

Research Article

Orthodontic Patients' Perception of Orthodontic Office Changes during COVID-19 Pandemic in Brazil: A National Cross-Sectional Survey

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Keywords: COVID-19; Dental care; Patient care; Perception



Abstract

There is still limited information regarding patients' perception of the dental approach changes in the pandemic circumstance. Therefore, the aims of this study were, firstly, to evaluate patient perception regarding the COVID-19 infection risk in the orthodontic office in Brazil, and to assess the influence of age in infection risk perception. Orthodontic patients from five states answered an online questionnaire, anonymously, about quarantine behavior, perception of the infection risk in the orthodontic office, as well as the apparent need for the new biosafety approach. Descriptive analyses were performed for each question. Correlations between age and concern of getting infected were calculated with Spearman correlation tests. There were 406 responses. Most patients respected the quarantine, and 93.10% of those who were scheduled for appointments realized that their appointment would be safe enough. From the total, 83.99%, 84.98%, 89.90%, and 95.81% of patients judged, respectively, health status checks by phone, temperature checking, disposable coat, and face shield, as necessary. Only 6.40% reported an increase in the concern of returning to appointments. The younger the patient, the greater the concern of getting infected in future appointments ($p = 0.042$). Most patients were confident in the professional care before the appointment. The new biosafety approach was well accepted by the majority, with less agreement with temperature checking and the use of disposable coats. The younger the patient, the greater the concern of getting infected in future appointments. The rate of patients with risk factors for COVID-19 was 14.77%.

Introduction

The Coronavirus Disease 2019 (COVID-19) pandemic is still making victims in several countries, and its side effects will remain in society indefinitely. In Brazil, the first death officially caused by this virus occurred in São Paulo city on March, 12th, 2020 [1]. Pandemic effects have changed daily life practices and healthcare procedures. In accordance with this new reality, preventive methods were adopted by the

population to reduce the incidence of the disease. Among them are hygiene care, decontamination of hands and surfaces, and social isolation, even without a complete lockdown [2].

Similarly, dental practice was also reformulated. Initially, the Brazilian Federal Council of Dentistry recommended that in-office procedures be restricted to urgencies and emergencies. Elective treatments should preferably be postponed [3,4]. Nonetheless, different rules were adopted



for the Brazilian states, and while the decision of how to manage dental appointment scheduling during the pandemic spreading was up to the professional in some of them, as it was determined in other countries [5,6], some others established lockdown restrictive actions even for dental appointments, which impacted in elective procedures despite of the professional opinion.

Evidently, even in urgent appointments, a series of cautions should be taken, since patient contact by phone until the in-office performance [4]. After determining the real need to carry out an appointment, patients should be asked, by phone or virtual messaging apps, regarding their own and their family's health statuses, work sanitary conditions, and willingness to go to the office [3]. In-office procedures should be performed under specific biosecurity and social conduct. Because touching contaminated surfaces can be a potential way to contamination, patients should be advised to avoid unnecessary contact with any structure or equipment in the office environment [7]. The same was recommended for professional behavior. Similarly, different behavioral caution should be taken to reduce the risk of infection. Additionally, Personal Protective Equipment (PPE) for Aerosol-Generating Procedures (AGP), such as Filtering Facepiece Respirators (FFR) and Full-Face Shields (FFS) have become of routine use [8]. Despite being routinely used by several professionals, disposable coats, for the dentist and staff, and hair- and foot protection for everyone are even more recommended in the current circumstances.

Because continuously exposed to AGP and saliva droplets from patients' mouths during dental interventions, dentists are at the top of risk professionals to get contaminated [6,7,9]. Not surprisingly, a 30-country survey found that 87% of dentists were afraid of getting in-office contamination from patients or co-workers, and 92% felt the same about carrying the virus to their houses and families [10]. Similar results were found in a previous investigation about dentists' anxiety and risk perception of returning to dental daily practice [5]. The main concerns hovered around the fear of death and of contaminating family members. Regarding patient concerns, previous studies performed in the earlier stages of the pandemic reality in Brazil evaluated patient anxiety levels and apprehension about ongoing treatments [11,12]. Delay in orthodontic treatment time was the greatest concern found, and patients with the lowest levels of anxiety showed more willingness to attend appointments.

Orthodontic patients are those who most likely need to keep going in the orthodontic office during the pandemic situation, due to appliance adjustment needs, side effects control, and oral hygiene monitoring [13,14].

On July 1st, 2021, a scientific search in the PubMed database of the associated terms 'COVID-19 AND Dental patient perception' resulted in 51 published papers. Surprisingly,

despite the clear tendency to maintain dental appointments, mainly orthodontic ones, during the COVID-19 pandemic, and the evident emergent need for patient emotional support in this delicate reality, most of these articles were dedicated only to evaluating the pandemic perception among dentists and/or dental students, and the emergency procedures performed in the current circumstances. However, none of them evaluated the influence of the new in-office procedures on orthodontic patients' perception of in-office contamination risk. Although changes in the appointment routine, as well as in the office environment, may seem logical and understandable by the orthodontist, they can be differently viewed by some patients, as laypeople, even if they have a tendency to trust in professional care. Knowing the patient's view of their care environment is essential to providing physical and emotional comfort, especially because mental health can be influenced by social isolation and human distancing [15].

Thus, the aims of this study were, firstly, to evaluate Brazilian patient perception regarding the COVID-19 infection risk in the orthodontic office, and to verify whether there was an influence of age in infection risk perception; the tested null hypothesis was that patient perception would not be associated with age. Secondly, to establish the prevalence of orthodontic patients with risk factors for the development of severe systemic repercussions of COVID-19, as those with underlying medical problems like cardiovascular disease, diabetes, chronic respiratory disease, and cancer history.

Materials and methods

This cross-sectional study was approved by the Ethics in Research Committee of Bauru Dental School, University of São Paulo (protocol number 35544420.8.0000.5417). Digital informed consent was obtained from each patient or guardian, without personal identification, but with an indispensable agreement to participate in this survey. All the patients who agreed to participate were included.

An anonymous Google Forms structured questionnaire (Alphabet Co., Mountain View, CA) was sent to 519 orthodontic patients from 5 private orthodontic offices from different Brazilian states: Bahia, Pernambuco, Rio de Janeiro, Santa Catarina, and São Paulo. Each orthodontic office is managed by a different orthodontist: M.M.P., L.F.C., J.A.M.M., G.T., and M.V., respectively. The longitudinal geographic distance between the state located closest to the equator (Pernambuco) and that located in the southern region (Santa Catarina) was 3,264 km. The other states are situated between both extremes. The questionnaires were accessed through a link sent by the WhatsApp Messenger App (WhatsApp, Inc., Menlo Park, CA), in the last quarter of 2020. Patients' personal information was not shared. Each orthodontist sent the link to his own patients. Only patients who were in active treatment were invited. They were, at that moment, returning to their regular appointments after a brief interruption due to the COVID-19 circumstances.



Similar messages were elaborated by the five professionals to invite patients to survey participation.

Before responding, informed consent was introduced to the participants. Survey details and Ethics in Research Committee contact were provided in the text. The non-obligation to participate was emphasized. Adult participants could directly answer the survey agreement, while minor participants should present their own and guardians' agreements. Both agreements were required to participate. To eliminate the chance of minor participants answering for their guardians, the questionnaires were sent directly to guardians' mobiles. In the minor participants' form, text language was simplified to facilitate young people's understanding.

Questionnaire readability and comprehensibility were previously evaluated by five orthodontic researchers, followed by a psychometrist, and then by 2 literacy teachers. To validate the questionnaire, a voluntary group composed of 10 adults and 10 minor volunteers from the private orthodontic office of São Paulo was invited to explain individually, in their own words, what they understood about each question. Since there was a full understanding of the objective of all questions for all of them, questionnaire elaboration was concluded. Additionally, the volunteers were questioned about the possibility of question writing structure that had sensitized them and influenced their responses. All of them stated that the questions were clearly written and felt no influence of writing structure in their choices. These volunteers were not included in the study.

The participants were not precisely identified at any time of questionnaire answering. The questions concerning sex, age, state, kind of orthodontic device, behavior regarding social distancing, presence of risk factors for the development of severe systemic repercussions of COVID-19, and patient perception regarding the need for specific equipment used in the new biosafety conduct in orthodontic appointments. Besides, concern regarding infection risk in the orthodontic office was assessed. Questions to evaluate the patient's perception regarding the risk of getting infected when attending an appointment and regarding the changes in the appointment routine were elaborated following the Likert-scale format, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree) [16]. The complete questionnaire comprised 14 questions (Tables 1-4). Once a questionnaire was answered and submitted, no edition nor re-submission was possible.

Statistical analysis

Descriptive analysis was performed, by percentage of respondents, in Excel software (Excel for Windows®, CA, USA), for all questions.

Because sample age did not present normal distribution according to the Shapiro-Wilk test, the Spearman correlation test was performed to evaluate if there was a correlation between age (Q2) and patient perception of infection risk in

Table 1: Sample distribution regarding sex, age, State, kind of orthodontic device, number of housemates and risk factor for COVID-19 (Questions 1 to 6).

Question 1: Sex (F/M)		
Female	283 (69.70%)	
Male	123 (30.30%)	
Question 2: How old are you?		
Age (Years)	Mean	Mode
	31.7 (15.9)	18
Age (Periods)	Minimum	Maximum
	7	70
Age (Periods)	≤ 17	107 (26.42%)
	18 – 29	108 (26.67%)
	30 – 39	61 (15.06%)
	40 – 49	62 (15.31%)
	50 – 59	43 (10.62%)
	≥ 60	24 (5.92%)
Question 3: Where do you live?		
State	Frequency	
Bahia	20.69%	
Pernambuco	12.07%	
Rio de Janeiro	32.27%	
Santa Catarina	19.46%	
São Paulo	15.51%	
Question 4: What kind of orthodontic device are you using?		
a) Fixed, with metallic brackets	203 (50%)	
b) Fixed, with esthetic brackets	90 (22.17%)	
c) Clear Aligners	113 (27.83%)	
Question 5: You live		
a) By yourself	29 (7.14%)	
b) With 1 or 2 people	191 (47.04%)	
c) With 3 people or more	189 (46.56%)	
Question 6: Do you present any risk factor condition to COVID-19 (e.g.: age +60, diabetes, cardiovascular disease, lung or respiratory disease, cancer, cerebrovascular disease, or immunosuppression)?		
Yes	60 (14.77%)	
No	346 (85.23%)	

the orthodontic office (Q9 and Q13). To this specific evaluation, values ranging from 1 to 5 were attributed to the Likert-Scale answers, from Strongly Disagree (1) to Strongly Agree (5), respectively. Thus, positive correlations would indicate that the older the patients, the greater would be their agreement, and negative correlations would indicate otherwise.

Statistical analysis was performed using Jamovi software (Jamovi for Windows, version 1.1, Sydney, New South Wales, Australia), at a significance of $p < 0.05$ [17,18].

Results

From the 519 (100%) questionnaires that were sent, there were 410 (78.23%) answers. Because 4 people declined to participate when confronted with informed consent, the survey comprised 406 participants (283 females and 123 males, mean age 31.7y SD 15.9y, Q1-2, Table 1). The geographic distribution was: 12.07% from Pernambuco, 15.51% from São Paulo, 19.46% from Santa Catarina, 20.69% from Bahia, and 32.27% from Rio de Janeiro (Q3). Participants with metallic brackets were 2.26 and 1.8 times more prevalent than those



with metal-free brackets and clear aligners, respectively (Q4). Lonely living was reported by 7.14% of the sample, meanwhile, 47.04% and 46.56% reported living with 1 or 2, and 3 or more people, respectively (Q5). Participants with risk factors for the development of severe systemic repercussions of COVID-19 comprised 14.77% of the sample (Q6).

The most reported quarantine behavior was 'going out just to perform essential activities', which comprised 87.69% and 81.52% of patient- and housemate behavior, respectively (Q7-8, Table 2). Regarding the patient perception of infection risk in the orthodontic office when scheduling (Q9), 93.10% of participants trust that the orthodontist would take enough care to avoid in-office contamination; meanwhile, 6.90% reported fearing getting infected. No patient assigned the risk of in-office infection as low.

Almost the whole sample strongly agreed (95.32%) or at least agreed (3.94%) with the use of the new biosafety equipment and social conduct in the orthodontic office, meanwhile only 0.74% assigned their perception as neutral (Q10, Table 3). Regarding the need for each contamination reduction method, all of them were judged as necessary by more than 80% of the participants, with agreement rates of 84.98%, 95.81%, 89.90%, and 83.99%, for the use of thermometer, FFS, disposable coat, and health status checking by phone, respectively (Q11). Patient perception of the in-office infection risk after attending an appointment under the new biosafety measures (Q12) revealed that 90.39% and 6.90% of participants feel strongly safer, or at least safer, with the new infection-risk reductive methods, respectively. Meanwhile, only 2.71% of participants reported a neutral feeling. When questioned whether the concern of returning in the future had increased after attending an appointment, most participants reported that it did not (78.08% strongly

Table 2: Sample behavior regarding the quarantine, and pre-appointment concern regarding COVID-19 infection risk (Questions 7 to 9).

Question 7: What is your behavior regarding the quarantine?	
a) I am going out as usual	50 (12.31%)
b) I am going out only to perform essential activities	356 (87.69%)
Question 8: Most people who live with you	
a) Are going out as usual	32 (7.89%)
b) Are going out just to perform essential activities	331 (81.52%)
c) Do not live home	14 (3.45%)
d) I live alone	29 (7.14%)
Question 9: When your orthodontist made contact to schedule your appointment, you	
a) Accepted, considering that he will take enough care to avoid that you get infected	378 (93.10%)
b) Accepted, but with fear of getting infected in the office	28 (6.90%)
c) Accepted, considering that the risk of getting infected in an orthodontic appointment is low	0 (0%)

Table 3: Sample in-office and post-appointment perception regarding the new biosafety approach to reduce COVID-19 infection risk (Questions 10 to 14).

Question 10: At the office, regarding the new biosafety equipment and social conduct used now (thermometer, full face shield, disposable coat, and previous call asking you about your health status), you		
a) Strongly agree	387 (95.32%)	
b) Agree	16 (3.94%)	
c) Neutral	3 (0.74%)	
d) Disagree	0 (0%)	
e) Strongly disagree	0 (0%)	
Question 11: How do you judge the need of each new equipment?		
Equipment	Necessary	Unnecessary
Thermometer	345 (84.98%)	61 (15.02%)
Full face shield	389 (95.81%)	17 (4.19%)
Disposable coat	365 (89.90%)	41 (10.10%)
Previous call asking about health status	341 (83.99%)	65 (16.01%)
Question 12: Please, answer as you fell regarding the following statement: "I feel safer with the new contamination control equipment in addition to the orthodontist conduct":		
Strongly agree	367 (90.39%)	
Agree	28 (6.90%)	
Neutral	11 (2.71%)	
Disagree	0 (0%)	
Strongly disagree	0 (0%)	
Question 13: Please, answer as you fell regarding the following statement: "My concern of returning to the office for the next appointments increased after attending an appointment with the new biosafety equipment":		
Strongly agree	18 (4.43%)	
Agree	8 (1.97%)	
Neutral	39 (9.61%)	
Disagree	24 (5.91%)	
Strongly disagree	317 (78.08%)	
Question 14: Orthodontic appointments do not represent risk of contamination for COVID-19:		
Strongly agree	53 (13.05%)	
Agree	68 (16.75%)	
Neutral	52 (12.81%)	
Disagree	83 (20.44%)	
Strongly disagree	150 (36.95%)	

disagreed and 5.91% disagreed, Q13). At last, when questioned whether the orthodontic appointment represents a risk of COVID-19 infection (Q14), 13.05% and 16.75%, respectively, strongly agreed or at least agreed that the appointment does not represent a risk; 12.81% of participants were neutral, and 36.95% and 20.44% of them strongly disagree or at least disagree that orthodontic appointments do not represent a risk.

Age and patient perception of the infection risk in orthodontic appointments after attending an appointment under the new biosafety measures were negatively correlated (Q2 vs. Q13, Table 4).



Table 4: Correlation between age and patient pre- and post-appointment perception (Spearman Correlation Tests, N = 406).

Age vs.	r	p
Pre-treatment perception	<0.01	0.917
Post-appointment perception	-0.10	0.042*

* Statistically significant at $p < 0.05$.

Discussion

The present sample was composed of orthodontic patients from five different Brazilian states, covering 3,264km of distance, from the most northern to the most southern city. If sample selection had been restricted to only one, or a few states, especially if they were from the same geographic region, patient perception could be influenced by governmental stay-at-home policies autonomously promoted by each state, regional disease incidence, and particular sanitary conditions [19]. This would represent a considerable study limitation. Therefore, the possibility of involving participants in such an extensive area provides more extrapolable scientific evidence.

The questionnaire was sent only to patients who were undergoing active orthodontic treatment, with a response rate of 78.23%. It is greater than what was achieved in the other two previously indexed published studies that also worked with sending digital questionnaires to dental patients during the present pandemic and evaluated similar topics [11,12]. The previous studies had their questionnaires applied in the early stages of the COVID-19 spreading. At that moment, the population was perhaps unaware of the importance of the topic, because the pandemic incidence and lethality rates had not been so catastrophic yet. The pandemic course may have contributed to this greater response rate.

Participants with fixed appliances comprised 72.17% of the participants, and 27.83% of the sample was composed of patients who were undergoing treatment with Clear Aligners (Table 1). Complications from metallic brackets were recently observed as the most frequent reason for urgent appointments, followed by problems with esthetic brackets [20]. Thus, patients with fixed appliances are those who most often tend to be in the orthodontic office, even during the pandemic. Therefore, it is crucial to know their perception of the current situation. Only 7.14% of participants reported lonely living. This low rate was expected. That is why a question about housemate quarantine behavior was previously included in the questionnaire. Participants with risk factors for the development of severe systemic repercussions of COVID-19 comprised 14.77% of the sample. This data should be interpreted as a warning sign for orthodontists, as the actual rate is probably higher than that, since some volunteers may not be aware that they present a risk factor.

Regarding quarantine social behavior, similar rates of participants and their housemates were reported as going out

only for essential activities: 87.69% and 81.52%, respectively (Table 2). Previous studies found the same behavior ranging between 78% and 78.20% of their participants [11,12]. The slightly greater rate found in the present study can be explained as the result of the stay-at-home policies that have been followed in the country since the pandemic began. However, 12.83% of participants reported that they had been going out as usual. This result represents an increase in the rates of the same behavior found in the two previously mentioned studies, which ranged from 4.5% to 8.75% and is probably due to the COVID-19 recovered participants who resumed their activities.

When scheduling, 93.10% of participants reported that accepted trusting that enough care would be taken by their professionals to avoid COVID-19 infection during the appointment, and 6.90% reported that accepted with fear of getting infected (Table 2). A previous study performed with Brazilian patients found that 18.5% of participants reported concern about contaminating themselves or their families [11]. Because the previous study was performed in the beginning, the present result represents an increase in the patient's confidence in the safety of the office environment over time.

When questioned in a general way regarding the new biosafety approach applied at the orthodontic office, 95.32% and 3.94% of participants strongly agree or, at least, agree, respectively, with it (Q10, Table 3). When specifically questioned regarding the need for a pre-appointment call to check health statuses, in-office temperature checking, and the use of disposable coats and FFS by the professional, the agreement rates were 83.99%, 84.98%, 89.90%, and 95.81%, respectively (Q11). Despite these high acceptance rates, the two that received the smaller rates should be highlighted: previous calling and temperature checking. These were the only items related to the possibility of the professional being contaminated by the patient. This suggests that patients may not consider the possibility of being infected and not realizing it. This speculation agrees with the results of a previous study that found that only 54.9% of orthodontic patients know that COVID-19 can be presented asymptotically [21]. In line with what would be expected after the positive perception regarding the new biosafety equipment (Q10 and Q11), almost the whole sample reported that felt safer with it (Q12). Additionally, because of this security feeling, only 6.40% of participants reported that their concern about returning for future appointments had increased after attending one (Q13, 4.43%, and 1.97% who answered that 'Strongly agree' and 'Agree' with the question sentence). Nonetheless, although they feel reasonably safe, more than half of the sample Strongly disagree, or, at least, disagree, when confronted with the statement that Orthodontic appointments would not represent a risk of COVID-19 infection (Q14).



The negative correlation found between age and the concern of returning to appointments is in accordance with the strongest signs of anxiety which were found in young people in other pandemic online cross-sectional surveys [22]. Perhaps, because they are not part of the risk group, young people were not very alarmed by the pandemic situation. Thus, when they saw the changes performed in the appointment routine, they were probably more shocked than older people were. Nonetheless, because anxiety symptoms were not evaluated in the present study, this explanation is speculative. Additionally, the sample age ranged from 7- to 70 years old. Evidently, some differences could be expected regarding the perception of children, adolescents, and adults. However, the negative correlation found between age and the concern of returning to the next appointment shows that the sample presents a perception tendency that linearly follows the age, indirectly.

Limitations

In ideal conditions, an Error Study would be carried out to evaluate the participants' agreement with themselves, and the questionnaire would be applied twice, within an interval. Due to the difficulty in obtaining the voluntary participation of patients in the first application, this questionnaire was applied only once. Despite the inclusion of 410 participants from 5 different states, the results should be extrapolated with caution because the sampling strategy used does allow robust representativeness.

Conclusion

The present cross-sectional survey performed in Brazil showed that:

- When scheduling, almost all participants accepted trusting that enough care would be taken to infection risk control;
- Participants reported less agreement with temperature checking and disposable coats than other infection control procedures;
- After attending an orthodontic appointment, less than a decimal part of participants reported that their concern about returning had increased;
- The percentage of participants with risk factors for the development of severe systemic repercussions of COVID-19 was 14.77%;
- Therefore, the tested null hypothesis was rejected because the younger the patient, the greater the concern of returning to future appointments.

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Author contributions

Marcelo Valerio: Project idealizer, data collection, data checking, statistical analysis, manuscript draft, and corrections.

José Augusto Mendes Miguel, Matheus Melo Pithon, Guilherme Thiesen, Luiz Filipe Canuto: Data collection and project revision.

Guilherme Janson: Research supervision, scientific and English revision.

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