

# DMFT index of patients in the COVID-19 normalization period in Turkey

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## Abstract

**Background:** During the 2019-nCoV pandemic, many health institutions stopped providing services, thus causing disruptions in the health system. This study aimed to examine the decayed, missing, and filled teeth (DMFT) index of individuals during the post-pandemic normalization period.

**Methods:** This cross-sectional study included 640 adult patients aged more than 18 years, who applied to Health Science University Gulhane Faculty of Dentistry for dental treatment between July 20, 2021, and December 31, 2021. The information forms were filled by the dentist of the patients during their first examination, which included the demographic data of the patients (age, sex, educational status, occupation, and income status), oral hygiene habits of the patients (patients' frequency of tooth brushing, floss use, and mouthwash use) and frequency of going to the dentist. In addition, the patients were examined by the same dentist using only mirrors and probes, and their DMFT index data (number of decayed, missing and filled teeth) were recorded. The data obtained from the study were analyzed using one-way analysis of variance ( $P < 0.05$ ).

**Results:** The mean age of the individuals participating in this study was  $40.94 \pm 22.89$  years, and the DMFT index was  $10.38 \pm 5.47$ . When the DMFT index was examined according to age ranges, the lowest DMFT index was in the 18–30 years ( $6.15 \pm 3.5$ ) ( $P < 0.05$ ). The group that used daily brushing, flossing, and mouthwash showed the lowest DMFT ratio of  $6.56 \pm 3.75$ .

**Conclusion:** This study showed that the group that used tooth brushing, flossing, and mouthwash had the lowest DMFT index when health services were disrupted, such as during the pandemic period.

**Keywords:** COVID-19, DMFT, Oral hygiene, Pandemics

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## Introduction

Toward the end of 2019, a new coronavirus (2019-nCoV) that was not detected in humans earlier was detected in Wuhan, China, and a global emergency was declared by the World Health Organization (WHO).<sup>1</sup> The transmission of the coronavirus (2019-nCoV) occurs mainly by inhaling the droplets dispersed by sick individuals through speaking, coughing, and sneezing. In addition, a large number of live virus particles were detected on the epithelial surface of the oral mucosa and the dorsum of the tongue of a 2019-nCoV-positive patient.<sup>1-3</sup>

The coronavirus disease is an unknown and unpredictable disease. Consequently, it was greeted with panic and fear by the society and caused the development of “coronaphobia” in some segments.<sup>4</sup> This developing coronaphobia has caused unprecedented difficulties in accessing oral and dental health services in many areas of the health sector. The primary transmission route of 2019-nCoV is via respiratory droplets and saliva, and such aerosols are released in almost all procedures of dental

services, and dentists constituted the occupationally high-risk group.<sup>5,6</sup> Therefore, many clinics providing dental treatment services in different countries worldwide were closed during the COVID-19 pandemic, and restrictions were imposed on dental procedures in almost all of these clinics. On November 26, 2021, Omicron, a new variant of 2019-nCoV, rapidly spread all over the world in less than 3 months. Although the peak in the number of cases has been reached in many countries, a decrease at the same rate was also observed.<sup>7</sup> As a result of this decline, the public health measures have begun to be relaxed in most places, which was not seen for almost 3 years. Simultaneously, oral and dental health services have also started to normalize.

Various criteria have been developed by the WHO for the planning of services related to oral health problems. Different criteria exist for dental caries such as decayed, missing, and filled teeth (DMFT), DMF-S, and Significant Caries Index.<sup>8,9</sup> Among these indexes, the DMFT index is an index that shows the sum of DMFT.

Various factors, such as age, sex, educational status,



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socioeconomic level, and tooth brushing, play a significant role in the risk profile of individuals. These risk profiles are crucial in the prevention of caries and the planning of treatments. Therefore, these factors affecting the DMFT rate should be investigated in epidemiological studies.<sup>10,11</sup>

One of the most important purposes of epidemiological studies is to describe the distribution and magnitude of disease problems in the population. Thus, the targets to alleviate the problem can be determined, and alternative methods can be planned

To achieve these targets. Especially during the COVID-19 pandemic, there were great changes in oral and dental health services. It is very important to determine whether these changes have an impact on the oral and dental health of the society and take precautions by determining various targets. This study investigated the DMFT index of adult individuals (aged 18–80 years) and also its interaction with demographic data and oral care habits during the COVID-19 normalization period.

## Methods

The sample group of this cross-sectional study consisted of 640 patients randomly selected from the patients who applied to Health Sciences University Gulhane Faculty of Dentistry between 20 July 2021 and 31 December 2021 in the same province.

Individuals under the age of 18 and over the age of 80 and who did not approve to participate were excluded from the study. Individuals aged 18–80 years and who approved to participate were included in the study.

The demographic data of the patients (age, sex, educational status, income status, and occupation), oral hygiene habits (the patient's frequency of tooth brushing, floss use, and mouthwash), frequency of going to the dentist, and DMFT index (the number of decayed, missing, and filled teeth) were recorded by one of the authors of the study (NA).

First, informed consent was obtained from the patients who applied to Health Science University Gulhane Faculty of Dentistry with the aim of receiving treatment. Then, the demographic data of the patients, their oral hygiene habits, and the frequency of going to the dentist were recorded in the patient information forms. Subsequently, an experienced dentist (BE) performed an intraoral examination of the patients using a mirror and probe under the light of the dental unit and recorded the DMFT index in the patient information form. The DMFT index was calculated by adding the number of decayed, missed, and filled teeth. A comprehensive analysis was conducted to evaluate the effect of the COVID-19 pandemic on the DMFT index of patients by examining the data in the patient information forms.

## Statistical analysis

This was a cross-sectional descriptive study. The

statistical analysis was performed using SPSS version 22.00 (SPSS Inc., IL, USA). The descriptive statistics of the demographic variables of the individuals participating in the study were made. The relationship between the sex, age, educational status, income status, occupation, frequency of tooth brushing, oral hygiene habits, frequency of going to the dentist, and DMFT indexes of the individuals were examined using the one-way analysis of variance (ANOVA). The statistical significance level was taken as  $P < 0.05$ .

## Results

Of the 640 individuals participating in the study, 60% were women ( $n = 384$ ) and 40% were men ( $n = 256$ ). The mean age of the individuals participating in the study was  $40.94 \pm 22.89$  years. As a result of the ANOVA test performed on DMFT, a statistically significant difference was found between age, educational status, occupation, income status, oral care habits, and DMFT index ( $P < 0.05$ ). No significant relationship was observed between sex, frequency of going to the dentist, and DMFT index ( $P > 0.05$ ) (Table 1).

The DMFT index of all individuals participating in the study was found to be  $10.38 \pm 5.47$ . The DMFT index of women ( $10.56 \pm 5.53$ ) and men ( $10.12 \pm 5.38$ ) was found to be close to each other ( $P > 0.05$ ). When the DMFT index was examined according to the age ranges of the patients, the lowest DMFT index was found in the age group of 18–30 years ( $6.15 \pm 3.5$ ), and the highest in the age group of 60+ years ( $15.09 \pm 4.99$ ) ( $P < 0.05$ ). In this study, it was observed that the DMFT index increased with increasing age (Table 1).

Based on the educational status, the group with the lowest DMFT index included graduates ( $8.80 \pm 5.32$ ) and university graduates ( $8.42 \pm 4.69$ ), while the group with the highest DMFT index comprised primary school graduates ( $13.97 \pm 4.93$ ) ( $P < 0.05$ ). When the relationship between socioeconomic status and DMFT was examined, the DMFT index of those with low ( $8.36 \pm 5.25$ ), middle ( $11.91 \pm 5.38$ ), and high income levels ( $11.43 \pm 5.1$ ) was lower (Table 1).

On examining the oral care habits of all individuals participating in the study, 72.7% of the individuals were found to have the habit of brushing only, 24.8% of them had the habit of brushing+flossing, and 2.5% of them had the habit of brushing+flossing+mouthwash. A statistically significant relationship was found between the oral care habits of the individuals participating in the study and the DMFT index ( $P < 0.05$ ). Those who had the habit of daily brushing, flossing, and mouthwash among their oral care habits had the lowest DMFT index ( $6.56 \pm 3.75$ ), while those who only brushed their teeth had the highest DMFT index ( $11.15 \pm 5.42$ ) ( $P < 0.05$ ) (Table 1).

No statistically significant difference was found between

**Table 1.** Patient information collection form

Demographic variable		<i>n</i>	%	DMFT index	<i>P</i>
Age (y)	18–30	196	30.6	6.15±3.5	0.000
	31–40	117	18.3	10.03±4.54	
	41–50	139	21.7	11.42±4.69	
	51–60	94	14.7	13.44±5.04	
	60+	94	14.7	15.09±4.99	
Gender	Female	384	60	10.56±5.53	0.314
	Male	256	40	10.12±5.38	
Educational status	Primary school	149		13.97±4.93	0.000
	High school	209		10.51±5.5	
	University	272		8.42±4.69	
	Postgraduate	15		8.80±5.32	
Income status	Low (below 3000 TL)	245		8.36±5.25	0.000
	Medium (3000–6000 TL)	170		11.91±5.38	
	High (over 6000 TL)	225		11.43±5.1	
Occupation	Employee	26		10.04±5.06	0.000
	Government official	43		11.37±5.38	
	Student	158		5.87±3.32	
	Housewife	111		13.55±5.13	
	Retired	63		14.79±4.42	
	Other	238		10.57±4.94	
Brushing frequency	1 time per day	191		11.49±5.79	0.003
	2–3 times a day	431		9.88±5.28	
	1 time per week	18		10.67±4.83	
Oral hygiene habits	Brushing teeth	465		11.15±5.42	0.000
	Brushing+flossing	159		8.52±5.17	
	Brushing+flossing+mouthwash	16		6.56±3.75	
Frequency of going to the dentist	Once in 6 months	79		10.77±5.59	0.195
	Once a year	152		9.59±5.54	
	When there is a complaint	272		10.49±5.44	
	Not going	137		10.85±5.33	
Total		640			

the frequency of going to the dentist and the DMFT index ( $P>0.05$ ). The DMFT indexes of those who said “I go to the dentist every 6 months” ( $10.77\pm5.59$ ), “I go once a year” ( $9.59\pm5.54$ ), “I go when I have a complaint” ( $10.49\pm5.44$ ), and “I do not go” ( $10.85\pm5.33$ ) were close to each other (Table 1).

## Discussion

Epidemiological research has a critical role in determining the oral hygiene status of the population, the importance given to oral care habits, and the risk of caries. Studies on oral hygiene and the prevalence of caries prevalence in individuals in our country mostly included children or adolescents.<sup>12–14</sup> This study investigated the DMFT index of adults during the COVID-19 normalization period. The most important result of the study was that the DMFT index of individuals who only brushed their

teeth was found to be significantly higher than that of individuals who additionally used mouthwash and dental floss.

In epidemiological studies, a detailed examination should be conducted to determine the effects of socioeconomic levels of communities on oral health.<sup>15</sup> Although many studies reported that individuals’ income status, educational status, and occupation had an impact on dental health, the findings were not consistent.<sup>16–20</sup>

Bahram et al performed studies on patients who applied to the department of dental diseases and treatment. They found that age, sex, educational status, and oral care habits were influencing factors for the DMFT index.<sup>21</sup> When the relationship between the educational status of individuals and the DMFT index was examined, it was observed that the DMFT index of graduates ( $8.80\pm5.32$ ) and university graduates ( $8.42\pm4.69$ ) was lower than that of primary

school graduates ( $13.97 \pm 4.93$ ). Similar studies reported that the DMFT index decreased as the educational status of the individuals increased.<sup>22-24</sup> These results, in line with other published studies, showed that the academic success and the level of knowledge of individuals were some factors affecting oral health.<sup>25</sup>

The findings of this study revealed that the DMFT index increased significantly with the increase in the income level ( $P < 0.05$ ). However, other studies reported no statistically significant relationship between the DMFT index and the income level.<sup>26-28</sup> As mentioned earlier, determining the impact of socioeconomic conditions on DMFT is a difficult and multifactorial issue. On the one hand, those with a good income can easily access oral hygiene tools and consult a dentist; on the other hand, access to cariogenic and various packaged foods becomes easier. Therefore, socioeconomic conditions need to be examined in more detail with different parameters.

One of the most important factors for the DMFT index is, undoubtedly, the importance given to oral hygiene habits. When dental plaque accumulation increases due to the lack of oral hygiene, the risk of developing caries and the DMFT index increase. For a good plaque control, regular removal of the plaque from the oral environment through tooth brushing, flossing, and mouthwash is necessary.<sup>22</sup> In this study, the effects of brushing, flossing, and mouthwash, which were critical for plaque control, on the DMFT index were investigated. The results showed that the DMFT index ( $6.56 \pm 3.75$ ) of the patients who performed all the habits of daily brushing + flossing + mouthwash was lower than that of the patients who only brushed teeth ( $11.15 \pm 5.42$ ) as expected.<sup>29</sup> This result was consistent with previous findings reporting that flossing and mouthwash use, besides tooth brushing, significantly reduced the DMFT index by reducing the incidence of caries.<sup>27,28,30</sup>

It is extremely important to have regular dental check-ups to increase the chances of a healthier oral area and survival of the teeth.<sup>30</sup> However, when we looked at our study data, no statistically significant relationship was found between the frequency of going to the dentist and the DMFT index ( $P > 0.05$ ). The DMFT rates of the groups who said "I go to the dentist every 6 months" ( $10.77 \pm 5.59$ ), "I go once a year" ( $9.59 \pm 5.54$ ), "I go when I have a complaint" ( $10.49 \pm 5.44$ ), and "I do not go" ( $10.85 \pm 5.33$ ) were found close to each other. This was because the study was conducted during the COVID-19 normalization period, and most dental clinics had just started dental services after the pandemic. This might also account for no significant relationship between sex and the DMFT index.

Many published studies reported that the risk of caries increased with an increase in age and the DMFT index.<sup>31-33</sup> A study conducted on 9387 people aged more than 18 years in Kosovo in 2016 revealed the DMFT index

of individuals aged 18–34 years, 35–44 years, 45–64 years, 65–74 years, and 75+ years was 9.61, 11.6, 13.68, 17.98, and 23.19, respectively.<sup>31</sup> In another study conducted by the Turkish Ministry of Health on 11,091 people across Turkey in 2018, the DMFT index of individuals aged 35–44 years was  $8.80 \pm 5.59$ , while that of individuals aged 65–74 years was reported as  $22.63 \pm 9.06$ .<sup>34</sup> Similar to these results, the present study showed that the DMFT index increased significantly with increasing age ( $P < 0.05$ ).

Under normal conditions, DMFT is expected to decrease in the same population with the increase in the level of consciousness and the use of oral hygiene tools over the years.<sup>35</sup> However, in some DMFT studies examined and the present study, increases in DMFT indexes were detected after the pandemic. According to an epidemiological study conducted in Iran in 2015, the DMFT index of individuals aged 35–45 years was  $7.8 \pm 3.2$ .<sup>29</sup> In another study conducted in Iran on the age group of 35–44 years in 2022, the DMFT index was reported as  $10.45 \pm 0.18$ .<sup>35</sup> Karaoğlanoğlu et al examined 440 participants of the same age categories as in the present study in Ankara in 2018, and the DMFT index was found to be 7.89. The DMFT index in this study, which was carried out on 640 patients in Ankara in 2021, was found to be  $10.38 \pm 5.47$ , with an increase compared with 2018.<sup>27</sup>

The COVID-19 virus, which was detected toward the end of 2019, led to the disruption of all health services and difficulties in meeting the dental needs of individuals. Also, individuals did not apply to health institutions for a long time due to hesitations in obtaining dental services.<sup>1</sup> It is inevitable that these disruptions, which last for a long time in dental services, do not affect the oral hygiene of the community. This study has some limitations. Although the population's DMFT index increased after the pandemic, the data need to be supported by comprehensive studies that will be conducted with larger populations. More studies are needed to compare the pre-pandemic and post-pandemic period. However, despite these limitations, this is one of the few studies that examined the population's DMFT index for pandemics.

## Conclusion

The results of this study indicated that the use of dental floss and mouthwash, besides brushing, was extremely important in reducing the DMFT index. In addition, necessary precautions should be taken against the possibility of an increase in community DMFT indexes within the scope of the disruption of oral and dental health services such as the COVID-19 pandemic period.

## Authors' Contribution

**Conceptualization:** Bilge Ersöz, Elif Aybala Oktay, Numan Aydın, Serpil Karaoğlanoğlu

**Data curation:** Bilge Ersöz, Elif Aybala Oktay, Numan Aydın, Serpil Karaoğlanoğlu.

**Formal analysis:** Bilge Ersöz, Elif Aybala Oktay, Numan Aydın, Serpil Karaođlanođlu.

**Methodology:** Bilge Ersöz, Elif Aybala Oktay, Numan Aydın, Serpil Karaođlanođlu.

**Resources:** Bilge Ersöz, Elif Aybala Oktay, Numan Aydın, Serpil Karaođlanođlu.

**Software:** Bilge Ersöz, Elif Aybala Oktay, Numan Aydın, Serpil Karaođlanođlu.

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**Writing–review & editing:** Bilge Ersöz, Elif Aybala Oktay, Numan Aydın, Serpil Karaođlanođlu.

### Competing Interests

None declared.

### Ethical Approval

This study, with an ethics code of 2021/303, was approved by the Gulhane Training and Research Hospital Clinical Research ethics committee and was conducted in accordance with the Declaration of Helsinki Principles.

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