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ORIGINAL RESEARCH ARTICLE

Comparison Of the Dental Treatments Performed In A Pediatric Dentistry Clinic During The Covid-19 Pandemic Period With The Pre-Pandemic Period: A Retrospective Study

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Abstract

Purpose: This study aimed to assess the impact of COVID-19 pandemic on attendance and treatments performed in a pediatric dental clinic.
Materials and Methods: : A retrospective study was conducted using the records of pediatric patients treated in two periods: before the pandemic (15 March 2019–14 March 2020) and during the pandemic (15 March 2020–14 March 2021). Data regarding patients' age, sex and administered treatment were collected and analyzed. The treatments applied were categorized under 6 groups: examination, restorative, preventive, prosthetic, emergency and surgical, and periodontal. Rates of each procedure were compared between two periods.
Results: During pandemic, 11,700 patients applied to our clinics and 26,995 procedures were performed, resulting a decrease by 63.5% and 84.3% in the outpatients and treatments, respectively, compared to the pre-pandemic period. During the pandemic, the rates of examination and surgical procedures were significantly higher than those before the pandemic, while the rates of other procedures were significantly decreased ($p<0.001$).
Conclusions: The COVID-19 Pandemic has been shown to have a significant impact on dental care delivery in children.

Key words: COVID-19; Dental procedures; Dental services; Pediatric dentistry; SARS-CoV-2

Introduction

Coronavirus disease 2019 (COVID-19), the result of infection with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), and which was first isolated and identified in patients visiting a seafood market in Wuhan City, China, in December 2019, has become a pandemic, posing a major worldwide threat to public health.[1] On March 11, 2020, the World Health Organization (WHO) declared COVID-19, SARS-CoV-2 disease as a global pandemic.[2]

COVID-19 is transmitted by mainly direct contact and droplet transmission. Aerosol transmission is also a possible way of spread when there is an exposure to high concentrations of aerosols in poorly ventilated or crowded indoors. Routine dental procedures generate aerosols that are potentially risky to the personnel and patients. There has been no reported case of coronavirus transmission in dental settings, yet. However, considering the high transmissibility of the disease, dental teams should be awaked and provide a healthy environment for both their patients and themselves. Therefore, it is essential to understand aerosol delivery and its implications in dentistry. In this special period, in addition to the standard measures, some special measures are also applied.[3] Children with COVID-19 were mostly asymptomatic, thus contributing to transmission and posing significant concern to dentists due to the uncertainty of their contagious status. In addition, it can be challenging to manage children during dental treatment as they may cough, sneeze, and cry and can generate more natural aerosols.[4]

During the peak of the pandemic, aerosol generating procedures (AGPs) have been suspended in many countries and are only pro-

vided to patients seeking emergency care, as per the advice of many health authorities around the world. If AGPs were to be provided, a proper personal protective equipment had to be used by dental care providers and a period of up to an hour was required post-treatment. This period was the time required to allow for clearance of infectious aerosols after a particular procedure before decontamination of the surgery could begin, and it mainly depended on the ventilation and air change system within the room. As a result, the number of patients treated was much lower.[4]

In the first period of the pandemic, only emergency and compulsory dental treatments were allowed in Turkey. Routine and elective treatment procedures were restricted.[5] These restrictions have led to a decrease in the number of treatments and the number of patients treated. Treatment protocols and operating procedures were constantly updated throughout the epidemic.[6] In the following period, new protocols regarding oral and dental health services were published by the Turkish Ministry of Health in the normalization process.[7]

Therefore, the objective of this study is to assess the impact of COVID-19 pandemic on attendance and treatments performed in a pediatric dental clinic. For this purpose, dental procedures performed in Ankara Yıldırım Beyazıt University Faculty of Dentistry Tepebaşı Oral and Dental Health Education and Research Hospital Pediatric Dentistry Clinics in pre-pandemic period and pandemic period were examined comparatively.

Material and Methods

A retrospective study was conducted using the records of pediatric patients who visited the Ankara Yıldırım Beyazıt University, Faculty of Dentistry, Tepebaşı Oral and Dental Health Education and Research Hospital, Pediatric Dentistry Clinics in two periods: before the COVID-19 (15 March 2019–14 March 2020) and during the COVID-19 (15 March 2020–14 March 2021). Ethical approval for this study was obtained from Ethical Committee of Ankara Yıldırım Beyazıt University (Registration number: 2021/376).

Information regarding patient age, sex and administered treatment were collected and analyzed. The treatments applied were categorized under 6 groups as: examination (1), restorative (2), preventive (3), prosthetic (4), emergency and surgical (5) and periodontal (6). Restorative procedures included permanent dental fillings (composite resin, compomer, amalgam restorations), glass ionomer cement restorations, root canal treatments, pulpotomies, preformed metal crowns and strip crowns. Fissure sealant and topical fluoride application (gel, varnish) were defined as preventive procedures. Prosthetic procedures comprised of space maintainer, occlusal splint, dental appliance, and dentures. Emergency and surgical procedures implied both tooth extraction and management of traumatic dental injuries. Periodontal procedures consisted of scaling. All procedures except emergency and surgical ones were elective procedures that can be rescheduled or managed with medication until appointment.

The age of unique patients within each period was summarized with mean±standard deviation, median, interquartile range (IQR) and range. Frequency and proportion (%) were provided for the sex of the patients and rates of the procedures were calculated. Rates of each procedure were compared between two periods by using prop.test function of stats package in R language via RStudio Software.[8,9] Graphs were prepared in Microsoft Excel. A p-value<0.05 was considered as statistically significant.

Results

A total of 32,087 patients were treated and 172,068 procedures were applied in the last year before the pandemic. The mean age of the patients was 8.32 ±3.01 years (median:8.00, IQR: 6.00-11.00, range: 0-15), and 50.8% (n=16,310) were male. During pandemic, 11,700 patients applied to our clinics and 26,995 procedures were performed, resulting a decrease by 63.5% and 84.3% in the outpatients and treatments, respectively. The mean age of these patients was 8.14 ±2.96 years (median:8.00, IQR: 6.00-10.00, range: 0-15) and 50.9% (n=5,956) were male. The monthly number of patients and applied procedures in our clinic are given in Figure 1. During the pandemic, the rates of examination and emergency & surgical procedures were significantly increased compared to those before the pandemic, while the rates of other procedures were significantly decreased (p<0.001, Figure 2.).

It was observed that the glass ionomer cement restorations and preformed metal crown applications were significantly more frequent during pandemic, while other treatments among the restorative procedures decreased (p<0.05). The rate of oral appliance was significantly increased, as the rate of prosthetic procedures were significantly decreased. In addition, within the emergency and surgical procedures, it was determined that there was a significant change between two periods for only tooth extractions, resulting an increase during pandemic (p<0.001, Table 1.).

Discussion

In this study it was found that the total number of pediatric patients who applied to our clinic decreased by 63.5%, and the total number of procedures performed decreased by 84.3% during the pandemic period compared to the routine pre-pandemic period. As the most dental procedures are elective ones, health authorities around the world have recommended to suspending these procedures.[10] Goswami et al. (2021) reported that during the COVID-19 epidemic, the patients mostly consulted pediatric dentists in emergencies. Causes were cited as strict stay-at-home orders, travel restrictions, as well as fear among parents of contracting COVID-19 disease while seeking dental treatment.[11] In a study about fear, eating habits and parent's oral health perceptions during pandemic, parents' fear of COVID-19 has been found to influence their behavior in seeking dental care for their children. There was an association between parents' willingness to take their children to dental appointments with the fear level. 66.6% of parents stated that they would only take their children to dentist appointments for emergency dental care during the pandemic period.[12]

Fux-Noy et al. (2021) reported that during lockdown, all scheduled appointments have been canceled except for treatments under general anesthesia and deep sedation. Compared to pre-pandemic and post-lockdown, it was determined that the number of patients seeking emergency dental care decreased during the lockdown period. The number of patients in the post-lockdown period was still lower than those in the pre-pandemic period and it has been associated with the ongoing restrictions set by the Ministry of Health. In this period, longer appointments were required for each patient, in order to sterilize all surfaces and equipment between patients, and this resulted in a decrease in the number of treatments that could be performed.[13]

At the beginning of the pandemic, on April 2, 2020, a statement was made by the Turkish Ministry of Health not to carry out nonemergency and non-compulsory dentistry practices and to postpone them to a later date.[5] This can be considered as the major the reasons of the decreases in number of patients and procedures performed. Moreover, in Turkey shortly after the onset of the pandemic, contact tracing team was created to collect samples from COVID-19 cases or their contacts at home, to arrange their treatment and to give their medicines. Dentists working at public hospitals were assigned to this team with other healthcare personnel such as physician, assistant health personnel (midwife, nurse, health officer, emergency medical technician), medical technologist, dietitian, and psychologist.[14] These assignments also had an impact on the decrease in the number of dentists working in

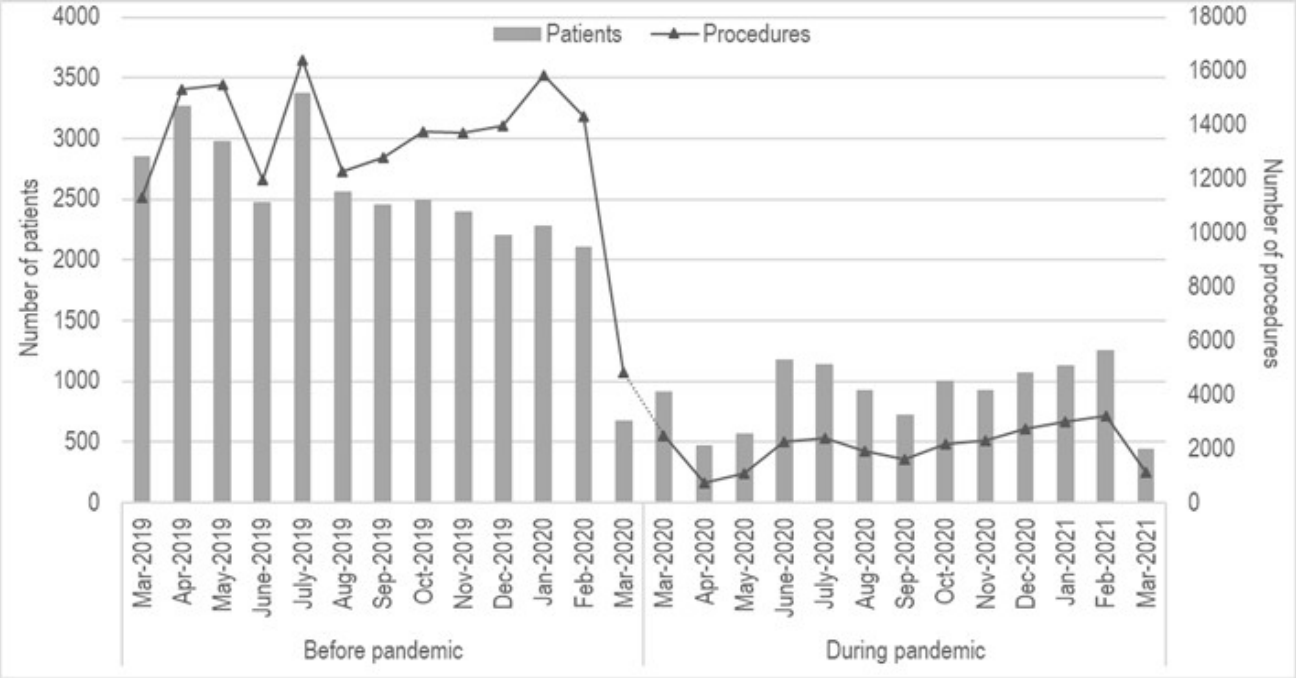

Figure 1. Number of patients and procedures before pandemic and during pandemic

Table 1. Distribution of detailed procedures within periods

	Before pandemic		During pandemic		
	n	%	n	%	p-value
Examination	**45 690**	**26.55**	**14 779**	**54.75**	**<0.001**
Restorative procedures	**40 833**	**23.73**	**2 189**	**8.11**	**<0.001**
Dental filling (composite resin, compomer, amalgam)	28 922	16.81	597	2.21	**<0.001**
Root canal treatment	9 635	5.60	283	1.05	**<0.001**
Glass ionomer cement	1 216	0.71	1 260	4.67	**<0.001**
Pulpotomy	971	0.56	16	0.06	**<0.001**
Preformed metal crown	17	0.01	30	0.11	**<0.001**
Strip crown	72	0.04	3	0.01	**0.024**
Preventive procedures	**61 430**	**35.70**	**924**	**3.42**	**<0.001**
Fissure sealant	50 321	29.24	663	2.46	**<0.001**
Topical fluoride (gel, varnish)	11 109	6.46	261	0.97	**<0.001**
Prosthetic procedures	**2 080**	**1.21**	**74**	**0.27**	**<0.001**
Space maintainer	2 018	1.17	58	0.21	**<0.001**
Occlusal splint	25	0.01	3	0.01	0.870
Appliance	29	0.02	12	0.04	**0.007**
Denture	8	<0.01	1	<0.01	>0.999
Emergency & Surgical procedures	**21 290**	**12.37**	**9 020**	**33.41**	**<0.001**
Extraction	21 286	12.37	9 017	33.40	**<0.001**
Trauma Splint	4	<0.01	3	0.01	0.087
Periodontal procedure (Scaling)	**745**	**0.43**	**9**	**0.03**	**<0.001**
Total	**172 068**	**100.00**	**26 995**	**100.00**	

The sum of rates could be different than the total rate of the corresponding procedure or 100, because of rounding.

the hospital, and therefore the number of patients and procedures performed.

In a similar study conducted by Yüksel and Bezgin (2021) the data of patients aged 0-14 years who applied to the pediatric dentistry clinic of the faculty of dentistry during the 1-year period before and after the pandemic compared retrospectively. The number of visits and the treatment procedures significantly decreased after the declaration of the pandemic when compared to the one-year preceding the pandemic. The authors noted that there is a need for evaluation of public and private clinical patient referrals as they merely presented university hospital clinical data. Since the present study was compiled from the data of the pediatric dentistry clinic of a university that has an affiliation protocol with the Ministry of Health, it can meet the aforementioned request.[15]

On January 30, 2020, following the recommendations of the Emergency Committee, the WHO Director General declared that the outbreak constitutes a Public Health Emergency of International Concern.[16] The COVID-19 pandemic has drastically affected the lives of people of all age-groups around the world. The coronavirus pandemic has required adaptations in the way people work, study, and interact with others. This new situation has affected people's well-being by reducing their income and increasing their fears, anxiety, and stress.[12] In Turkey the first coronavirus case was announced on March 11, 2020. On April 3, 2020, curfew was introduced for children born on January 1, 2000, and later. Using masks in public places became mandatory and 15-day entrance ban to 30 metropolitan municipalities, as well as Zonguldak, was announced. After that, short-term curfews were announced at dif-

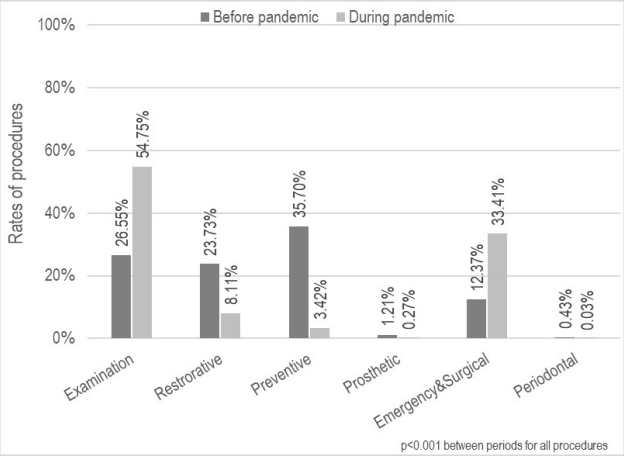

Figure 2. Rates of procedures before pandemic and during pandemic

ferent times (11-12 April 2020, 18-19 April 2020, 23-26 April 2020, 1-3 May 2020, 23-26 May 2020).[17]

In the present study, the lowest number of patients and treatment procedures in the entire period examined was determined in March 2021. In the controlled normalization process, the city of Ankara was in the middle risk group at the beginning of March 2021, the number of cases increased, and it became one of the provinces with very high risk on March 29.[18] This explains the lowest numbers in March 2021. On the contrary, the effect of the COVID-19 pandemic on the city of Wuhan, the source of the disease, mainly has been the short-term. The impact of COVID-19 pandemic and the deferral of dental treatment in Wuhan, intensified in the first 3 months after re-opening. In the fourth month (July 2020), the characteristics of children gradually returned to normal.[19] Yüksel and Bezgin (2021) found that there was a statistically significant decrease in the number of topical fluoride application, fissure sealant, restoration, pulp capping, pulpotomy and root canal treatment during the pandemic period compared to the pre-pandemic period. On the other hand, they stated that more radical and non-aerosol-generating treatments such as tooth extraction were preferred more.[15] In the present study, the rates of dental examination and emergency & surgical procedures were found to be increased. However, the rates of other procedures were significantly decreased, which is consisted with Yüksel and Bezgin's study.

In a study where tooth extractions were determined to be performed more during the pandemic period, it was stated that the indeterminate restrictions on dental treatment during the pandemic period led dentists to more radical treatments. In addition, it was stated that the high number of extractions also reflects the severity of the dental condition of the patients.[13] Similarly, Nijakowski et al. (2021) found that the amount of emergency and more invasive surgical procedures has increased significantly during the COVID-19 pandemic.[20]

Inci et al., (2020) retrospectively analyzed the data of patients aged 0-16 years who applied to the pediatric dentistry clinic of the faculty of dentistry for 5 years before the declaration of the COVID-19 pandemic and for 3 months after the declaration of the pandemic. In terms of all dental treatments examined, the monthly average number of treatments decreased significantly during the pandemic period compared to the previous period. The number of tooth extractions has decreased to about a quarter of the previous annual averages, and the number of elective procedures such as scaling, fissure sealant and fluoride has decreased approximately 10-14 times.[21]

When the emergency and surgical procedures were examined in detail, it was determined that tooth extractions increased significantly but same increment was not detected for dental trauma splints. It is thought that outdoor injuries may have decreased during the post-pandemic period, when there were curfews for individuals under the age of 18. However, it would not be correct to interpret that the number of dental traumas has decreased. In fact, there is no set fee for clinical treatments of dental trauma in Social Security Institution Communiqué on Healthcare Practices in Turkey. This has led to the fact that emergency interventions due to dental trauma were not properly recorded and not included in the procedures in this study.

Dentistry consists of many procedures, mostly AGPs, that can cause the spread of the COVID-19 virus to the dentists and patients. All guidelines published during this period emphasized that the use of AGP should be kept to a minimum. Guidelines also classified cases into an emergency or urgent ones and deferable ones. Whenever possible, evaluation of the patient's dental condition using teleconferencing or tele-dentistry options has been suggested as an alternative to in-office care. If dental treatment can be delayed, it is recommended that patients be given detailed home care instructions and proper medications. If an emergency dental patient does not have symptoms consistent with COVID-19 infection, they can be treated in dental settings with appropriate protocols and personal protective equipment in place.[10,22]

In the guideline published at the beginning of the pandemic, the Ministry of Health announced that treatment with hand instruments should be given priority due to the spread of COVID-19 infection via droplets or aerosols.[6,22] The need to avoid AGPs has resulted in a reduction in the majority of treatments among the restorative procedures in our clinic during the pandemic. However, in this study, it was found that some restorative procedures such as glass ionomer cement restorations and preformed metal crowns were performed more frequently during the pandemic period compared with prepandemic period. Using biological atraumatic, non-invasive, or minimally invasive treatment methods that require minimal or no AGPs would be more logical and safer in caries management has been advocated in the pandemic era. Treatment options for teeth with normal healthy pulp or teeth showing signs of reversible pulpitis include sealing non-cavitated caries, using fluoride varnish and resin infiltration to arrest non-cavitated caries, atraumatic restorative technique (ART), interim therapeutic restorations (ITR), indirect pulp treatment, the Hall technique (HT), and Silver Diamine Fluoride.[10,22] The high numbers of glass ionomer cements and preformed steel crowns detected in this study are the result of increased clinical applications of ART, ITR, and HT procedures.

Yüksel and Bezgin (2021) found that the application rate of glass ionomer cement, which is used as a restorative material in ART applications, increased during the pandemic compared to the prepandemic period. On the other hand, they stated that the Hall technique was not widely applied because there was a statistically significant decrease in the use of prefabricated crowns.[15]

Before the pandemic, there were an average of 4-5 dental units in each pediatric clinic in the hospital. After the onset of the pandemic, these clinics required both separating the dental units from each other and isolating them to be ventilated from the outside. But this arrangement could not be made for most dental units for practical reasons. As a result, after the pandemic started, a very limited number of dental units that can perform AGPs have been allocated to the pediatric dental clinic. According to the results of the latest national oral health survey conducted in Turkey in 2018, the prevalence and severity of dental caries in children is still high.[23] It is likely that there has been a significant increase in the treatment needs of patients during this pandemic period. In order to meet the dental treatment needs of the society, the conditions of such hospitals, which do not have qualified dental treatment areas where aerosol procedures can be performed, need to be improved quickly.

However, we should not lose sight of the fact that dental caries cannot be overcome with operative treatment alone, and we should remember that the main solution to improve oral health is prevention. Preventive dentistry should be supported to improve oral

health. Recommended methods for caries control include consumption of a low cariogenic diet, daily and proper removal of biofilm, use of fluoride, as well as sealing techniques. Policies to be carried out by the Ministry of Health on a national scale to support these measures are very important for the promotion of oral health. In addition to the implementation of preventive oral health programs, the acceptance of these programs by the society is the key point in solving the problem.

Conclusion

The COVID-19 Pandemic has been shown to have a significant impact on dental care delivery in children. The numbers of treated pediatric patients and dental procedures performed in these patients have decreased. Moreover, it has affected the spectrum of dental procedures performed. The amount of examination and surgical procedures has significantly increased, while conservative procedures have decreased.

The precautions and restrictions have caused a significant increase in the pediatric patients in need of dental care during the COVID-19 pandemic and have placed a huge burden on dental care in the post-COVID era due to increased waiting lists. While meeting the needs of operative dental treatment, priority should be given to preventive dentistry, which is the actual solution of dental caries.

Author Contributions

A.I.O conceived the idea. E.S.K. and A.I.O. designed the study. E.S.K., A.I.O. and A.A. performed the data cleaning and arrangement. A.A. did statistical analyses. A.I.O. and A.A. interpreted the data. E.S.K., A.I.O. and A.A. wrote the manuscript.

Conflict of Interest

Authors declare that they have no conflict of interest.

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