The Effects of the Coronavirus Disease (COVID-19) Pandemic on Dental Patients' Attitudes and Oral Health Problems in Thailand

Aisoon Ruetaijetjaroen[1] Thaksaporn Sirichanyaphong[1] Jiratchaya Nuntachurat[1] Suraphong Yuma[2] Chanita Tantipoj[3]

[1] Mahidol International Dental School, Faculty of Dentistry, Mahidol University, Ratchathewi, Bangkok, Thailand
[2] Department of Physics, Faculty of Science, Mahidol University, Bangkok, Thailand
[3] Department of Advanced General Dentistry, Faculty of Dentistry, Mahidol University, Bangkok, Thailand

Address for correspondence Chanita Tantipoj, DDS, MSc, PhD, Department of Advanced General Dentistry, Faculty of Dentistry, Mahidol University, Bangkok, 10400, Thailand (e-mail: chanita.tat@mahidol.edu).

Eur J Gen Dent 2023;12:189–198.

Abstract

Objectives The aim of this study was to determine oral problems and attitude of dental patients toward the effect of the COVID-19 pandemic in Thailand.

Materials and Methods This cross-sectional study used a questionnaire consisting of four parts: demographic data, oral health problems before and during the COVID-19 outbreak, daily behavior and oral hygiene care during the pandemic, and attitudes toward the effects of COVID-19 situations and oral health problems in Thailand. It is randomly distributed to the dental patients at the Faculty of Dentistry, Mahidol University.

Statistical Analysis Descriptive statistics and Pearson's chi-squared test were used to determine the correlation between each individual demographic data and the attitudes toward the COVID-19 effect. McNemar's test was used to examine the association between oral problem before and during the pandemic.

Results Among the total of 409 participants, 59.9% believed that the COVID-19 situation impacted their oral health. The fractions are 64.6 and 50.7% for females and males, respectively. Halitosis and gum bleeding showed significant increase during the pandemic from 9.3 to 15.4% and 5.9 to 10.3%, respectively. Unchanged tooth brushing habit was reported in 86.3% of respondents, while only 44.6% reported unchanged consumption of sugary snacks and/or beverages. COVID-19 caused more difficulty in accessing the dental service for 89.5% of respondents. The majority of the participants were not worried about their safety while receiving dental treatment after the pandemic, but they believed that the pandemic influenced their decision to seek dental treatment.

Conclusion Inadequate oral hygiene appears to be the main reason for the increase in cases of halitosis and gum bleeding during the pandemic. Viral infection preventive measures and protocols greatly affected the patients' decision to visit a dentist. This information could serve as a primary reference for both dentists and administrators in preparing actions in case a similar pandemic occurs in the future.

Keywords
- oral problem
- attitude
- dental patients
- COVID-19

DOI https://doi.org/10.1055/s-0043-1775987.
ISSN 2320-4753.

Thieme Medical and Scientific Publishers Pvt. Ltd., A-12, 2nd Floor, Sector 2, Noida-201301 UP, India

Introduction

Coronavirus disease, commonly known as COVID-19, is an ongoing, highly devastating, and contagious viral infection of the respiratory system that has caused 6,927,378 global deaths as of May 2023.[1,2] The World Health Organization (WHO) declared the disease a global pandemic on March 11, 2020.[1] In Thailand, the pandemic has caused 30,349 deaths[3] and economic damages from the prolonged quarantine since December 2020.[4,5]

According to the WHO, the disease can spread through oral and nasal cavities via direct contact, droplets, and, in some cases, airborne transmission.[6] Furthermore, the presence of SARS-CoV-2's angiotensin-converting enzyme 2 in the oral cavity confirms that the oral cavity is one of the main entries for the virus.[7] Dental treatments, which naturally create droplets and aerosol, are thus limited to only emergency treatments during the pandemic.[7,8] The limited access to dental services could lead to a decline in oral health and more oral-related diseases as preventive intervention through regular oral health checkups is imperative to good oral health.[9]

Another effect of COVID-19 is the change in patients' attitudes toward dental practices due to increased anxiety and stress levels.[10] Various studies reported that anxiety and stress may negatively affect oral health care behavior and diet, leading to poor oral health.[7,10,11] The patients with dental phobia tend to avoid routine checkups for preventive care, resulting in visiting the dentist less than once a year.[11] The avoidance of preventive oral health care could increase the risk of long-term chronic medical conditions, especially those correlated to oral disease such as gingivitis.[11]

The effect of the COVID-19 pandemic on dental health has been widely studied across the world. Ciardo et al recently reported good Oral Health-Related Quality of Life (OHRQoL) for most adult participants in Germany during the pandemic.[12] In contrast, a study conducted in India found that COVID-19 could worsen OHRQOL especially among females.[13] It is suggested that distinctive sociopolitical circumstances across regions and countries result in different impacts of the pandemic on social, professional, and personal life. Investigating the impact of COVID-19 in various countries is, therefore, essential to understand the situation unique to that country. This study aims to comprehensively investigate the wide-ranging impacts of the COVID-19 pandemic on both oral health and patient attitudes in Thailand. Despite limited understanding of the full extent of COVID-19's influence in this region, our primary focus is to gain crucial insights that can inform the development of a comprehensive preventive protocol. By doing so, we aim to enhance global preparedness in anticipation of future pandemics.

Materials and Methods

This is a cross-sectional study that was approved by the Ethics Committee of Human Research, Faculty of Dentistry, Mahidol University, Bangkok, Thailand (COA. No. MU-DT/PY-IRB 2021/091.1510). The participants are the patients at the Faculty of Dentistry, Mahidol University, who are older than 25 years, living in the Bangkok metropolitan area since April 1, 2021, and can read/listen and answer questions within the questionnaire. The participants were given the option to withdraw at any time. The researchers employed the convenience sampling technique to recruit participants for the study. The sample size was determined through the formula for cross-sectional descriptive study at a 95% confidence interval.[14] The minimum required number of participants to represent an entire population of 197,354 patients who used the dental service at the Faculty of Dentistry, Mahidol University, between October 2019 and March 2020 was set as 384 participants.

The questionnaire was developed to suit the COVID-19 situation in Thailand. The validity of the questionnaire was evaluated by three experts (two in dental education and one in advanced general dentistry specialist) using content validity analysis. Language clarity, practical pertinence, and theoretical relevance of each question were evaluated. The question with an index of item-objective congruence (IOC) less than 0.5 was revised according to the evaluator suggestion; otherwise, it remained unchanged. Then, the pilot survey was performed with 10 dental patients who had a similar background to the targeted participants to perform reliability analysis through the test–retest procedure. The questionnaire was applied by the researchers and the pilot group of participants answered the questions (test). A week later, the questionnaire was reapplied to the same group (retest). The internal and external consistencies of the questionnaires were evaluated with Cronbach's α coefficient of 0.87 and correlation coefficient of 0.65.

The final version of the questionnaire was divided into four parts. The first part was about demography, job-related information, general health status, and COVID-19 vaccination. The second part acquired information about oral health problems before and during the COVID-19 outbreak in Thailand. The Third part asked about the daily and oral hygiene care behavior of the participants during the pandemic. The last part concerned attitudes toward the effects of COVID-19 situation on oral health problems, in which we used the 5-point Likert scale to record the score. The answer scores of 4 and 5 were categorized as favorable scores. The final questionnaires were randomly distributed to the dental patients at different departments in the Faculty of Dentistry, Mahidol University. The responses from the participants were then anonymized and recorded on Google sheets.

The descriptive statistics were used to evaluate the distribution of data in each part. Pearson's chi-squared was used to determine a correlation between each demographic data and attitudes of whether the COVID-19 situation has an impact on the oral health or not at a significant level of 0.05. To assess the association of oral problems before and during the pandemic, McNemar's test was employed at a significant level of 0.05. All analyses were performed through STATA/BE version 17.0 (Stata Corp., College Station, TX, United States).

Result

The survey was performed during November to December 2021. The original number of participants was 414, but we excluded 5 of those who returned the questionnaire with less than 90% completion. The characteristics of the final 409 respondents are summarized in ►**Table 1**. It is noteworthy that the number of respondents answering each question can be different as some of them may omit or skip some questions. The respondents were divided into the yes and no groups based on their attitude toward the effect of COVID-19 outbreak in August 2021 on their oral health problems (question 1 in the 4th part of the questionnaire). The respondents in the "yes" group were those who responded with favorable scores, that is, agree or strongly agree. Other responses were classified as "no."

The final 409 participants consisted of 138 (33.7%) males and 271 (66.3%) females. A majority of females (64.6%)

Table 1 General characteristic of participants ($n = 409$)

Factors	Total	Oral health status affected by COVID		p-value
	n (%)	No, *n* (%)	Yes, *n* (%)	
Gender				
Male	138 (33.7)	68 (49.3)	70 (50.7)	0.007
Female	271 (66.3)	96 (35.4)	175 (64.6)	
Age ($n = 408$)				
21–34	115 (28.2)	46 (40.0)	69 (60.0)	0.938
35–44	78 (19.1)	30 (38.5)	48 (61.5)	
45–59	126 (30.9)	49 (38.9)	77 (61.1)	
60–79	89 (21.8)	38 (42.7)	51 (57.3)	
Education level ($n = 408$)				
Less than bachelor's degree?	99 (24.3)	46 (46.5)	53 (53.5)	0.154
Bachelor's degree	231 (56.6)	83 (35.9)	148 (64.1)	
More than Bachelor's degree?	78 (19.1)	34 (43.6)	44 (56.4)	
Occupation ($n = 405$)				
Laborer	18 (4.4)	8 (44.4)	10 (55.6)	0.293
Private company employee	78 (19.3)	26 (33.3)	52 (66.7)	
Government employee including soldier and police	125 (30.9)	45 (36.0)	80 (64.0)	
Service worker and freelance	63 (15.6)	26 (41.3)	37 (58.7)	
Merchant	40 (9.9)	21 (52.5)	19 (47.5)	
Currently not working, retirement	81 (20.0)	37 (45.7)	44 (54.3)	
Dental service coverage ($n = 408$)				
No dental coverage	106 (26.0)	51 (48.1)	55 (51.9)	0.112
Civil servant medical benefit scheme	141 (34.6)	53 (37.6)	88 (62.4)	
Social security system	99 (24.3)	40 (40.4)	59 (59.6)	
Universal health coverage	25 (6.1)	5 (20.0)	20 (80.0)	
Private insurance	37 (9.1)	14 (37.8)	23 (62.2)	
Underlying medical disease				
No or unknown	220 (53.8)	88 (40.0)	132 (60.0)	0.965
Yes	189 (46.2)	76 (40.2)	113 (59.8)	
Diabetes mellitus	34 (8.3)	13 (38.2)	21 (61.8)	
Hypertension	62 (15.2)	26 (41.9)	36 (58.1)	
Cardiovascular disease	13 (3.2)	6 (46.2)	7 (53.9)	
Dyslipidemia	78 (19.1)	29 (37.2)	49 (62.8)	
Other	88 (21.5)	32 (36.4)	56 (63.6)	

(*Continued*)

Table 1 (*Continued*)

Factors	Total	Oral health status affected by COVID		p-value
	n (%)	No, *n* (%)	Yes, *n* (%)	
History of COVID vaccination				
No	10 (2.4)	2 (20.0)	8 (80.0)	0.328[a]
Yes	399 (97.6)	162 (40.6)	237 (59.4)	
Received at least 2 COVID vaccine shot				
No	19 (4.7)	5 (26.3)	14 (73.7)	0.209
Yes	390 (95.4)	159 (40.8)	231 (59.2)	

[a]Using Fisher exact test, while the rest used Chi-square test.

believed that the COVID-19 situation impacted their oral health, while roughly half of males (50.7%) had a similar opinion. Based on the chi-squared test, the attitude toward the effect of the COVID-19 outbreak on the oral health was statistically related to sex with a *p*-value less than 0.05. The largest population of the participants (30.9%) were in the age ranges of 45 to 59 years. The second in rank was the population in the age group of 21 to 34 years, which comprised 28.2% of the participants. Most of the participants (75.7%) had at least a bachelor's degree. The occupation of the participants varied from government employees (30.9%) and retirees (20.0%) to private company employees (19.3%). Dental expense of most respondents was covered by the government civil servant benefit (34.6%) or the social security system (24.3%), which was mainly for private company employees. The percentages of the participants using government benefit and social security system to support their dental expenses were larger than the number of government employees and those currently working in private companies, simply because the retired participants could still use their benefits. About half of the participants (46.2%) knew their health conditions and had at least one disease including diabetes mellitus, hypertension, and cardiovascular disease. The top three underlying diseases were dyslipidemia (19.1%), hypertension (15.2%), and diabetes mellitus (8.3%). The majority of the respondents had good and very good physical health (77.8%) and mental health status (74.6%) before the COVID-19 pandemic. Finally, 97.6% of all respondents received at least one shot of COVID-19 vaccine, while 95.4% received at least two shots.

►**Table 2** shows the number of the participants who faced oral problems before and during the pandemic. Among all listed problems, halitosis and gum bleeding escalated, while temporomandibular disease (TMD), dental prostheses–related problems, and tooth crack/fracture declined significantly during the pandemic. In all, 15.4% of participants had halitosis after the pandemic as against only 9.3% before the pandemic. Patients with complaint of gum bleeding increased from 5.9% before the pandemic to 10.3% during the pandemic. On the other hand, the percentage of participants

Table 2 Oral problems of participants before and during the COVID-19 pandemic ($n = 409$)

Oral problem	Before COVID-19,*n* (%)	During pandemic, *n* (%)	*p*-value
None (oral health checkups)	70 (17.1)	112 (27.4)	<0.001[a]
Gum bleeding	24 (5.9)	42 (10.3)	<0.001[a]
Toothache	64 (15.7)	67 (16.4)	0.775
Tooth sensitivity	83 (20.3)	95 (23.2)	0.200
Impacted tooth	25 (6.1)	14 (3.4)	0.052
Halitosis	38 (9.3)	63 (15.4)	<0.001[a]
TMD (joint pain/sound, limited mouth opening)	33 (8.1)	17 (4.2)	<0.001[a]
Problem related to fixed prosthesis	59 (14.4)	31 (7.6)	<0.001[a]
Problem related to removable prosthesis	27 (6.6)	11 (2.7)	<0.001[a]
Tooth crack/fracture	78 (19.1)	60 (14.7)	0.013[a]
Dislodgement of filling	74 (18.1)	64 (15.7)	0.229
Dental caries, abrasion	14 (3.4)	8 (2.0)	0.146
Orthodontic problem	12 (2.9)	2 (0.5)	0.002

[a]Significantly difference at $p < 0.05$.

Table 3 Daily behavior and oral hygiene caring behavior of the participant during the COVID-19 pandemic in August 2021 in Thailand

Activity	Total	*n* (%)	*n* (%)	*n* (%)	*n* (%)
		Before 9 a.m.	**9–11 a.m.**	**11.01 a.m.–1.00 p.m.**	**After 1 p.m.**
1. What time did you usually go to bed?	408	48 (11.8)	191 (46.8)	131 (32.1)	38 (9.3)
Activity		**Less than 6 h**	**6–8 h**	**9–10 h**	**More than 10 h**
2. How many hours did you sleep in average?	408	83 (20.3)	300 (73.5)	25 (6.1)	0 (0)
Activity		**None**	**1–2 d**	**3–4 d**	**More than 4 d**
3. How many days did you exercise at least 30 min in a week?	408	192 (47.1)	106 (26.0)	61 (15.0)	49 (12.0)
Activity		**More frequent**	**Less frequent**	**Unchanged**	**I did not have sugary snack/beverage**
4. How often do you have sugary snack and/or beverage?	408	115 (28.2)	91 (22.3)	182 (44.6)	20 (4.9)
Activity		**More frequent**	**Less frequent**	**Unchanged**	**I did not smoke**
5. How often do you smoke?	408	10 (2.5)	3 (0.7)	9 (2.2)	386 (94.6)
Activity		**More frequent**	**Less frequent**	**Unchanged**	**I did not drink alcohol**
6. How often do you consume alcohol?	408	7 (1.7)	52 (12.8)	18 (4.4)	331 (81.1)
Activity		**Not brushing/ uncertain**	**1 time/d**	**2 times/d**	**More than 2 times**
7. How many time(s) a day did you brush your teeth?	409	7 (1.7)	14 (3.4)	301 (73.8)	86 (21.1)
Activity		**Uncertain**	**Less frequent**	**Unchanged**	**More frequent**
8. How did the spreading of COVID-19 in Thailand in August 2021 affect your frequency in tooth brushing?	409	15 (3.7)	10 (2.4)	353 (86.3)	31 (7.6)

with complaints of TMD substantially decreased from 8.1% before the pandemic to 4.2% during the pandemic. Complaints pf dental prostheses also declined significantly during the pandemic. Those with problems related to fixed prostheses accounted for 7.6% of the participants in comparison to 14.4% before the pandemic and those with removable prostheses complaints totaled up to 2.7% during the pandemic, which was less than 6.6% before the pandemic.

►**Table 3** demonstrates the daily behavior of the participants during the spreading of COVID-19 in Thailand in August 2021. The participants went to bed mostly at 9 to 11 p.m. (46%) and 11.01 to 1 a.m. (32.1%). Most participants slept approximately 6 to 8 hours (73.5%). Almost half of the participants did not exercise (47.1%), whereas 26% of the participants exercised only 1 to 2 days a week. In all, 44.6% of the participants reported unchanged consumption of sugary snacks and/or beverages. Most participants did not smoke (94.6%). However, among those who did, 2.5% reported more frequent smoking during the pandemic, while 2.2% reported unchanged frequency. Finally, 81% of the participants did not consume alcohol. Among those who did (19%), 12.8% reported less consumption during the pandemic. ►**Table 3** also summarizes an evaluation of oral hygiene care after being affected by the COVID-19 situation. Most of the respondents brushed their teeth more than twice a day (94.9%), while some of them brushed their teeth once a day (3.4%). There were also those who did not brush at all or were uncertain (1.7%). Finally, the COVID-19 lockdown in August 2021 did not affect the tooth brushing habit of most participants (86.3%).

►**Table 4** shows the patients' attitudes toward the effects of the COVID-19 situation on oral health problems. Most of the participants (59.9%) agreed that the COVID-19 situation affected their oral health problem(s). Among all participants, 89.5% stated that it was getting difficult to receive dental treatment, 58.5% believed that their current oral health problems were getting worse, and 59.0% believed that COVID-19 affected the finance that they had prepared for their dental treatment. Nevertheless, only 13.8 and 34.9% of the participants agreed that the COVID-19 situation affected oral health caring behavior and negatively affected their eating behavior, respectively. Half of the participants (49.1%) paid more attention to their oral hygiene care and oral disease prevention after the exacerbation of the COVID-19 situation. Similarly, 47.3% of the participants were not concerned about their mental health being affected during

Table 4 Patients' attitudes toward the effects of COVID-19 situation and health

Questions	**Total**	Strongly disagree **(1)**	Disagree **(2)**	Unsure **(3)**	Agree **(4)**	Strongly agree **(5)**	Favorable score **(4, 5)**
1. Do you agree that the spreading of coronavirus (COVID-19) situation affects your oral health problem(s)?	409	14 (3.4)	55 (13.5)	95 (23.2)	191 (46.7)	54 (13.2)	245 (59.9)
2. Do you agree that the spreading of coronavirus (COVID-19) affects various factors such as							
2.1. Getting dental treatment is more difficult	408	9 (2.2)	17 (4.2)	17 (4.2)	223 (54.7)	142 (34.8)	365 (89.5)
2.2. As a result, existing oral health problems are getting worse	405	8 (2.0)	66 (16.3)	94 (23.2)	181 (44.7)	56 (13.8)	237 (58.5)
2.3. Affects the money prepared for dental treatment	407	9 (2.2)	81 (19.9)	77 (18.9)	185 (45.5)	55 (13.5)	240 (59.0)
2.4 Affects oral health care behavior such as reduced frequency of tooth brushing	407	68 (16.7)	224 (55.0)	59 (14.5)	43 (10.6)	13 (3.2)	56 (13.8)
2.5 Negatively affects eating behavior such as increased frequency of eating or eating sweet foods more often	401	33 (8.2)	143 (35.7)	85 (21.2)	118 (29.4)	22 (5.5)	140 (34.9)
Questions	**Total**	**Not pay attention (1)**	**Pay less attention (2)**	**Unchanged (3)**	**Pay more attention (4)**	**Pay very much attention (5)**	Favorable score **(4, 5)**
3. After the spreading of coronavirus (COVID-19) situation, how much will you pay attention to oral hygiene care and oral disease prevention?	409	2 (0.5)	8 (2.0)	198 (48.4)	151 (36.9)	50 (12.2)	201 (49.1)
Questions	**Total**	Strongly concerned **(1)**	Concerned **(2)**	Unsure **(3)**	Less likely concerned **(4)**	**Not concerned (5)**	Favorable score **(4, 5)**
4. During the spreading of coronavirus (COVID-19) in Thailand in August 2021, how much did you concern about your mental/emotional health condition being affected by the situation of COVID-19?	408	43 (10.5)	138 (33.8)	34 (8.3)	137 (33.6)	56 (13.7)	193 (47.3)
5. Will you be concerned about your safety while receiving dental treatment after the spreading of coronavirus (COVID-19) situation?	407	23 (5.7)	138 (33.9)	45 (11.1)	176 (43.2)	25 (6.1)	201 (49.3)
Questions	**Total**	**Will not receive any treatment (1)**	**Will not receive most of the treatment (2)**	Unsure **(3)**	**Will receive most of the treatment (4)**	**Will receive all treatment (5)**	Favorable score **(4, 5)**
6. After the spreading ofthe coronavirus (COVID-19) situation, will you still be receiving dental treatment normally?	409	1 (0.2)	3 (0.7)	12 (2.9)	197 (48.2)	196 (47.9)	393 (96.1)

Table 4 (*Continued*)

Questions	Total	Not very important (1)	Not important (2)	Unsure (3)	Important (4)	Very important (5)	Favorable score (4, 5)
7. How do the following factors play an important role in your decision-making for receiving dental treatment after the spreading of the coronavirus (COVID-19) situation?							
7.1 Your oral health problem(s) such as toothache	408	4 (1.0)	2 (0.5)	22 (5.4)	227 (55.6)	153 (37.5)	380 (93.1)
7.2 Cost of dental treatment	408	7 (1.7)	50 (12.3)	39 (9.6)	219 (53.7)	93 (22.8)	312 (76.5)
7.3 Guidelines for preventing the transmission of coronavirus (COVID-19)	397	2 (0.5)	3 (0.8)	16 (4.0)	171 (43.1)	205 (51.6)	376 (94.7)
7.4 Dental personnel getting vaccinations	405	3 (0.7)	5 (1.2)	14 (3.5)	143 (35.3)	240 (59.3)	383 (94.6)
7.5 Yourself getting vaccinations	407	1 (0.3)	4 (1.0)	12 (3.0)	128 (31.5)	262 (64.4)	390 (95.8)
7.6 Screening test to confirm non-COVID-19 infection by ATK in dental patients before treatment	406	6 (1.5)	17 (4.2)	63 (15.5)	193 (47.5)	127 (31.3)	320 (78.8)
8. How do the following preventive measures in dental clinic affect your decision-making for receiving dental treatment during the spreading ofthe COVID-19 situation?							
8.1 Opening and closing times of dental clinic	409	36 (8.8)	79 (19.3)	35 (8.6)	185 (45.2)	74 (18.1)	150 (36.7)
8.2 Limit the number of patients receiving dental treatment per day	408	20 (4.9)	64 (15.7)	53 (13.0)	195 (47.8)	76 (18.6)	271 (66.4)
8.3 COVID-19 screening process in patients before receiving dental treatment	409	49 (12.0)	113 (27.6)	45 (11.0)	142 (34.7)	60 (14.7)	202 (49.4)
8.4 Additional service charges for screening and prevention of COVID-19	409	35 (8.6)	97 (23.7)	75 (18.3)	145 (35.5)	57 (13.9)	202 (49.4)
Questions	**Total**	**Not affect (1)**	Less likely affect **(2)**	Unsure **(3)**	More likely affect **(4)**	Affect very much **(5)**	Favorable score **(4, 5)**
9. Do you think that the spreading ofthe COVID-19 situation affects your choice in making decision to receive dental treatment?	409	5 (1.2)	43 (10.5)	22 (5.4)	233 (57.0)	106 (25.9)	339 (82.9)

the COVID-19 situation and 49.3% were not concerned about COVID-19 infection while receiving dental treatment after the pandemic. Moreover, 96.1% were willing to receive dental treatment after the pandemic. The participants decided whether or not to receive dental treatment after the exacerbation of COVID-19 depending on the dental health problem (93.1%), cost of dental treatment (76.5%), guidelines for preventing the transmission of COVID-19 at the dental clinic (94.7%), getting vaccinations (dental personnel 94.6% and the patient themselves 95.8%), and Antigen Test Kit (ATK) screening test prior to dental treatment (78.8%). During the COVID-19 pandemic, 82.9% stated that the situation affected their decisions to receive dental treatment. However, some preventive measures also affected their decision; for example, opening and closing times of dental clinics (63.3%), limiting the number of patients receiving dental treatment per day (66.4%), screening process prior to the dental treatment (49.4%), and additional service charges for screening and prevention of COVID-19 (49.4%).

Discussion

We found in this study that female participants believed that the COVID-19 situation impacted their oral health more than the males, regardless of other demographic aspects. Most of the participants believed that the COVID-19 situation affected their oral health and dental treatment. However, only a few stated that the situation affected their oral health care behavior and their eating behavior. Tooth brushing and sugary snack and/or beverage consumption behaviors of most participants remained unchanged across the pandemic situation. The participants were mostly not concerned about safety while receiving dental treatment during the pandemic, but thought that the pandemic affected their decision to receive a dental treatment. Comparing with the time before the pandemic, patients visiting a dentist because of halitosis and gum bleeding significantly increased during the pandemic.

Among all demographic data collected from respondents, only gender demonstrated a statistically significant difference among participants who believed and did not believe that the COVID-19 situation impacted their oral health. The number of female participants who agreed that COVID-19 situation impacted their oral health was higher than that of male participants regardless of other demographic characteristics. It might be due to a considerable perception toward risk and emotional care exhibited by female partcipants.[15] Moreover, based on the gender trait in coping stress, female participants demonstrated more emotional dependency and suffered more stress than males.[16] Besides gender, our results revealed no significant correlation between the participants' attitudes and other demographic characteristics including age, education, and socioeconomic factors during the COVID-19 pandemic.

The impact of the COVID-19 situation on oral health could be seen from the complaints in ►**Table 2**. Gum bleeding and halitosis increased significantly during the pandemic. They are closely associated with the state of oral cleanliness as poor hygiene could cause both complications.[17–19] Thus, the increased prevalence of these conditions could be explained by inadequate oral hygiene due to lack of professional health promotion and prevention.[9] Mask wearing as a new common manner during the COVID situation could also explain the rise in halitosis.[20] Compliance to maintain oral hygiene of patients will decline without persistent motivation and education, which is obviously hindered by the pandemic.[21]

Stress is a subjective state depending on displeasure and high arousal.[22] Since stress levels can be observed via sleep quality and sugar consumption,[22–24] unchanged sleep and sugary diet behaviors in our results suggest stable stress level. While TMD causes are inconclusive and involve many physical and psychological factors, it is generally accepted that the initiation, prolongation, and even exacerbation of TMD are associated with stress and depend on the psychological state of a person.[25–29] The decreasing number of participants who have TMD problems during the pandemic in our study is in accordance with the implied unchanged stress level. Di Giacomo et al reported a similar finding in their study in Italy. They found that the participants diagnosed with TMD showed low to moderate stress level during the COVID-19 pandemic.[30]

Facial aesthetics is important to many individuals and the mouth alone accounts for 31% of all facial aesthetics.[31] In case of Thai citizens, teeth alignment is an extremely prominent factor in facial aesthetics.[32,33] Before the pandemic, aesthetics was one of the most common complaints in both fixed and removable prostheses.[34,35] However, participants with prostheses reported fewer removable and fixed prosthetic complaints during the pandemic. This is probably due to a decrease in importance of dental aesthetics during the pandemic where lockdown and mask-wearing regulations were implemented.

The participants in our study believed that the COVID-19 situation did affect their oral health (59.9%) and made access to dental services (89.5%) more difficulty. This might be explained by the impact COVID-19 had on the living conditions and access to health care services, which was interrupted by several government policies and actions since the beginning of the pandemic.[36] As access to health care services was prohibited and people's capability to afford health care services depleted, it is possible that the participants could not maintain their oral health during the pandemic.

We also found that participants were willing to receive dental treatment after the pandemic (96.1%), which is similar to the findings of Cotrin et al.[37] The decision of the patients might be influenced by several factors. More than 90% of the participants stated that vaccination and COVID prevention guidelines at the clinic were the most relevant factors that influenced their decision to receive dental treatment after the COVID-19 situation. At that time, almost every participant received at least two vaccinations during the interview and dental professionals were already given at least three doses of vaccination. The result is consistent with that of Nardi et al,[38] who pointed out that patients were comfortable to visit the dental clinic that had the COVID-19 prevention protocols in place.

The limitation of this study is that the participants were only limited to those who visited the dental clinic at the Faculty of Dentistry, Mahidol University. Most of them had a high level of education, stable occupations, and medical expense coverage. Thus, this population is not a good representation of the entire population in Thailand. Nevertheless, the results are still useful for dentists and related personnel in preparing for a similar pandemic situation in the future.

This study can be used as a future pandemic reference. As a result of poor hygiene during pandemics, common issues such as halitosis and gum bleeding highlight the need for intensified preventive dental education prior to and during pandemics. Our findings stress the role of preventive measures. This insight can guide clinic resumption plans based on staff vaccination and guideline adherence. During the pandemic, guidelines or protocols of visiting a dental clinic and vaccination should be clear and updated frequently so that the patients feel comfortable and safe to visit the clinic. Online platforms can be used to advocate this through podcasts, streaming, teledentistry, etc. Dental care during the pandemic should be prioritized potentially based on an online survey for severity of the case. Urgent cases involving infection can then be addressed by well-prepared practitioners in an isolated setting, while nonurgent cases might be postponed. In summary, this study extends to future pandemic readiness, emphasizing dental education, preventive measures, and effective management of urgent cases.

Conclusion

We found in this study that complaints of gum bleeding and halitosis significantly increased during the COVID-19 pandemic in August 2021 in Thailand. On the other hand, patients with TMD and prosthetic problems statistically declined. Finally, most of the participants thought that the COVID-19 situation affected their dental health. They complained that the pandemic made access to dental care services more difficult and they were willing to visit the dental clinic after the COVID-19 situation.

Funding
None.

Conflict of Interest
None declared.

Acknowledgments
We would like to express our heartfelt gratitude to the staffs from various departments from the Faculty of Dentistry, Mahidol University, for providing us with equipment and location for this research.

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