


# Level of Knowledge, Understanding, and Impact of the COVID-19 Pandemic on Continuing Fixed Orthodontic Treatment in Adults: A Questionnaire Study

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## Abstract

**Objectives:** To evaluate the level of knowledge, understanding, and impact of the coronavirus disease 2019 (COVID-19) pandemic on adult patients regarding their ongoing fixed orthodontic treatment.

**Subjects and Methods:** A cross-sectional and descriptive survey was conducted on 108 adult patients undergoing fixed orthodontic treatment at GSL Dental College (GSLDC), India. All the candidates were aged 18 years and above, who were in lockdown due to the COVID-19 pandemic and devoid of treatment.

**Results:** Among the patients 43.5% were male and 56.5% were female; 22.3% were not at all aware that the COVID-19 virus spreads quickly in a dental setup; 64.8% were definitely willing for their status disclosure and to undergo pretreatment screening; 71.3% were definitely willing to adhere to strict appointment timings for adequate sanitization of the clinical area; 60.2% thought that missed appointments during the COVID-19 pandemic would prolong their overall orthodontic treatment and affect their treatment outcome; and 51.9% were financially affected due to the pandemic.

**Conclusions:** Not all adult orthodontic patients were in knowledge of COVID-19 cross infection. The majority were in a state of understanding and willing to follow infection-eradicating protocols. Patients' view on overall orthodontic treatment was altered due to the psychological and financial impact of COVID-19.

## Keywords

COVID-19 pandemic, adult patients, ongoing fixed orthodontic treatment, lockdown

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## Introduction

Coronavirus disease 2019 (COVID-19), caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has become a significant public health emergency across the world, which has led the World Health Organization (WHO) to declare it as a pandemic.<sup>1</sup> Currently, it is believed that its interpersonal transmission occurs predominantly via respiratory droplets/secretions (cough, sneeze), saliva, and contact transmission where the virus enters the mucous membrane of the mouth, nose, and eyes.<sup>2</sup> All dental professionals, including orthodontists, are at higher risk of SARS-CoV-2 infection due to dental practices and hospitals' characteristics, which include aerosol generation, handling of sharps, and proximity to patients' oropharyngeal region.<sup>1,3</sup> If acceptable safety measures are not taken, cross-contamination risk could be extreme among dentists, orthodontists, and patients.

Most countries initiated a regional or national lockdown to restrain the spread of this disease, permitting only medical and dental emergency services to continue. In many such efforts, performing of elective tasks, including orthodontic treatment, is suspended.<sup>4</sup> Since fixed orthodontic treatment is a long and

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continuous scheduled process, millions of patients who were already undergoing treatment have been affected. The overall treatment time might be affected due to the unknown span of this mandatory suspension. A lot of awareness and understanding of the COVID-19 pandemic needs to be emphasized for orthodontic patients, so that it does not impact their psychological well-being. For instance, most minor to moderate orthodontic problems can be taken care of through teleconsultation. However, addressing orthodontic emergencies in this pandemic might be an extra financial burden, as dental setups need to be maintained with a very high standard of sterilization, infection prevention and control protocol.

The study aims to evaluate the level of knowledge, understanding, and impact of the COVID-19 pandemic on continuing fixed orthodontic treatment in adults.

### Subjects and Method

Ethical approval was obtained from the GSL Institutional Ethics Committee and GSL Research Cell, Project ID: 032020/001. A cross-sectional study design was used.

#### Inclusion Criteria

Adult patients aged 18 years and above who were undergoing fixed orthodontic treatment at GSL Dental College (GSLDC) during the lockdown due to the COVID-19 pandemic were included in the study.

#### Sample Size

The sample size calculation for the present study was done through a questionnaire-based study that considers the level of knowledge and understanding among people in different regions.<sup>5</sup>

#### Questionnaire Design

A questionnaire was devised from the key themes and concepts identified with regard to the COVID-19 pandemic (Table 1).

**Table 1.** Overview of the Results of the 13 Questions

No.	Question	Options	Count (%)
Q1	Are you aware that the COVID-19 virus spreads easily in the dental setup?	(a) Extremely aware (b) Very aware (c) Moderately aware (d) Slightly aware (e) Not at all aware	43 (39.8) 12 (11.2) 10 (9.3) 19 (17.5) 24 (22.3)
Q2	Are you willing to undergo treatment from an orthodontic team who were previously affected with COVID-19?	(a) Definitely (b) Probably (c) Possibly (d) Probably not (e) Definitely not	17 (15.7) 19 (17.6) 16 (14.8) 32 (29.6) 24 (22.2)

(Table 1 Continued)

(Table 1 Continued)

No.	Question	Options	Count (%)
Q3	Are you willing to disclose your COVID-19 status and undergo pre-treatment screening before every appointment?	(a) Definitely (b) Probably (c) Possibly (d) Probably not (e) Definitely not	70 (64.8) 22 (20.4) 8 (7.4) 6 (5.6) 2 (1.9)
Q4	What is your view on visiting the orthodontic office after the COVID-19 pandemic?	(a) I will visit the orthodontist if proper infection control precautions are followed. (b) I will have some fear or doubt even though the orthodontist follows the infection control precautions. (c) I will not visit even though the appropriate infection control precautions are followed. (d) I will only visit after this COVID-19 pandemic issue is resolved.	68 (63.0) 18 (16.7) 1 (0.9) 21 (19.4)
Q5	Do you adhere to strict appointment timings for the clinical area's adequate sanitization to counteract COVID-19?	(a) Definitely (b) Probably (c) Possibly (d) Probably not (e) Definitely not	77 (71.3) 27 (25.0) 3 (2.8) 1 (0.9) 0 (0)
Q6	Would you like to adhere to "Strictly no accompanying person" (until and unless specified by the orthodontist) for future appointments?	(a) Definitely (b) Probably (c) Possibly (d) Probably not (e) Definitely not	58 (53.7) 31 (28.7) 8 (7.4) 5 (4.6) 6 (5.6)
Q7	Do you have any pain or discomfort due to missed appointments during the COVID-19 pandemic?	(a) Severe (b) Moderate (c) Mild (d) Very mild (e) None	13 (12.0) 16 (14.8) 22 (20.4) 20 (18.5) 37 (34.3)
Q8	For unexpected orthodontic problems, which of the following options do you choose?	(a) I prefer telecommunication with the dental office. (b) I prefer to visit the dental office. (c) I will wait until my next appointment.	50 (46.3) 24 (22.2) 34 (31.5)

(Table 1 Continued)

(Table 1 Continued)

No.	Question	Options	Count (%)
Q9	Do you think the missed appointments will have an effect on your orthodontic treatment during the COVID-19 pandemic?	(a) It will prolong my overall treatment.	65 (60.2)
		(b) It will affect my treatment outcome.	20 (18.5)
		(c) It will not prolong my overall treatment.	7 (6.5)
		(d) It will not affect the treatment outcome.	16 (14.8)
Q10.	Would you like to undergo additional treatment procedures, if indicated by your orthodontist, to compensate for the lost time?	(a) Definitely	50 (46.3)
		(b) Probably	31 (28.7)
		(c) Possibly	18 (16.7)
		(d) Probably not	5 (4.6)
		(e) Definitely not	4 (3.7)
Q11.	Does your current financial situation have any effect on future orthodontic appointments?	(a) My financial situation is not affected, and I can afford further treatment.	38 (35.2)
		(b) My financial situation is affected, but I can afford the treatment.	56 (51.9)
		(c) My financial situation is affected, and I cannot afford further treatment.	14 (13.0)
Q12.	Protective gear and equipment to counteract COVID-19 may increase future treatment costs. What is your opinion?	(a) I understand the situation, and I will bear the extra amount.	23 (21.3)
		(b) I understand the situation, but I cannot bear the amount.	41 (38.0)
		(c) I won't pay the additional amount, as it was not informed before the start of treatment.	14 (13.0)
		(d) I expect the dental institution/clinician/government/insurance companies to bear the extra amount.	30 (27.8)

The questionnaire consisted of 12 closed questions, which the researchers considered to be ideal. The questions cover the fundamental importance of knowledge and the understanding of adult patients about the COVID-19 pandemic, and the financial burden and its impact on ongoing fixed orthodontic treatment. It was mandatory for the patients to answer all 12 questions to send their response. The Likert's response format was used for 7 questions, and the other questions were provided with options that are considered appropriate by the researchers. The initial questionnaire was rated by 6 experts involved in the provision of orthodontic care, and the item-level content validity index was 0.94. Minor changes in the questionnaire were made based on the suggestions received by the experts to make it more readily understandable to the subjects. The Cronbach's alpha of 0.86 demonstrated good internal-consistency reliability of the questionnaire when administered to 30 subjects meeting the inclusion criteria for this study. The questionnaire was also assessed for test-retest reliability through administering it to the same set of participants based on the response of whom Cronbach's alpha was derived. The intraclass correlation coefficient (ICC) of 0.91 between the test and retest responses was indicative of the temporal stability of the questionnaire. The typical time taken for completion of consent and the questionnaire was approximately 5 to 10 minutes.

#### Questionnaire Distribution and Study Duration

The online questionnaire was posted to 153 adult patients undergoing orthodontic treatment, selected through the random sampling method at GSLDC, India, on May 18, 2020. Google Forms® was used as an online plotting source, and the questionnaire's link was sent via WhatsApp or email to the patients on the contact list in the GSLDC orthodontic database. Online consent was obtained from the participants. All the responses were anonymous and could not be traced by the researchers. This was done to eliminate bias that could arise if patients felt that their answers could influence any aspect of their subsequent treatment. The deadline for the final return of the questionnaire was set for May 23, 2020.

#### Data Analysis

Of the 153 adult patients undergoing fixed orthodontic treatment, 108 consented to participate in this study. The findings from the questionnaire were analyzed using SPSS Version 20.0 (SPSS Corporation, Chicago, IL).

#### Results

A total of 153 adult patients undergoing fixed orthodontic treatment were approached to complete the questionnaire, and 108 completed responses were returned. The responses to each question are illustrated in Table 1. The gender distribution

of the study subjects and the differences in responses to the study questions based on gender are illustrated in Tables 2 and 3, respectively.

During the period of lockdown, patients might be in a state of stressful agony. This factor may well account for the missing responses and have resulted in some degree of pessimism.

### Discussion

The knowledge, understanding ability, and financial standing of adult patients play an influential role in the progress of fixed orthodontic treatment during the COVID-19 pandemic. In the course of fixed appliance therapy, a higher intensity of pain and discomfort was often reported.<sup>6</sup> Although it varies based on the age and pain threshold of patients, our questionnaire was confined to adults, as patients below 18 might experience problems with specific complex questions and their characteristics might affect the quality of the data.<sup>7</sup> After the questionnaire link was sent, there were a total of 108 responses, at a response rate of 70.5%, which seems to be similar to other orthodontic-based questionnaire studies published.<sup>8</sup> However, the response rate is difficult to compare in light of this new aspect of the COVID-19 pandemic.

### Each Question Was Discussed to Benefit the Reader

- Question 1: Are you aware that the COVID-19 virus spreads easily in the dental setup?*  
Of the patients, 17.5% are slightly aware and 22.3% are not at all aware that the COVID-19 virus spreads quickly in a dental setup. Hence, there is still a need to educate and create awareness among patients regarding the COVID-19 pandemic irrespective of gender.
- Question 2: Are you willing to undergo treatment from an orthodontic team who were previously affected with COVID-19?*  
Of the patients, 5.6% are probably not willing to undergo treatment from an orthodontic team previously affected by COVID-19. Most patients believe that they

**Table 2.** The Number (n) and Proportion (%) of Patients, Based on Gender, to Total Sample (N = 108)

	n	%
Male	47	43.5
Female	61	56.5
Others	0	0
Total sample	108	100

**Table 3.** The Proportion (%) of Patients, Based on Gender (Male [M] and Female [F]), Who Responded to the Questionnaire (N = 108)

	(a)		(b)		(c)		(d)		(e)		P-value
	M (%)	F (%)	M (%)	F (%)	M (%)	F (%)	M (%)	F (%)	M (%)	F (%)	
Q1	34.9	65.1	41.7	58.3	60.0	40.0	42.1	57.9	54.2	45.8	.473
Q2	35.3	64.7	31.6	68.4	37.5	62.5	65.6	34.4	33.3	66.7	.057
Q3	41.4	58.6	54.5	45.5	25.0	75.0	66.7	33.3	0.0	100.0	.305
Q4	44.1	55.9	33.3	66.7	100.0	0.0	47.6	52.4			.584
Q5	39.0	61.0	55.6	44.4	66.7	33.3	0.0	100.0	0.0	0.0	.271
Q6	51.7	48.3	29.0	71.0	62.5	37.5	20.0	80.0	33.3	66.7	.150
Q7	46.2	53.8	37.5	62.5	63.6	36.4	40.0	60.0	35.1	64.9	.282
Q8	32.0	68.0	70.8	29.2	41.2	58.8					<b>.006*</b>
Q9	43.1	56.9	30.0	70.0	57.1	42.9	56.2	43.8			.385
Q10	50.0	50.0	38.7	61.3	16.7	83.3	80.0	20.0	75.0	25.0	<b>.022*</b>
Q11	42.1	57.9	46.4	53.6	35.7	64.3					.752
Q12	47.8	52.2	41.5	58.5	28.6	71.4	50.0	50.0			.566

**Notes:** Questions 1, 3, 4, 5, 6, 9, 10 and 11 used Fisher's exact test. Questions 2, 7, 8 and 12 used the chi-square test. Q1 to Q12 are the questions asked, and (a) to (e) are the options provided (see Table 1). P ≤ .05 is considered statistically significant. \* Denotes statistical significance.



could get infected via dentists with viral infections.<sup>9</sup> Moreover, recurrence of COVID-19, with a previously infected person capable of transmitting the virus to other people even after a second negative test, has been reported in the literature.<sup>10</sup> This could be a probable reason why patients tend to avoid treatment from a previously infected orthodontist.

- *Question 3: Are you willing to disclose your COVID-19 status and undergo pretreatment screening before every appointment?*  
Of the patients, 64.8% are definitely willing, and the rest are still in a dilemma over disclosing their COVID-19 status and undergoing pretreatment screening before every appointment. This is a dangerous sign and might put many at risk of contracting the virus. Thus, we need to make patients understand the importance of their status disclosure and participation in a pretreatment triage.<sup>3</sup>
- *Question 4: What is your view on visiting the orthodontic office after the COVID-19 pandemic?*  
Of the patients, 63.0% are willing to visit the orthodontic office after the COVID-19 pandemic if proper infection control precautions are followed. However, the rest of the patients fear cross infection in a dental office and do not want to risk it.<sup>9</sup>
- *Question 5: Do you adhere to strict appointment timings for the clinical area's adequate sanitization to counteract COVID-19?*  
Of the patients, 71.3% are definitely ready to adhere to strict appointment timings to sanitize the clinical area to counteract COVID-19. More emphasis should be placed on this aspect among orthodontic patients. Additional time is required for proper sanitization of the clinical area, as the virus has been detected on stainless steel, on plastic, and in aerosols for up to 5.6, 6.8, and 3 hours, respectively.<sup>1,11</sup>
- *Question 6: Would you like to adhere to "Strictly no accompanying person" (until and unless specified by the orthodontist) for future appointments?*  
Of the patients, 53.7% would like to adhere to "Strictly no accompanying person" (until and unless specified by the orthodontist) for future appointments. The current unprecedented circumstances put the accompanying person also at risk of COVID-19 infection. Performing pretreatment triages as a routine procedure for accompanying persons adds a physical burden on the dental team.<sup>1</sup>
- *Question 7: Do you have any pain or discomfort due to missed appointments during the COVID-19 pandemic?*  
Of the patients, 34.3% have no pain or discomfort due to missed appointments during the COVID-19 pandemic. There is a nonlinear relationship between age, gender, psychological state, and cultural background in pain perception following placement of an orthodontic appliance, according to the literature. However, with

fixed orthodontic treatment, mild to moderate pain or discomfort is often experienced by patients.<sup>6</sup>

- *Question 8: For unexpected orthodontic problems, which of the following options do you choose?*  
Of the patients, 46.3% preferred telecommunication in case of unexpected orthodontic problems. Gender distinction was observed in the participants' responses ( $P = .06$ ). While most females expressed interest in teleconsultation with the dental office, males demonstrated readiness in visiting the dental office and seeking care. Teledentistry facilities should be encouraged during this pandemic to prevent unnecessary visits to the dental office. This would aid patients in resolving a new orthodontic problem that can be managed at home and help determine which patients need in-person attendance.
- *Question 9: Do you think missed appointments will have an effect on your orthodontic treatment during the COVID-19 pandemic?*  
Of the patients, 60.2% think missed appointments due to the COVID-19 pandemic would prolong their overall treatment time. Association of the pandemic with orthodontic treatment time and outcome has not been previously investigated.
- *Question 10: Would you like to undergo additional treatment procedures, if indicated by your orthodontist, to compensate for the lost time?*  
Of the patients, 46.3% are definitely willing to undergo additional treatment procedures to make up for the lost time. From a patient's perspective, shorter treatment times impact psychosocial well-being, which contributes to the overall quality of life.<sup>12,13</sup> Comprehensive orthodontic treatment requires, on average, less than 2 years to be complete.<sup>14</sup> The lost time during the pandemic prolongs the overall treatment duration. Males ( $P = .022$ ) and more qualified participants ( $P = .028$ ) expressed willingness to undergo additional procedures in this regard. However, the type of intervention and financial aspect may affect patients' decision to undergo additive procedures when indicated.
- *Question 11: Does your current financial situation have any effect on future orthodontic appointments?*  
The virus has spread throughout the inhabited world and led to unprecedented financial crises. Of the patients, 51.9% opined that their financial situation is affected but they can afford future treatment. However, economic crises depend upon several factors, such as the lockdown period, type of occupation, and socioeconomic status.
- *Question 12: Protective gear and equipment to counteract COVID-19 may increase future treatment costs. What is your opinion?*  
Of the patients, 38.0% revealed that while protective gear and equipment might increase future treatment costs, they cannot bear that extra amount, and 27.8%

expect the dental institution/clinician/government/insurance companies to bear the additional amount.

## Limitations

*A potential concern in this study is the noninclusion of the study participants' socioeconomic background and geographical location as independent study variables.*

Though these parameters were documented at the beginning of the orthodontic treatment, they were not included in the present study's data analysis. A review of patient records suggests little variability concerning these parameters among the study subjects, who share the common characteristics of availing orthodontic treatment at a single facility at substantially lower costs because the facility is provided at a dental teaching institution. However, it would be interesting to see if the study results are replicated in geographical areas where COVID-19 is comparatively more prevalent.

*The preliminary nature of the study with a small sample is a limitation.*

The present study intended to qualitatively explore patients' attitudes regarding ongoing orthodontic treatment during challenging COVID-19 times. Moreover, the study attempted to include all the eligible study subjects seeking care at the facility, as mentioned earlier, circumventing sampling. The authors opine that the observations made in this study form a concrete basis for future research to more thoroughly understand the attitudes, knowledge, and impact of COVID-19 on patients undergoing orthodontic treatment considering the study's preliminary nature with a small sample.

## Conclusions

- Knowledge of cross infection, the importance of status disclosure, and pretreatment screening regarding COVID-19 was not up to mark for adult orthodontic patients.
- The understanding of the adult orthodontic patients regarding the significance of adhering to strict appointment timings and having no person accompany them to the orthodontic office during the COVID-19 pandemic was satisfactory.
- In the case of an unexpected orthodontic problem, most patients preferred telecommunication during this pandemic.
- Most patients think missed appointments due to the COVID-19 pandemic would prolong their overall treatment time, and the majority of them showed a willingness to undergo additional treatment procedures to make up for the lost time.
- The adult orthodontic patients mostly opined that there has been an impact on their financial situation due to

the lockdown but they can afford future treatment. A few cannot bear the extra amount due to protective gear and equipment, and patients expect the dental institution/clinician/government/insurance companies to cover this.

## Declaration of Conflicting Interests

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