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Impact of the COVID-19 Pandemic on Orthodontic Patients at a University Clinic: Self-Report

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ABSTRACT

Introduction: Academic activities and patient care at university clinics at UNAM were suspended on March 17th, 2020 due to the SARS-CoV-2 (COVID-19) pandemic. As a result, regular appointments for patients undergoing orthodontic treatment were disrupted. **Objective:** To assess the impact of a one-year interruption in orthodontic treatment due to the COVID-19 pandemic from the perspective of patients at a university clinic. **Material and methods:** A survey was designed and applied via Google Forms, with informed consent, to 65 patients from a university orthodontic specialty clinic. The instrument consisted of 31 questions (closed and open, focused on orthodontic emergencies, the perspective, feelings, and actions taken by patients) with a response time of approximately 5-7 minutes. Results were saved in a Microsoft® Excel spreadsheet. Open-ended responses were grouped by category and results are expressed as frequencies. **Results:** The survey was answered by 71% (n=46). The most frequently reported orthodontic

emergency was due to injuries caused by wires protruding from the tube (66.7%). Most patients had not continued their treatment elsewhere (67.4%), 61% reported frustration and 72% dissatisfaction due to the lack of treatment follow-up. The majority were considering continuing their treatment after the pandemic was over. Comments were received regarding time, the impact on treatment as a result of the global situation, as well as the need for care to be resumed. **Conclusions:** The disruption of orthodontic care due to the pandemic had a significant impact on patients in multiple ways. It is necessary to evaluate possible strategies to address potential interruptions in orthodontic care in the future.

Keywords: orthodontics, covid-19, pandemic.

INTRODUCTION

At the end of 2019, an outbreak of pneumonia of unknown aetiology began in Wuhan, China[1], and in January 2020 it was identified as being caused by a new Coronavirus. On January 30th, the World Health Organization (WHO) declared a global health emergency[2] and a declared the pandemic in early March[3]. The aetiological agent was named SARS-CoV-2 and the disease covid-19[4].

The covid-19 pandemic represented a public health problem, so risks were controlled with containment, identification and quarantine measures for infected people or individuals who were in contact with suspected cases. As a result, the Universidad Nacional Autónoma de México (UNAM) decided to suspend in-person classes as on March 17th 2020 to protect the student and academic community, encouraging them to pay attention to the measures to be adopted during the health contingency[6]. From that date, UNAM dental clinics had to restrict access to their facilities and the delivery of patient care.

The virus was found to spread through aerosol droplets or possibly by fomites from an infected person through exposure to oral, nasal, or ocular mucosa[7-10]. Recommendations included avoiding person-to-person contact and maintaining a distance of at least one metre between individuals, which is not possible in a dental office due to the nature of the work, putting health professionals at risk[11,12]. Additionally, an individual may be unaware of an infection due to a lack of symptoms, being in the incubation period, or deliberately concealing it, which makes patient care more complex[13]. The WHO therefore recommended postponing non-urgent oral services until the contagion rate decreased[14].

Patients undergoing orthodontic treatment must have regular appointments every 4-8 weeks for the adjustment and activation of appliances[15]. Between appointments, patients may experience irritation caused by appliances, pain due to tooth movement, or appliance breakage. While these issues are not considered emergencies per se, prompt action is needed to relieve discomfort[16] and/or avoid a negative effect on patient expectations or satisfaction.

At the time this study was performed, there was scarce[17-19] information on the impact related to the lack of follow-up of orthodontic treatment during confinement because of the covid-19 pandemic. Moreover, the confinement period was longer in Mexico than in other countries. Therefore, this study aimed to assess the effects of interrupted orthodontic care from the perspective of patients treated at a university specialty clinic during a year of confinement due to the covid-19 pandemic.

MATERIAL AND METHODS

To design the survey for this descriptive cross-sectional study, we began with a brainstorming session and formulated questions based on relevant literature aligned with the study objective. Once the questions were selected, ordered and the response format determined, validation was carried out by expert judgement. Three orthodontists reviewed whether the questions captured the objective of the study, and three researchers evaluated the construction of the instrument, verifying that there were either no confusing questions, or questions that guided the response. The survey was refined based on a pilot test (technical understanding and functionality) with 7 patients. The invitation was sent via a WhatsApp message (Meta Platforms, Inc., Menlo Park, USA) containing the hyperlink to answer the survey via Google Forms (Google LLC, Mountain View, USA), between May and September 2021 to the total available sample of 65 active patients of third-year orthodontic specialty students at a university clinic in Mexico City. The research was conducted under the ethical principles for medical research involving human participants of the WMA Declaration of Helsinki[20]. Informed consent was obtained, and patient anonymity has been ensured. For minors, the survey was completed by a parent or guardian.

The instrument consisted of 31 questions, the first 7 inquired about sex, age, level of education, nationality, type of appliance/treatment and years under orthodontic treatment. Eleven questions dealt with emergencies or problems related to orthodontic treatment (yes/no). If the patient answered yes to two of them, two more questions followed for the patient to extend the information. One question explored continuity of treatment (yes/no/partially) and the last ten questions asked about the patients' perspectives and feelings. Perspective refering to the way a person thinks about something, while feelings are the sensations caused by external/internal causes (these consisted of two open-ended questions and eight on a Likert scale). The estimated response time for the survey was 5-7 minutes. Descriptive statistics were performed with Microsoft® Excel (Microsoft Corporation, Redmond, USA) and open-ended responses were grouped into categories which helped to give meaning and improved information understanding. Results were expressed in terms of frequency.

RESULTS

A total of 71% (46/65) of the patients who were invited to participate completed the survey, all of whom were Mexican nationals, with 63% being women. The median age was 20 years (range: 11-53), and the mode for years in treatment was 3 (range: 1-10 years). Of the participants, 85% had fixed orthodontic appliances, 4% had removable appliances, and 11% were in the retention phase. Regarding education level, 43.5% had completed high school, and 41% had a Bachelor's degree.The most frequently reported emergency by patients with fixed appliances (n=39) was injury due to wires protruding from the tube (67%, 26/39), followed by debonded brackets (62%, 24/39), broken, lost, or detached bands (41%, 16/39), and discomfort/injury from the tip of a ligature (36%, 14/39). Inflammation or swelling (41%, 19/46), bleeding gums (35%, 16/46), ulcers (35%, 16/46) and bad breath (33%, 15/46) were also reported in the total sample. Of the five patients with retainers, three reported a broken, detached or lost retainer.

Of the total, 39% (n=18) reported having had to urgently attend a dental consultation due to issues with their appliances during the evaluated period, including: 'an oral disorder,' dislodged brackets, vertigo and ear pain, injury caused by a detached appliance, wire irritation, ulcers,

and bleeding gums. In turn, 28% (n=13) mentioned some problem related to the orthodontic treatment that was present at the time of the survey: dental pain, movement or change in the position of the teeth, *"pain in the gums"*, *"the eruption of canines"*, *"a crooked bite"*, as well as the debonding of brackets, wires and bands that *"hurt"*. The majority had not continued their treatment elsewhere (67.4%, n=31) while 15.2% (n=7) had and 17.4% (n=8) had done so partially.

Information on actions, the perspective and feelings regarding the lack of continuity of treatment revealed that 57% had maintained contact with the assigned resident during the pandemic and 80% of the patients were willing to continue treatment when the service resumed. 61% reported feeling frustrated by the lack of treatment follow-up and 72% were dissatisfied with care during the pandemic, despite 76% indicating that they were aware that the interruption of the clinical service was for their protection, as well as for the students (Table 1).

TABLE 1.
Patients' actions, perspective, and feelings (n=46) regarding the lack of continuity of treatment during the closure of the clinics due to the COVID-19 pandemic.

Questions	Completely agree	Partially agree	Partially disagree	Completely disagree
	Percentage (n)	Percentage (n)	Percentage (n)	Percentage (n)
The assigned doctor has maintained contact with me throughout the pandemic.	34.78 (16)	21.74 (10)	23.91 (11)	19.57 (9)
I have continued to attend my orthodontic appointments with the assigned doctor in spite of the pandemic.	32.60 (15)	10.86 (5)	13.04 (6)	43.47 (20)
I am willing to continue my orthodontic treatment at the clinic once services resume.	69.57 (32)	10.87 (5)	6.52 (3)	13.04 (6)
I have felt frustrated due to the lack of follow-up of my orthodontic treatment.	41.30 (19)	19.56 (9)	15.21 (7)	23.91 (11)
I feel upset because my expectations for orthodontic treatment are not being met.	17.39 (8)	23.91 (11)	15.21 (7)	43.47 (20)
I have been disappointed by the lack of continuity in my orthodontic treatment.	28.26 (13)	21.74 (10)	17.39 (8)	32.60 (15)
I am satisfied with the attention given to me during the pandemic.	4.34 (2)	23.91 (11)	19.56 (9)	52.17 (24)
I was aware that the interruption of orthodontic treatment at the clinic was part of the strategies to protect patients and students from COVID-19 infection.	67.39 (31)	8.69 (4)	15.21 (7)	8.69 (4)

Regarding the actions that patients considered taking at the end of the pandemic in relation to their orthodontic treatment (Table 2), most of them expressed a willingness to continue with the treatment. Two patients specifically mentioned that they would continue, but only under appropriate safety and patient protection measures because of the pandemic. Concerning the requested comment on the pandemic and their orthodontic treatment (Table 3), eleven patients did not make any comments, four only reiterated that they had continued elsewhere and three were isolated comments such as "*may we all have health*". Some respondents expressed two or even three categories in their comments, resulting in 32 comments grouped into three

categories. The first related to the fact that the clinic should have had a plan to follow. The second category corresponded to feelings caused by the impact of their treatment due to the global situation. The third category was related to time issues, such as delays in treatment because of the pandemic and the need for the clinical services to resume (13 comments).

Table 2.
Actions considered by patients (n=46) regarding their orthodontic treatment after the pandemic.

Answers	Percentage (n)
Continue, resume, carry on with my treatment	69.56 (32)
Continue with another professional	4.34 (2)
Ask for an appointment, an immediate check-up	4.34 (2)
Start, undergo treatment again	4.34 (2)
Finish the treatment	4.34 (2)
Have not decided	2.17 (1)
Did not answer	6.52 (3)
Fix my teeth	2.17 (1)

Table 3.
Comments expressed (open-ended question) in regards to the COVID-19 pandemic and their orthodontic treatment, grouped by category and examples.

Category	n= 32
Planning, measures, recommendations Examples: "The clinic should have developed a plan to support its patients", "Continue with appointments with pertinent safety measures to avoid infections", or "It would have been better to partially continue appointments".	n= 12 (7 contagion, 2 partially)
Feelings Examples: "I know it's an external situation that affected the world, but in my case, it makes me feel frustrated and desperate", "For me, it was somewhat frustrating not to go (to my appointment) or know how my case was progressing".	n= 7
Time Examples: "My treatment has been delayed due to the pandemic,", "I hope services will resume soon", "It's urgent to resume it".	n= 13

DISCUSSION

The COVID-19 pandemic has significantly impacted multiple aspects of daily life around the world. As an easily transmitted infectious disease, it forced the adoption of new rules for social distancing and self-isolation to mitigate the spread of the virus, and consequently, the closure of university dental clinics, among other services or facilities. Due to the sudden interruption of clinical activities due to the pandemic, there was no opportunity to adequately guide patients on what could happen, given the interruption of their regular appointments, and how to resolve any mishap regarding their appliances. Orthodontic emergencies together with actions, the perspective and feelings of patients as a consequence of the lack of follow-up of orthodontic treatment are reported here.

The findings on the most common emergencies related to the orthodontic appliances are injuries caused by wires protruding from the tube (67%) and debonded brackets (62%), which

are consistent with those of another study, also undertaken during the pandemic, which points to sharp wires (30%) and debonded brackets (27%)[17]. The lower prevalence of emergencies reported by Turkistani may be attributed to the fact that they applied the survey two months after clinical closure, while in our study at least 12 months had elapsed. The emergencies are also in agreement with those of another study conducted prior to the pandemic, but whose survey was administered to residents and orthodontists, while ours was applied to patients. Patients often do not realise that a bracket has come loose, and this may explain the reverse order of frequency: bracket debonding (37%) and wires sticking out of the tube (25%)[21]. Other emergencies reported by patients in our study were broken/lost/debonded bands, ligature tip discomfort or injury, gingival swelling and bleeding, and bad breath, which were also reported by Turkistani[17] during clinical closure.

The action reported by 39% of patients in the event of orthodontic emergencies was to go to an appointment with a private dentist. A study using data collected from different services and times since clinic closures during the pandemic found exposed wires to be the most common emergencies[18]. It also reported that the first thing patients with fixed appliances did in case of an emergency was to contact their orthodontist (38%), visit a nearby dentist (12%), and schedule an emergency appointment (10%).

At the time of our survey, 28% of patients reported some problem related to orthodontic treatment, which is lower than the 59% reported by Turkistani[17]. This may be because the time elapsed between the disruption of orthodontic treatment and the period during which the study was conducted is different. Since the patients in our study had been left without care for one year approximately, they had likely already sought some solution for their problem, either on their own or through a professional. Another possibility is that they had become accustomed or adapted to the problem.

Approximately half of the studies patients had made contact with their treating dentist during the period of interruption of clinical activities and managed to see him/her despite the pandemic, which is lower than those reported by Bustati *et al*.[18] They found that most respondents had contacted their treating dentist at least once. It is important to note that although some patients chose to continue their treatment elsewhere, either permanently or partially, most of them considered continuing their treatment at the same university clinic, which may be due to the lower cost of the university clinic, since comments received were such as *"...I would like to resume it. It is a great support since my finances do not allow me to receive treatment elsewhere"*.

Two-thirds of the respondents were aware that the interruption of the service at the clinic was a measure taken by the authorities to protect students and patients, this percentage was similar to another study where 74% expressed understanding and support regarding the closure of dental offices during the pandemic[22]. Despite patients' awareness of the unfortunate conditions brought on by the COVID-19 pandemic and the measures taken, and despite 70% indicating their willingness to continue their treatment once activities resumed, the majority of respondents reported being dissatisfied, frustrated, disappointed, or annoyed, either completely or partially, by the lack of follow-up to their treatment. These results are consistent with expectations, as lack of treatment adherence leads to anxiety[22], mental distress, and anxiety about the duration and outcome of orthodontic treatment[19]. Furthermore, the interruption of ongoing treatments during the pandemic caused stress, worry, annoyance, anger, resentment, and frustration[23,24], and even led patients to feel abandoned by their doctors[25].

There was a recurring comment that the interruption of monthly appointments by the pandemic prolonged treatment, which expressed the need for a prompt reopening of clinical

services. Missed appointments increase orthodontic treatment time[26] and long-term use of archwires or retainers without proper monitoring can harm patients' oral health[27,28]. Lack of treatment control or its extension can increase the possibility of white spots on the margins of the bracket associated with poor control of dental plaque[29,30] and another complication associated with a longer treatment time can be root resorption[31].

Comments such as *"the space for patients is small in relation to the size of each student's workstation; they are too close together"*, *"consultations must be resumed with appropriate protective measures to avoid contagion"*, *"we need the contagion to subside so we can be treated better without being worried"*, indicate concern about the possibility of contagion when activities resume.

It is important to reassure patients that dentists adhere to official Mexican standards for risk prevention, including cross-contamination, through the use of personal protective equipment for the dentist, patient barriers, sterilization of instruments, and the cleaning and disinfection of surfaces exposed to aerosols and splashes. Additionally, proper management of hazardous biological waste is strictly followed. These measures were fully implemented during the health crisis, with even stricter protocols, such as the use of N-95 masks, to ensure patient and staff safety.

Other comments received referred to the lack of follow-up by the orthodontic service: *"the clinic should have developed a plan to support its patients"*, *"I would have liked them to continue to provide care, even if only partially"*. Although the study is limited by the number of patients, which did not allow other types of inferences or analyses, the information provided indicates that there was a gap in communication with patients and an impact on treatment continuity. The impact was not limited to dentistry. Health services, prevention, and treatment for non-communicable diseases have been severely disrupted due to the COVID-19 pandemic, either partially or completely, affecting services for the timely diagnosis and treatment of high blood pressure, diabetes, cancer, and cardiovascular emergencies[32-34]. The COVID-19 pandemic has posed serious challenges to global health and caused disruptions to essential health services[35], such as missed or late cancer diagnoses, which could lead to a serious public health problem in the coming years[36].

It is therefore necessary to have a means of communication with the patient in situations where an in-person consultation is not possible. One tool that can provide this means of communication is teledentistry. This originates from telemedicine, which corresponds to the use of telecommunications and virtual technologies to provide medical care outside of traditional medical care centers. Its purpose is to provide clinical support and overcome geographic barriers by connecting people who are not in the same physical location, improving health outcomes[37]. In 1994, the United States Department of Defense initiated a teledentistry project allowing the armed forces' primary dentists to consult patients remotely[38]. Currently, using this technology, remote evaluations can be performed by the professional, using the images and information sent by the patient. The professional is able to monitor treatment progress, manage emergencies, provide recommendations, and reassure patients, which is important during times of confinement such as those caused by the COVID-19 pandemic, without exposing the patient or the professional to unnecessary risks[39,40]. However, challenges must be overcome, such as establishing measures to protect patient confidentiality and privacy. In Mexico, there are no specific regulations for telemedicine, although there are laws applicable to the matter[41].

The COVID-19 pandemic has taught us that we must be prepared for eventualities that could disrupt dental treatments, including orthodontic treatments. Strategies must be planned now to limit the impact of health emergencies, ensuring that patients' experiences and emotions

are considered in such planning. Given the uncertainty regarding the course of the pandemic in Mexico, the survey was validated by expert judgment. The uncertainty limited the sample size; however, the strength of this study lies in the fact that patients were surveyed after more than a year of the disruption of clinical activities. In other countries, dental services were closed for a shorter period, and therefore reports on orthodontic treatments only cover the first few months of the covid-19 health crisis.

CONCLUSIONS

The lockdown as a result of the covid-19 pandemic significantly affected orthodontic treatment at the university clinic. Appliance emergencies were frequent, requiring 29% of patients to seek dental care, and treatment was completely interrupted in 67% of the cases. Many patients reported feeling dissatisfied, frustrated, and/or disappointed with the lack of follow-up, and several commented that care should have been planned during this time, although perhaps only partially. Most of them considered continuing their treatment, but they hoped it would be soon and with adequate protective measures. With this in mind, knowledge of the impact of the lack of follow-up care on patients undergoing orthodontic treatment due to the covid-19 pandemic highlights the need to develop remote monitoring and counseling tools using teledentistry, among other means. A care plan for patients needs to be established for future unforeseen events, taking the patients' own perspective into account.

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