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A Study on Patient Behaviors Towards Dental Visits and Oral Health during COVID-19 Outbreak

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Abstract

Objectives: Investigating the impact of COVID-19 pandemic on oral health and patient attitudes towards a dental visit is essential to improving access to oral health care during the pandemic. This calls for studying the chief patient fears, preferences and future intentions related to dental visits during the COVID-19 pandemic.

Methods: A web-based survey was administered to the public within the US in December 2020. The participants (N=502) answered questions about their oral health, trust level for dental offices, and chief concerns and preferences related to dental visits during the COVID-19 outbreak. We used descriptive statistics (e.g., Chi-square, Shapiro-Wilk and Kruskall-Wallis tests) to find if demographics, oral health history or social behaviors were associated with the relevant patient attitudes.

Results: When queried about COVID-19's impact on oral health, 62.5% respondents reported a minimal impact, 7.2% a positive impact, and 30.3% a negative impact. There were statistically significant differences in responses based on respondents' ethnicity (N=502, P=.033) and dental visit history during the pandemic (N=502, P=.008).

The public trust rating for COVID-19-related precautions was more favorable towards the medical offices than the dental offices (N=502, P<.001). The majority considered contracting COVID-19 from the other patients in the dental office waiting area (60.4%), from the dentist/hygienist/dental assistants (54.2%), and from the aerosols (50.8%) as their chief concerns. 20.1% respondents preferred no other patient, 25.1% only one more patient, and 31.1% up to three more patients in the waiting area during a dental visit.

Conclusion: The reported impact of COVID-19 on self-perceived oral health was modest for most respondents. Patients' chief concerns for a dental visit include contracting COVID-19 infection from other patients, dentists, and aerosols in the operatory. It may be beneficial if dental practices avoid scheduling multiple patients in the waiting area to improve access to oral health care.

Keywords: COVID-19; dentistry; patient comfort; oral health.

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Introduction

Coronavirus disease 2019 (COVID-19) is caused by the severe acute respiratory syndrome coronavirus 2 virus (SARS-CoV-2) [1]. It spreads through respiratory droplets and aerosols produced by the infected person's breathing, coughing, speaking and sneezing [2,3]. A person can get infected if these droplets/aerosols settle on the mucous membranes or are inhaled [2–4]. Although SARS-CoV-2 is usually transmitted via close person-person contact, it can also spread through contaminated surfaces [2–4]. In dental settings, SARS-CoV-2 can potentially be transmitted through aerosols generating dental procedures (AGDP) [5–8].

COVID-19 has had a profound impact on all aspects of dentistry [9–11]. The American Dental Association (ADA) Health Policy Institute (HPI) has been regularly polling dentists to track the economic impact of COVID-19 on dental practices [12]. In the early days of the pandemic (March 2020), most dental practices were closed except for emergency

services. The patient volume has since gradually risen to 81% of the pre-pandemic levels as per the recent HPI poll (February 15, 2021) [13]. The reduced patient volume during the pandemic can be attributed to the fear of contracting COVID-19 at the dental office. However, there is no existing detailed study on the specific concerns of the patients regarding dental visits during the pandemic. Moreover, the information available on how COVID-19 has impacted the oral health is rather limited [14]: An increased prevalence of stress-related conditions such as bruxism and clenching during the pandemic has been reported [13]. An association between poor oral health and the severity of COVID-19 symptoms has also been suggested [15]. COVID-19 related restrictions are expected to cause a degradation in the oral health of vulnerable populations such as older adults [16,17]. As the existing work is mostly based on information gathered from dental providers, the patients' perspectives on oral health during COVID-19 remain little-known. We aim to address these gaps by providing further insights on these aspects in this study.

In this cross-sectional study, we investigate the impact of COVID-19 on oral health and dental visits from a patient's perspective. It has three main objectives. Firstly, assess if the ongoing pandemic has affected the patients' self-perceived oral health. Secondly, quantify how much the patients trust the COVID-19 related precautionary measures taken by the dental offices versus those by (non-dental) medical offices. Thirdly, identify the chief patient fears related to dental visits during the COVID-19 pandemic and learn about their intentions for a future visit under different scenarios. We use statistical analysis of the collected data to see if demographics, oral health history or social behaviors impact the relevant patient attitudes.

Methods

We administered a web-based survey hosted on Google Forms and SurveyMonkey during Dec 3-Dec 24, 2020. The survey was circulated using e-mail and messaging apps to the public within the US. The ethical review and approval of the study was provided by HML IRB (FWA# 1102). The survey was completely anonymous, and the informed consent of the participant was obtained prior to accessing the survey questions. There was no monetary benefit offered to the respondents. The designed survey included 27 closed-ended questions on the following topics: demographics; oral health and the impact of COVID-19 pandemic; future intentions and history for dental visits during COVID-19 pandemic; trust level for dental offices and key concerns for dental visits amid the COVID-19 pandemic; and lifestyle. The questionnaire contained both mandatory and optional questions.

The section on demographics contained questions on gender, age group, ethnicity, race, state of residence, and living status (with or without family). Respondents were asked to rate their current oral health (excellent, good, fair/poor), caries risk category based on the number of needed dental interventions (low risk: once a year, moderate risk: 2-3 times a year, high risk: 4 or more times a year), and oral hygiene habits (twice daily, once daily, irregular) for brushing and flossing. We then asked how the COVID-19 pandemic had affected their oral health and oral hygiene routines (positive impact, little or no impact, negative impact). This was followed by a set of questions related to whether they had visited the dental office during the pandemic, and if they intend to do so in the next 6 months.

We asked the respondents about their trust level for the COVID-19

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related preventive measures taken by dentists/dental offices and doctors/medical offices using a 5-point Likert scale (1 = lowest trust level, 5 = highest trust level). We also asked them to identify their greatest concern(s) for a dental visit amid COVID-19. Options included contracting COVID-19 infection from: the dentist/dental assistant/hygienist; front desk staff; patients in the waiting area; physical contact with dental equipment/office surfaces; and aerosols/air droplets in the operatory. We further asked if the number of patients present in the waiting area of a dental office was an important consideration when planning a dental visit. We also queried about the preferred number of patients in the waiting area (1, 2, 3-4, any number of patients). There was also a question about their attitudes towards a dental visit in the post-pandemic era (same as in pre-pandemic times, same as during the pandemic, somewhere in-between). Finally, they were asked about their general lifestyle: whether working from home, outdoor activity level (regular, sometimes, rare) and shopping style (online, curbside, in-store) during the preceding three-month period.

We performed the statistical analysis on the collected survey data using IBM SPSS software. We used the Chi-square test and the exact Fisher test to check for statistical independence between categorical variables. We used the Shapiro-Wilk test to check for normality of ordinal data. We used non-parametric tests (Mann-Whitney U and Kruskall-Wallis 1-way ANOVA) to check for association between ordinal and categorical variables. We used the Wilcoxon Signed Rank test to compare the results of two ordinal variables. We used a P-value of .05 to determine the statistical significance.

Results

Demographics

We received N=502 completed responses. The completion rate of individual questions varied as not all questions were mandatory. The demographics, social behaviors and self-reported dental history are provided in Table 1. We note that the racial demographics resemble that of an urban metropolitan region [18].

Oral health during COVID-19 outbreak

We asked the respondents about the impact of the COVID-19 outbreak on their oral health and oral hygiene routine. For oral health, 62.5% of the respondents reported a minimal impact, 7.2% reported a positive impact while 30.3% reported a negative impact (see Figure 1).

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Table 1 - Demographics, social behaviors, and dental history of respondents.

Characteristics		% (No.)
Demographics		
Gender (N=502)	Male	46.6 (234)
	Female	52.5 (266)
	Prefer not to say	.004 (2)
Age group (N=502)	18-24	15.7 (79)
	25-34	36.3 (182)
	35-44	19.3 (97)
	45-54	14.1 (71)
	55-64	9.0 (45)
	65+	5.6 (28)
Ethnicity (N=502)	Hispanic or Latino	12 (60)
	Not Hispanic or Latino	88 (442)
Race (N=502)	American Indian or Alaska Native	0.4 (2)
	Asian	31.7 (159)
	Black or African American	5.2 (26)
	Native Hawaiian or Pacific Islander	0.8 (4)
	White	44.8 (225)
	Other	17.1 (86)
US census region (N=497)	Midwest	14.1 (71)
	Northeast	16.1 (81)
	South	27.9 (140)
	West	40.8 (205)
Living status (N=430)	Single	20.23 (87)
	With family	79.77 (343)
Social behaviors		
Nature of work (N=419)	Working from home	75.18 (315)
	Going to work	24.82 (104)
Outdoor exercise (N=428)	Rarely	21.73 (93)
	Sometimes	41.59 (178)
	Regularly	36.68 (157)
Shopping style (N=427)	Online	17.09 (73)
	Curb-side pickup	12.18 (52)
	In-store	70.73 (302)
Dental history		
Caries risk category (N=423)	Low risk	39.24 (166)
	Moderate risk	52.72 (223)
	High risk	8.04 (34)
Current oral health (N=432)	Excellent	20.14 (87)
	Good	64.58 (279)
	Fair/Poor	15.28 (66)
Brushing routine (N=431)	Twice daily	64.73 (279)
	Once daily	31.55 (136)
	Irregular	3.71 (16)
Flossing routine (N=418)	Twice daily	11.00 (46)
	Once daily	32.30 (135)
	Irregular	56.70 (237)
Dental visit history in the 5 years period before COVID-19 (N=432)	Twice a year or more	49.07 (212)
	Once a year	26.16 (113)
	Once every 2 years	10.19 (44)
	Once or twice in 5 years	14.58 (63)

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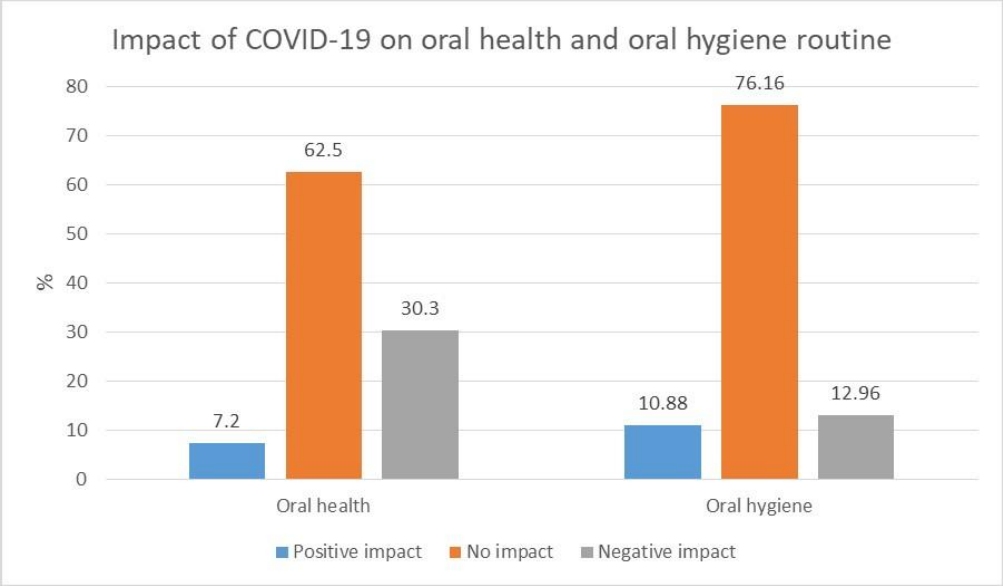
Figure 1 Impact of COVID-19 outbreak on respondents' oral health and oral hygiene routine.



There were statistically significant differences in responses based on ethnicity (N=502, P=.033) due to a considerably higher negative impact reported by the Hispanic respondents (see Table 2). There were statistically significant differences in the responses depending on the respondent's current oral health (N=432, P<.001), brushing habits (N=431, P<.001), flossing habits (N=419, P<.001), and whether they had visited a general dentist during the COVID-19 pandemic (N=502, P=.008). There was also an association between the caries risk category that the respondents belonged to and the impact of COVID-19 pandemic on respondent's self-perceived oral health (N=423, P=.013). As shown in Table 2, the self-reported negative impact was most prevalent among those with poor oral hygiene habits. Conversely, those with good oral hygiene habits reported the highest positive impact on their oral health. Similarly, the negative impact was disproportionately high among those with poor oral health and/or belonging to "high risk" caries category. Finally, a lower negative impact was observed among those who sought routine dental care during the pandemic.

When asked about COVID-19 outbreak's impact on oral hygiene routine, 76.16% of the respondents reported a minimal impact, 10.88% reported a positive impact whereas 12.96% reported a negative impact (see Figure 1). There were statistically significant differences in the responses depending on the respondent's gender (N=432, P=.019), current oral health (N=432, P<.001), and oral hygiene habits ((N=432, P<.001) for brushing; (N=419, P<.001) for flossing). The disruption in oral hygiene routines due to the pandemic was observed to be higher among females than males. Similarly, the association between oral health and hygiene follows from the earlier explanation provided for COVID-19's impact on oral health.

Dental visits during COVID-19 outbreak

Trust level: Dentists vs. Doctors

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Our intention was to know how much the public trusts the COVID-19 safety precautions followed by dental practices. We also wanted to learn if the public trust ratings for doctors was any different than that towards dentists. We found that the doctors/medical offices received a more favorable rating than dentists/dental offices (see Figure 2): the average score was 3.74 (std. 1.076) for dentists/dental offices and 3.91 (std. 1.03) for doctors/medical offices (N=502, P<.001).

Table 2 Impact of COVID-19 outbreak on oral health and oral hygiene routine cross-tabulated with other variables.

Variables	Categories	COVID-19 impact on oral health				COVID-19 impact on oral hygiene			
		Positive	No	Negative	P-value, N	Positive	No	Negative	P-value, N
		% (No.)				% (No.)			
Gender	Male	8.5 (20)	64.1 (150)	27.4 (64)	.277, 500	14.0 (29)	76.8 (159)	9.2 (19)	.019, 430
	Female	6.0 (16)	61.2 162)	32.8 (88)		8.0 (18)	75.6 (168)	16.4 (37)	
Ethnicity	Hispanic	6.7 (4)	48.3 (29)	45.0 (27)	.033, 502	13.7 (7)	68.6 (35)	17.6 (9)	.399, 432
	Not Hispanic	7.2 (32)	64.5 (285)	28.3 (125)		10.5 (40)	77.2 (294)	12.3 (47)	
Brushing habits	Irregular	0 (0)	25.0 (4)	75.0 (12)	<.001, 431	0 (0)	31.3 (5)	68.8 (11)	<.001, 431
	Once daily	2.9 (4)	68.4 (93)	28.7 (39)		7.4 (10)	77.2 (105)	15.4 (21)	
	Twice daily	7.9 (22)	63.1 (176)	29.0 (81)		12.9 (36)	78.5 (219)	8.6 (24)	
Flossing habits	Irregular	3.4 (8)	64.6 (153)	32.1 (76)	<.001, 418	7.2 (17)	74.7 (177)	18.1 (43)	<.001, 418
	Once a day	3.7 (5)	63.7 (86)	32.6 (44)		7.4 (10)	84.4 (114)	8.1 (11)	
	Twice a day	23.9 (11)	56.5 (26)	19.6 (9)		32.6 (15)	65.2 (30)	2.2 (1)	
Current oral health	Fair/Poor	4.5 (3)	31.8 (21)	63.6 (42)	<.001, 432	7.6 (5)	60.6 (40)	31.8 (21)	.005, 432
	Good	4.7 (13)	67.0 (187)	28.3 (79)		10.4 (29)	78.5 (219)	11.1 (31)	
	Excellent	11.5 (10)	75.9 (66)	12.6 (11)		14.9 (13)	80.5 (70)	4.6 (4)	
Caries risk category	Low risk	4.8 (8)	70.5 (117)	24.7 (41)	.013, 423	7.2 (12)	80.7 (134)	12.0 (20)	.206, 423
	Medium risk	6.3 (14)	60.5 (135)	33.2 (74)		12.6 (28)	74.0 (165)	13.5 (30)	
	High risk	11.8 (4)	41.2 (14)	47.1 (16)		17.6 (6)	64.7 (22)	17.6 (6)	
Dental visit during COVID-19	No	5 (15)	60.5 (181)	34.4 (103)	.008, 502	9.3 (24)	73.7 (191)	17.0 (44)	.005, 432
	Yes	10.3 (21)	65.5 (133)	24.1 (49)		13.3 (23)	79.8 (138)	6.9 (12)	

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Figure 2 Trust ratings based on a 5-point Likert scale for dental offices/dentists and medical offices/doctors. 1 is the lowest and 5 is the highest trust rating.

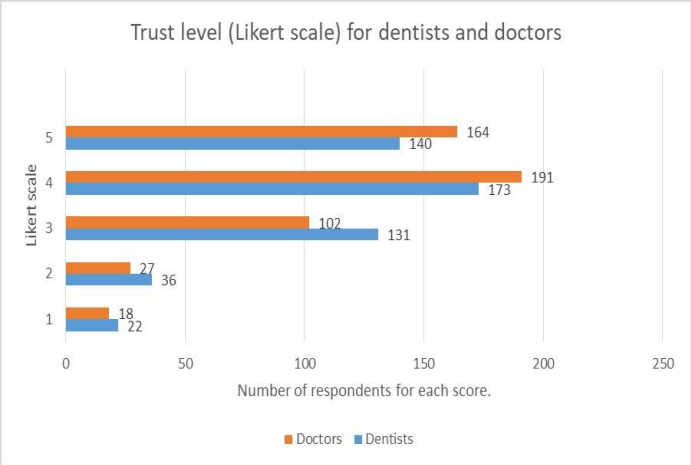
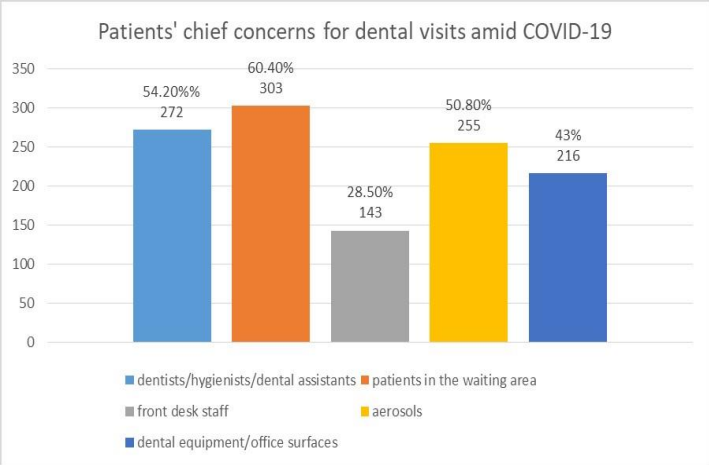


Figure 3 Patients' chief sources of concern about contracting COVID-19 during a dental visit.



We found a statistically significant difference in the trust level for dentists based on the respondent's age (N=502, P=.004). Moreover, there were also statistically significant differences depending on whether the patient had visited a dental office (N=502, P<.001) during the COVID-19 pandemic, as well as the dental visit history prior to the COVID-19 pandemic (N=432, P=.009). As shown in Table 3, dentists enjoyed a higher trust level among the respondents who had visited their dentists during the pandemic. Similarly, the respondents who regularly visited their dentists prior to the pandemic also gave a higher trust rating compared to infrequent dental patients.

Patient concerns

When asked about their greatest concerns regarding visiting the dental offices during the current pandemic, the majority was concerned about contracting COVID-19 from the patients in the waiting area (60.4%), the dentists/hygienists/dental assistants (54.2%), and the AGDP (50.8%). A relatively smaller proportion regarded dental equipment/office surfaces (43%) and front desk staff (28.5%) as their major concerns (see Figure 3).

There were statistically significant differences depending on the patient's trust level for dentists and dental offices (N=432, P=.002). Furthermore, as shown in Table 4, we also found a significant association with certain demographics. For instance, a significantly higher proportion of female respondents was concerned about contracting COVID-19 from AGDP than the male respondents.

Number of patients in the waiting area

We wanted to learn if the public was concerned about the patient traffic at a dental office while planning their dental visits. A majority (84.9%) of the respondents agreed that the number of patients present in the waiting area of the dental office was an important consideration even if COVID-19 precautions were followed. Moreover, there was a statistically significant association between the response to this question and the patient trust level

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Table 3 Average scores for trust level for dentists/dental offices for different categories.

	(No.)						P-value
	Age group (N=502)						
	18-24 (79)	25-34 (182)	35-44 (97)	45-54 (71)	55-64 (45)	65+ (28)	.004
Mean	3.49	3.83	3.47	3.97	3.73	4.25	
	Routine dental visit during COVID-19 outbreak (N=502)						
	Yes (203)	No (299)					<.001
Mean	4.01	3.46					
	General dentist visits in last 5 years before COVID-19 outbreak (N=432)						
	Twice a year or more (212)	Once a year (113)	Less than once a year (107)				.009
Mean	3.89	3.64	3.63				

Table 4 Patients' concerns about contracting COVID-19 during a dental visit for different US census regions, age, and gender.

Greatest concern	% (No.)						P-value
US census region (N=497)							
	Midwest (71)	Northeast (81)	South (140)	West (205)			
Patients	63.38 (45)	60.49 (49)	55.71 (78)	62.93 (129)			NS (.553)
Dentists	49.29 (35)	41.98 (34)	55 (77)	60.0 (123)			.039
Aerosols	47.89 (34)	35.80 (29)	48.57 (68)	60.0 (123)			.002
Equipment	45.07 (32)	35.80 (29)	40.0 (56)	47.8 (98)			NS (.235)
Front desk	30.99 (22)	19.75 (16)	21.43 (30)	35.61 (73)			.008
Age group (N=502)							
	18-24 (79)	25-34 (182)	35-44 (97)	45-54 (71)	55-64 (45)	65+ (28)	
Patients	74.7 (59)	61 (111)	58.8 (57)	49.3 (35)	48.9 (22)	67.9 (19)	.018
Dentists	49.4 (39)	55.5 (101)	60.8 (59)	49.3 (35)	62.2 (28)	35.7 (10)	NS (.141)
Aerosols	48.1 (38)	56 (102)	53.6 (52)	52.1 (37)	31.1 (14)	42.9 (12)	NS (.068)
Equipment	51.9 (41)	46.7 (85)	45.4 (44)	28.2 (20)	40 (18)	28.6 (8)	.026
Front desk	34.2 (27)	33.5 (61)	29.9 (29)	19.7 (14)	13.3 (6)	21.4 (6)	.034
Gender (N=502)							
	Male (234)	Female (268)					

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Patients	56.83 (133)	63.43 (170)		NS (.132)
Dentists	55.12 (129)	53.36 (143)		NS (.691)
Aerosols	44.01 (103)	56.72 (152)		.005
Equipment	41.45 (97)	44.40 (119)		NS (.505)
Front desk	26.92 (63)	29.85 (80)		NS (.468)

for the dental offices (N=502, P=.026). We then asked a more specific question about the number of patients in the waiting area that the respondents feel comfortable with during their dental visits. We found that about 20.1% respondents were comfortable with having no other patient, 25.1% with only 1 other patient, 31.1% with 2-3 other patients, and 23.7% with any of these options as long as COVID-19 safety precautions (social distancing and face coverings) were followed. There were no statistically significant differences between the responses based on the demographics. However, there were statistically significant differences depending on how much the respondents trust the measures taken by dental offices to prevent the spread of COVID-19 (N=502, p<.001). As illustrated in Figure 4, we observe that the higher the trust rating, the more indifferent the respondents were to the number of patients in the waiting area provided COVID-19 precautions were followed.

We also asked the respondents about their attitudes towards a dental visit in a post-pandemic scenario (N=429). 45.2% (No.=194) responded that it will be the same as before the pandemic, 13.5% (No.=58) believed that it will be same as during the pandemic, whereas 41.3% (No.=177) said that it will be somewhere in between the two extremes. This is plausible given the disruptive nature of the social and psychological changes brought about by the pandemic.

Future visits

We also asked the respondents if they intended to visit a dental office in the 6-month period following the survey (i.e., until June 2021). The majority (55.6%, No.=279) answered yes, 29.5% (No.=147) were undecided while 15.1% (No.=76) said no. There were statistically significant differences in the received responses depending on the patients' trust rating for dentists/dental offices (N=502, P<.001). Patients with a higher trust level were more willing to visit a dentist than those with a lower trust level.

Social behaviors

We also asked the respondents about their activities outside the household in the three-month period preceding the survey. There was a statistically significant association between the preferred number of patients in the waiting area and the respondents' shopping style (N=427, P=0.012). We observed that online/curb-side shoppers preferred a smaller number of patients than in-store shoppers. This is plausible as in-store shoppers are likely to be more comfortable in crowded areas (in the context of COVID-19) than others. Furthermore, in-store shoppers assigned a higher trust rating to dentists/dental offices than others. This led to a statistically significant association between the trust rating for dentists and shopping style (N=427, P=.008). We did not find any other significant association with the social behaviors.

Discussion

In this exploratory study, we have found the self-perceived impact of COVID-19 pandemic on oral health

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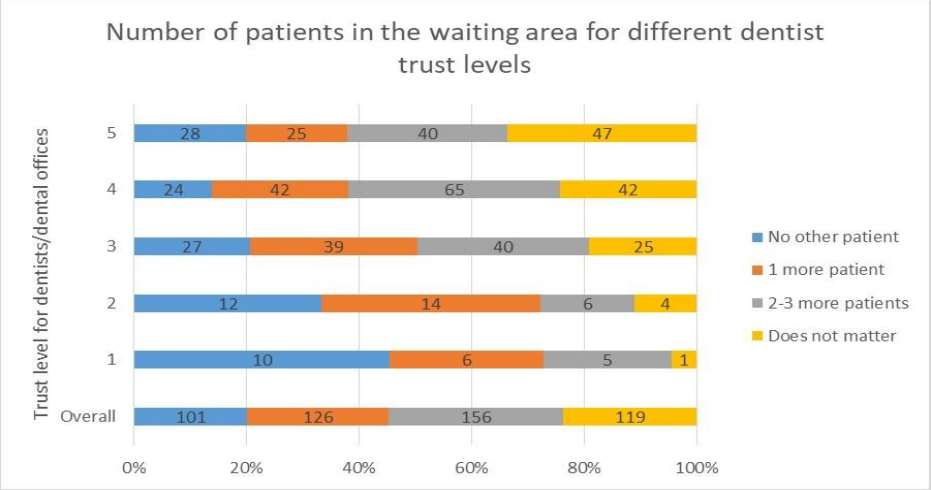
Figure 4 Respondents' preferences for the number of patients in the dental office waiting area. A stratification based on the respondents' trust rating for dental offices is also shown.



to be modest. Our preliminary findings indicate a more adverse impact on the oral health for the Hispanic population. However, more specialized studies are needed for vulnerable populations as the COVID-19 pandemic may disproportionately affect the oral health care for marginalized populations. Furthermore, we found the adverse impact to be higher among those with a poor oral health or a poor oral hygiene routine.

We also found that dental offices have a lower trust rating among the public when it comes to COVID-19 precautionary measures, as compared to medical offices. We further observed that most patients were mainly concerned about contracting COVID-19 infection from the dental staff in the operatory, from the other patients in the waiting area and from AGDP. Recent studies have shown the prevalence of COVID-19 among dentists [19] and dental hygienists [20] to be extremely low. The ongoing mass vaccination drives are further expected to boost the patient confidence for dental visits [21]. We found that a significant proportion of the patients prefers to have no other patients in the waiting area of the dental office. It may be beneficial to have the patients wait in their cars instead, a protocol which many dental practices are already implementing. Teledentistry, though still in its infancy, may also prove useful in this regard [22,23]. As for AGDP, significant research efforts are needed to establish the risk factors and proper guidelines. The onset of the pandemic has already catalyzed the research on AGDP [24,25], which will prove useful in the future. To conclude, we have identified the key patient concerns and offered insights into patient attitudes regarding a dental visit during COVID-19 pandemic. Dental practices may benefit by incorporating patient preferences in their protocols and proactively communicating relevant information to patients, thus easing access to oral health care during the ongoing pandemic.

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Conflicts of interest

The authors declare no competing interest.

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