in burden of oral conditions from 1990 to 2017: a systematic analysis for the global burden of disease 2017 study. *J Dent Res*. 2020;99(4):362-373. [CrossRef]
5. Bernabé E, Sheiham A. Age, period and cohort trends in caries of permanent teeth in four developed countries. *Am J Public Health*. 2014;104(7):e115-e121. [CrossRef]
6. Marthaler TM. Changes in dental caries 1953-2003. *Caries Res*. 2004;38(3):173-181. [CrossRef]
7. Sun R, Xu X, Dong Y, et al. Global and regional trends in prevalence of untreated caries in permanent teeth: age-period-cohort analysis from 1990 to 2019 and projections until 2049. *J Dent*. 2024;147:105122. [CrossRef]
8. Qin X, Zi H, Zeng X. Changes in the global burden of untreated dental caries from 1990 to 2019: a systematic analysis for the Global Burden of Disease study. *Heliyon*. 2022;8(9):e10714. [CrossRef]
9. Watt RG, Daly B, Allison P, et al. Ending the neglect of global oral health: time for radical action. *Lancet*. 2019;394(10194):261-272. [CrossRef]
10. Peres MA, Macpherson LMD, Weyant RJ, et al. Oral diseases: a global public health challenge. *Lancet*. 2019;394(10194):249-260. [CrossRef]
11. Dolic O, Obradovic M, Kojic Z, et al. Validation of Cariogram in caries prediction in women and their children 4 years after pregnancy–longitudinal study. *Risk Manag Healthc Policy*. 2020;13:549-557. [CrossRef]
12. Poorterman JH, Aartman IH, Kieft JA, Kalsbeek H. Approximal caries increment: a three-year longitudinal radiographic study. *Int Dent J*. 2003;53(5):269-274. [CrossRef]
13. Wahid AA, Yusof ZYM, Jaafar N. Caries increment among army personnel: a 5-year longitudinal study. *Asia Pac J Public Health*. 2014;26(3):268-274. [CrossRef]
14. Sarıçam E, İnce Yusufoğlu Sİ. Comparison of hepatitis B-infected and healthy individuals in terms of DMFT scores, endodontic treatment and extraction numbers: a cross-sectional study. *Acta Odontol Turc*. 2021;38(3):56-61. [CrossRef]
15. Splieth Ch, Schwahn Ch, Bernhardt O, et al. Caries prevalence in an adult population: results of the Study of Health in Pomerania, Germany (SHIP). *Oral Health Prev Dent*. 2003;1(2):149-155.
16. Flink H, Hedenbjörk-Lager A, Liljeström S, Nohlert E, Tegelberg Å. Identification of caries-active individuals in longitudinal data a methodological study using a national registry. *Acta Odontol Scand*. 2024;83:70-75. [CrossRef]
17. Schwendicke F, Dörfer CE, Schlattmann P, Foster Page L, Thomson WM, Paris S. Socioeconomic inequality and caries: a systematic review and meta-analysis. *J Dent Res*. 2015;94(1):10-18. [CrossRef]
18. Sahab L, Sabbah W. Is the inability to afford dental care associated with untreated dental caries in adults? *Community Dent Health*. 2022;39(2):113-117. [CrossRef]
19. Thomson WM, Poulton R, Kruger E, Boyd D. Socio–economic and behavioural risk factors for tooth loss from age 18 to 26 among participants in the Dunedin multidisciplinary health and development study. *Caries Res*. 2000;34(5):361-366. [CrossRef]
20. Kumar S, Tadakamadla J, Duraiswamy P, Kulkarni S. Dental Caries and its Socio-Behavioral Predictors- An exploratory Cross-Sectional Study. *J Clin Pediatr Dent*. 2016;40(3):186-192. [CrossRef]
21. Diep MT, Skudutyte-Rysstad R, Sødal ATT, Young A, Hove LH. Caries experience and risk indicators of having decayed teeth among 65-year-olds in Oslo, Norway: a cross-sectional study. *BMC Oral Health*. 2023;23(1):726. [CrossRef]
22. Kassebaum NJ, Smith AGC, Bernabé E, et al. Global, regional, and national prevalence, incidence, and disability-adjusted life years for oral conditions for 195 countries, 1990-2015: a systematic analysis for the global burden of diseases, injuries, and risk factors. *J Dent Res*. 2017;96(4):380-387. [CrossRef]
23. Liu L, Zhang Y, Wu W, Cheng R. Characteristics of dental care-seeking behavior and related sociodemographic factors in a middle-aged and elderly population in northeast China. *BMC Oral Health*. 2015;15:66. [CrossRef]
24. Carvalho JC, Schiffner U. al Caries in European Adults and Senior Citizens 1996-2016: ORCA Saturday Afternoon Symposium in Greifswald, Germany - Part II. *Caries Res*. 2019;53(3):242-252. [CrossRef]
25. Rødseth SC, Høvik H, Schuller AA, Bjertness E, Skudutyte-Rysstad R. Dental caries in a Norwegian adult population, the HUNT4 oral health study; prevalence, distribution and 45-year trends. *Acta Odontol Scand*. 2023;81(3):202-210. [CrossRef]
26. Ferraro M, Vieira AR. Explaining gender differences in caries: a multifactorial approach to a multifactorial disease. *Int J Dent*. 2010;2010(1):649643. [CrossRef]
27. Monisha K, Leelavathi L, Aravind K. Association of gender and caries experience based on Dmft index-retrospective analysis of patient records. *J Contemp Issues Bus Gov*. 2021;27(2):3261-3268. [CrossRef]
28. Tian T, Yang Z, Li S, et al. Cross-sectional survey and analysis of factors influencing the prevalence of dental caries among older individuals aged 65-74 in Guangdong Province in 2021. *BMC Oral Health*. 2024;24(1):948. [CrossRef]
29. Mulic A, Tveit AB, Stenhagen KR, Oscarson N, Staxrud F, Jönsson B. The frequency of enamel and dentin caries lesions among elderly Norwegians. *Acta Odontol Scand*. 2020;78(1):6-12. [CrossRef]