

Article

The Impact of COVID-19 on Dental Treatment in Kuwait – a Retrospective Analysis from the Nation’s Largest Hospital

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Abstract: *Background:* The COVID-19 pandemic has changed the way dentistry has been practiced world over, this study sought to assess the impact of the COVID-19 pandemic on the patterns of attendance for dental treatment in a large hospital in Kuwait compare them to data from the year prior to the pandemic *Methods:* A total of 176,690 appointment records of 34,250 patients presenting to the AlJahra specialist hospital, Kuwait for dental treatment from April 2019 to March 2021 were analyzed. Types of procedures and the departments to which they presented were analyzed and the patterns of attendance before and during the pandemic were compared; *Results:* While there was a significant reduction in the number of orthodontic, endodontic and periodontal procedures there was no impact on oral surgery, restorative procedures or pediatric dentistry; *Conclusions:* There has been a return in the numbers of patients availing dental treatment, however, there has been a definite shift in the use of certain dental procedures.

Keywords: Access to Dental Care; COVID-19; Dental Public Health

1. Introduction

The World Health Organization (WHO) announced the outbreak a Public Health Emergency of International concern on 30 January 2020, and a pandemic on 11 March 2020, affecting more than 7 million people over more than 188 countries(1). The COVID-19 pandemic has changed the way dentistry has been practiced world over(1–4). The spread of the virus by aerosols and the aerosols generated in dentistry, have meant that dental practices the world over have had to adapt the way dentistry is practiced(5). There is also data emerging that shows that the pandemic has had different impacts on different specialties(5–7).

The impact of COVID-19 in Kuwait has been documented in literature and the State adopted aggressive measures towards the containment of the Pandemic including an early and aggressive lockdown from 1st April to 30th May 2020. Between the declaration of the pandemic in March 2020 and the first administration of vaccines in April-May 2021, Kuwait saw variations in both the number of cases and mortality from COVID-19(8). There is however no data on how these factors affected the attendance of patients in dental clinics in Kuwait.

Dental care in Kuwait has been provided free of charge since 1951. However, since 1992, growth and improvements in the economy has meant that dental care in Kuwait is provided by both government hospitals and private dental clinics(9). While private clinics provide a service for fee, the government hospital provide free dental care to all who are

eligible. Despite the growth of private dental care in Kuwait the role of government centers in the provision of dental care by Government centers and their impact on the overall wellbeing of the people of Kuwait has been documented in the literature(9,10).

The Kuwait dental administration at the ministry of health in Kuwait has built an integrated medical system based on recommended scientific policies and a clear methodology in the different dental specialties representing the most medical specialties with regard to finance and human resources. This plan includes the provision of dental services in all dental specialties are at major dental centers that are distributed across different Kuwaiti governates. These include the Amiri hospital, Adan hospital, Bneid AlGhar dental center, Farwaniya hospital, Jaber hospital and AlJahra Specilized Dental Center (ASDC). A total of 1083272 patient benefit of dental services provided in polyclinics at distinct residual areas in Kuwait, while 537596 citizens used the dental services at the six specialized centers at Kuwait after primary referral from the polyclinic including ASDC which account for 22.1% of patients presented the majority of served population (10).

ASDC is part of the new AlJahra hospital at AlJahra governate, the largest governate among the six Kuwaiti governates with the highest population density (9). The new AlJahra hospital is one of the most ambitious healthcare medical facilities built on Kuwait. It consisted of the main hospital building, specialized dental center, regional health administrative building and central utility plant as well as two parking centers. The hospital has a 1234 bed capacity, a women's center, diagnostic imaging, and surgical suite with 32 ORs, emergency services, education center, daycare, and outpatient center. ASDC provides advanced dental services in various dental specialties including pediatric dentistry, orthodontic, oral and maxillofacial surgery, periodontology, prosthodontic, endodontic, oral medicine, oral hygiene, advanced dental images and radiology at AlJahra government and the surrounding AlJahra districts with a population of 452.596 people (3). AlJahra specialized dental center (ASDC) serves AlJahra government and the surrounding AlJahra districts with a population of 452.596 people (3). Prior to the pandemic, this was one of the largest dental treatment centers in Kuwait, seeing over 20,000 patients per year. At the onset of the COVID-19 outbreak, ASDC activated an emergency plan (March 2020), through which the employees were divided into three main groups in order to minimize staff contact and prevent disease spread. Over the following year the dental center reopened services to patients while keeping in place pandemic specific safety measures.

Data is emerging from around the world that shows that the initial reluctance of individuals to seek dental treatment during the pandemic has been replaced by differing access to dental care(3,11–13). While there have been some attempts to analyze data from multiple centers(14–16), there has been little longitudinal data from a large public hospital. Newer variants of the virus and increased transmissibility have seen the pandemic slowly start to show features of an endemic. Data on how services were impacted by the COVID-19 pandemic is important for a better understanding of how dentists across the globe can deal with the challenges posed by this new phase of the disease. This study sought to assess the impact of the COVID-19 pandemic on the patterns of attendance for dental treatment at the AlJahra specialized dental centre (ASDC) and compare them to data from the year prior to the pandemic.

2. Materials and Methods

Ethics Approval

Ethics approval for the study was obtained from the Standing Committee for the Coordination of Medical and Health Research, Ministry of Health, Government of Kuwait, of the AlJahra Hospital (1829/2021). All patients attending the hospital sign a form consenting to the use of anonymized data for research purposes.

Data Collection

The data was collected retrospectively from the patient management system (Patient Statistic Program-Microsoft Access 2000, Microsoft Corp. Palo Alto CA, USA). The age, gender, nationality, type of treatment and department providing the treatment were collected. Monthly COVID-19 case rates and vaccination rates for AlJahra Governorate were obtained from the Central Statistical Bureau.

Data Analysis

Patient data was exported using Microsoft Excel (Microsoft Corp, Palo Alto CA, USA) and analyzed using the SPSS ver. 25 data processing software (IBM-SPSS, Armonk, NY, USA). Descriptive data were tabulated and significances of differences among gender and nationality were calculated. Differences between pre-pandemic and pandemic levels of attendance were compared according to the specialty with differences calculated using the binomial test. All tests were carried out with a level of significance of $p < 0.05$.

3. Results

The sample comprised of 176,690 appointment records of 34,250 patients who presented to the dental clinics of AlJahra hospital from March 2019 to March 2021. The sample was divided into two main groups, records of patients visiting before the pandemic (April 2019-March 2020) and during the pandemic (April 2020 to March 2021) (Fig 1). Overall there were fewer patients seen during the pandemic ($n=83813$) when compared to the previous year ($n=92598$).

When divided according to gender it was observed that there were significantly more female patients in all departments except the COVID-19 unit and Pediatric Dentistry. This trend was the same before and during the pandemic (Table 1).

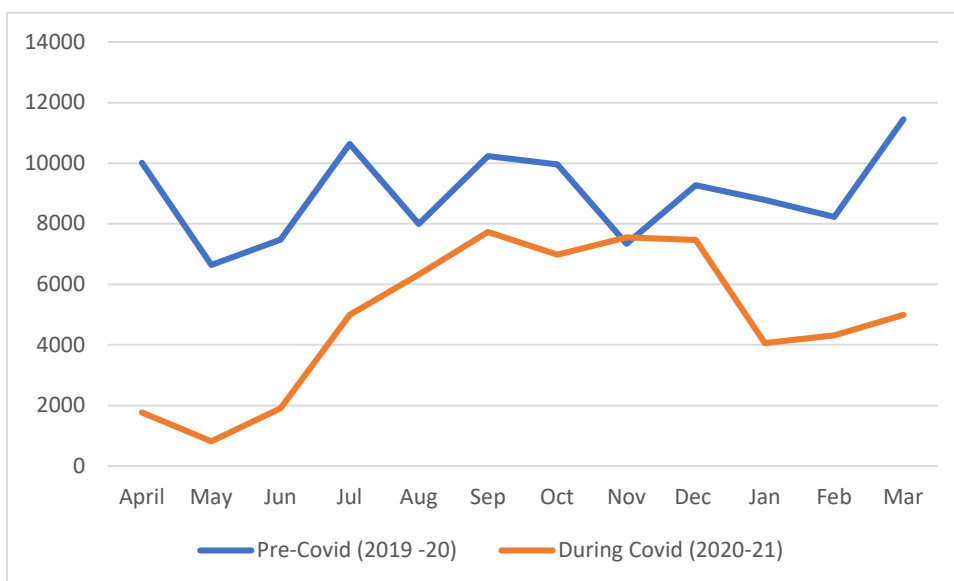


Fig 1: Impact of COVID-19 on Overall Patient Presentation

Table 1: Attendance differences according to Gender

		Gender		Female	Row N %	p*
		Male	Row N %			
Pre-Pandemic (2019-20)	Pediatric dentistry	7162	47.9%	7786	52.1%	0.187
	COVID-19 unit	N/A	N/A	N/A	N/A	N/A
	Prosthodontics	5270	37.0%	8958	63.0%	<0.001**
	Orthodontics	2717	30.2%	6270	69.8%	<0.001**
	Oral Surgery	12880	41.7%	18032	58.3%	<0.001**
	Endodontics	3831	38.2%	6204	61.8%	<0.001**
	Periodontics	1645	35.0%	3054	65.0%	<0.001**
	Pediatric dentistry	7073	48.0%	7664	52.0%	.865
During the Pandemic (2020-21)	COVID-19 unit	338	49.3%	347	50.7%	.906
	Prosthodontics	5026	33.4%	10030	66.6%	<0.001**
	Orthodontics	3576	33.7%	7027	66.3%	<0.001**
	Oral Surgery	11253	40.5%	16519	59.5%	<0.001**
	Endodontics	6247	37.9%	10253	62.1%	<0.001**
	Periodontics	2659	36.7%	4585	63.3%	<0.001**

*Calculated using the binomial test

**Differences significant at $p < 0.05$

Table 2: Impact of Pandemic on Attendance by specialty

	During the Pandemic (2020-21)	Pre- Pandemic (2019-20))	p*
Pediatric dentistry	14952	14737	0.564
COVID-19 unit	NA	685	NA
Restorative/Operative	14228	15057	0.148
Orthodontics	8987	10603	0.021**
Oral Surgery	30912	27772	0.076
Endodontics	10035	16500	0.005**
Periodontics	4699	7244	0.001**

*Calculated using the binomial test

**Differences significant at $p < 0.05$

The impact of the pandemic was compared according to specialty (table 2) it was observed that different specialties were affected differently. While there was a significant reduction in patients seen in orthodontics, endodontics and periodontics, no significant reductions were observed in prosthodontics. In both pediatric dentistry and oral surgery there was an increase in the number of patients seen, although the differences were not statistically significant.

When the types of treatment rendered were tabulated (Chart 2) it was observed that all types of procedures were impacted by the first shut down from April 2020 to June 2020.

During this period almost no aerosol generating procedures were performed (Table 3). However, after the lifting of restrictions, a rebound in the number of procedures was observed (Chart 2). It was observed that variations were greatest among procedures such as prosthodontics, restorative procedures and orthodontics (Chart 2).

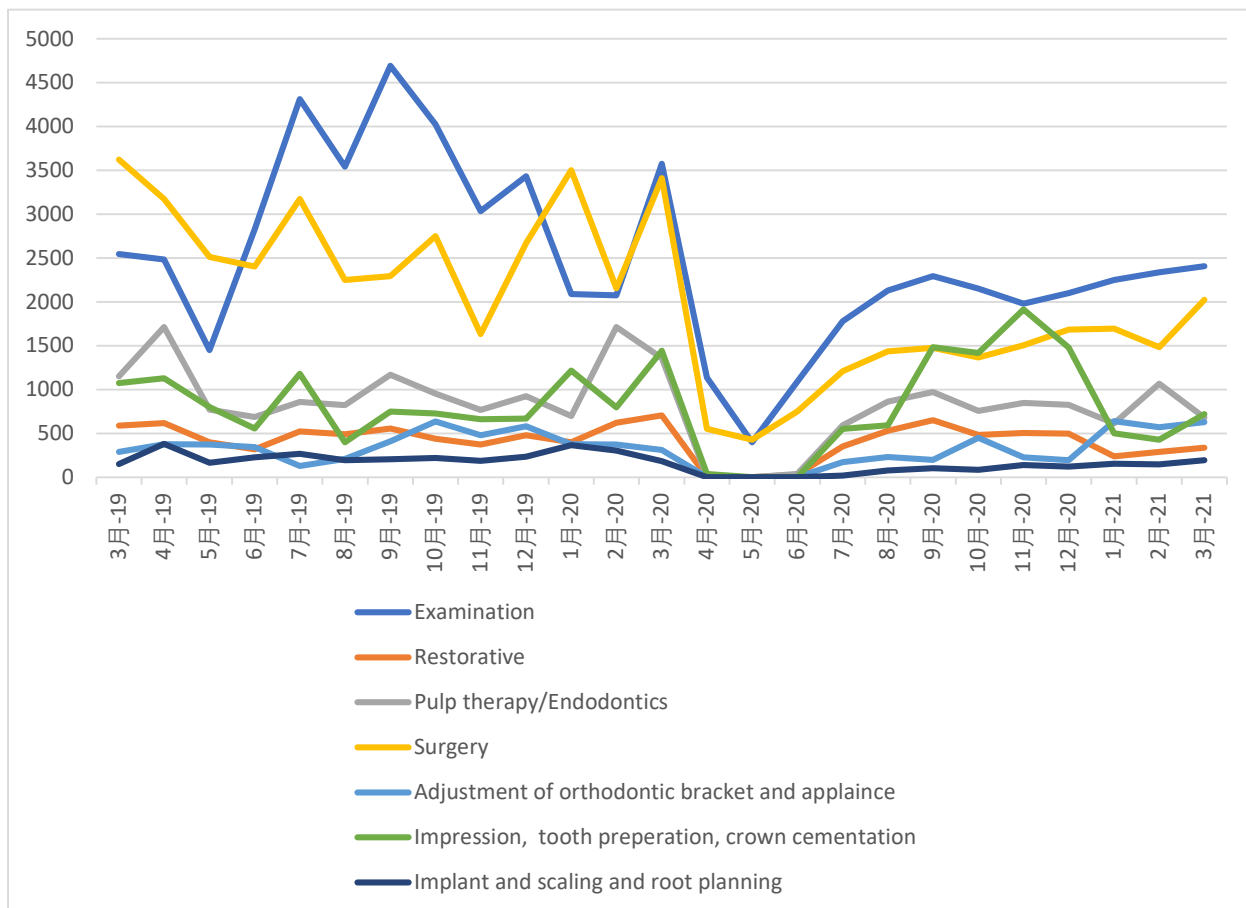


Chart 2: Type of treatment rendered before and during the pandemic

Table 3: Type of procedure performed by month from March 2019 to March 2021

	Examination	Restorative	Pulp therapy/Endodontics	Surgery	Adjustment of orthodontic bracket and appliance	Impression, tooth preparation, crown cementation	Implant, scaling and root planning
Mar-19	2547	589	1149	3621	288	1075	151
Apr-19	2484	618	1712	3175	378	1130	379
May-19	1450	397	771	2511	371	799	163
Jun-19	2827	318	686	2402	345	555	226
Jul-19	4313	524	859	3172	128	1180	265
Aug-19	3543	490	820	2248	210	399	195
Sep-19	4694	556	1170	2295	408	748	205
Oct-19	4025	440	953	2748	635	727	218

Nov-19	3035	374	768	1634	477	660	188
Dec-19	3431	477	925	2670	582	670	235
Jan-20	2090	399	697	3502	378	1216	365
Feb-20	2073	620	1712	2155	371	796	305
Mar-20	3574	706	1358	3409	309	1441	181
Apr-20	1137	4	5	550	0	35	0
May-20	397	0	0	426	0	1	0
Jun-20	1088	28	38	747	0	0	0
Jul-20	1777	349	591	1208	170	550	19
Aug-20	2128	531	862	1435	231	592	77
Sep-20	2292	651	970	1475	197	1484	102
Oct-20	2151	481	755	1366	448	1417	83
Nov-20	1981	503	849	1506	225	1912	139
Dec-20	2098	495	826	1683	195	1478	120
Jan-21	2251	238	614	1693	640	500	152
Feb-21	2338	287	1067	1481	570	426	146
Mar-21	2406	337	680	2024	627	721	195

4. Discussion

It has now been over two years since the first COVID-19 case was diagnosed, and the impacts on dentistry are becoming clearer(14,15,17,18). This study aimed to follow the patterns of patient care over a one-year period from the implementation of the first COVID-19 restrictions in Kuwait. As data emerges on the ways that dental practices globally are adapting to pandemic induced restrictions, this study sought to visualize the changing patterns in a large governmental hospital as the pandemic progressed.

The initial stages of the pandemic from April 2020 to July 2020 were a period of effective shutdown for dental practices across the globe(8). The lack of clear guidelines on the risks of aerosols combined with global shutdowns and/or lockdowns, meant that elective dental procedures were not performed(4,18,19). This is reflected in the drop in cases seen between April and July 2020. As restrictions on aerosol generating procedures were gradually lifted, there was a slow increase in the number of patients seen. Our data shows that between June and July 2020 there was a sharp increase in the number of patients seen for examination and surgery. This is explained by the fact that as operatories were opened up for non-aerosol generating procedures, the hospital was able to deliver emergency care. This is also in keeping with studies that showed that emergency procedures in the early days of the pandemic were restricted to extractions (4,17).

The increase in restorative and endodontic procedures in the period from July 2020 to the end of the study is of great significance. Our data suggests that there was a gradual increase in the numbers of these procedures being performed. The data also shows that once these procedures were being performed there was little variation in the numbers of procedures. This suggests that endodontic and restorative procedures are essential to the well being of individuals. The tendency to restrict emergency procedures to extractions in the early days of pandemic was based largely on the fact that there were insufficient operatories to manage aerosol generating procedures(4,19,20). The pandemic has resulted

in the re-designing of dental operatories, both in small practices and large hospitals(2,3,5,19,21). The data from this study shows that the availability of sufficient rooms to perform these procedures is essential for the delivery of optimal dental care. The data also shows that the hospital was able to create infrastructure that could support the practice of aerosol generating procedures. In this case the hospital was a public organization, and funding from the government allowed for the creation of the necessary infrastructure. The financial toll on practices, both large and small, is beyond the scope of the current paper, but is an important area for further research.

The fact that there were variations in orthodontic procedures suggest that these procedures are perhaps viewed as non-essential. While an argument can be made for these procedures to be given a lower priority than pain relieving procedures such as endodontics, the impact of treatment suspension on the outcomes of tertiary dental care are emerging(22,23). Literature shows that prolonging or postponing orthodontic care that has already started can result in care being extended for long periods, with adverse outcomes not just for orthodontic outcomes but also oral hygiene(24).

The current data set used secondary data, and since the operatory used for the provision of ultrasonic scaling is the same as the operatory used for the placement of implants, the data on the numbers of these procedures is presented together. The results are worrisome as they show a significantly lower number of procedures when compared to restorative or endodontic care. Good ultrasonic scaling has long been viewed as the bed-rock of dental hygiene maintenance(7). However, the restrictions imposed on aerosol generating procedures, have meant that across the world dentists have had to either limit, or altogether stop, the number of ultrasonic scaling procedures(5,7,14,15,18). The results of the current study show that while the numbers of endodontic and restorative procedures are classified as "essential" and have returned to pre-pandemic levels, the numbers of scaling/root-planing/implant procedures are at half the pre-pandemic levels authors should discuss the results and how they can be interpreted from the perspective of previous studies and of the working hypotheses. The findings and their implications should be discussed in the broadest context possible. Future research directions may also be highlighted.

Since the pandemic began, research has focused on both minimizing aerosols in dental practices and the optimal allocation of rooms where aerosol generating procedures can be safely carried out (15 -17). The results of this study highlight the fact that pain relieving procedures such as restorative care, oral surgery and endodontics quickly bounced back to pre-pandemic levels. A more interesting find is that while the placement of orthodontic brackets had returned to pre-pandemic levels by March 2021, ultrasonic scaling procedures had not. This finding mirrors global trends that show that while non-aerosol generating procedures quickly return to pre-pandemic levels, practices (both large and small) struggle to create new infrastructure to cope with the requirements for aerosol generating procedures (12, 17). Orthodontic care is known to be associated with poorer oral hygiene outcomes (21); the absence or limitations in access to good ultrasonic scaling can have potential adverse effects that need to be addressed.

The practice of dentistry in large hospital based or hospital like situations differs in many ways from the practice in a smaller individual or group dental practice. Since the beginning of the pandemic, there have been several factors that have affected the practice of dentistry in hospital settings. The fact that the pattern of practiced changed during the pandemic has been previously documented. However, our results suggest that even after the lifting of restrictions there are certain shifts in the practice of dentistry that have continued to remain in place. This is in keeping with other hospital data from the region, which suggested changes in dental practice in a hospital setting in Saudi Arabia. It is

therefore reasonable to assume that large hospitals in the region will need to further evaluate the impact these changes have on the cost of care, the efficiency of care delivery and the impact of these changes on patient satisfaction.

5. Conclusions

The results of this study show that while attendance in dental clinics at the AlJahra hospital have nearly returned to pre-pandemic levels there have been significant shifts in the types of procedures performed. The long-term impacts of these shifts are deserving of future research in order to provide comprehensive dental care to patients as well as to better plan for future waves of the pandemic.

Author Contributions: For research articles with several authors, a short paragraph specifying their individual contributions must be provided. The following statements should be used “Conceptualization, WA. and SCP.; methodology, SCP.; software, WA and SCP.; validation, KA FA.; formal analysis, SCP.; investigation, WA.; resources, WA;KA and FA.; data curation, WA.; writing—original draft preparation, SCP.; writing—review and editing, WA, KA.;

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Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Institutional Review Board (or Ethics Committee) of Standing Committee for the Co-ordination of Medical and Health Research, Ministry of Health, Government of Kuwait. of the AlJahra Hospital (1829/2021).

Informed Consent Statement: All patients attending the hospital sign a form consenting to the use of anonymized data for research purposes.

Data Availability Statement: Data will be made available upon reasonable request to the authors

Acknowledgments:

Conflicts of Interest: The authors declare no conflict of interest

References

1. Campus G, Diaz Betancourt M, Cagetti MG, Giacaman RA, Manton DJ, Douglas G, et al. The COVID-19 pandemic and its global effects on dental practice. An international survey. *J Dent.* 2021 Jul;103749.
2. Farshidfar N, Jafarpour D, Hamedani S, Dziedzic A, Tanasiewicz M. Proposal for Tier-Based Resumption of Dental Practice Determined by COVID-19 Rate, Testing and COVID-19 Vaccination: A Narrative Perspective. *J Clin Med.* 2021 May;10(10).
3. Dong Q, Kuria A, Weng Y, Liu Y, Cao Y. Impacts of the COVID-19 epidemic on the department of stomatology in a tertiary hospital: A case study in the General Hospital of the Central Theater Command, Wuhan, China. *Community Dent Oral Epidemiol.* 2021 Jul;
4. Salgarello S, Salvadori M, Mazzoleni F, Francinelli J, Bertolotti P, Audino E, et al. The New Normalcy in Dentistry after the COVID-19 Pandemic: An Italian Cross-Sectional Survey. *Dent J.* 2021 Jul;9(8).
5. Singh H, Maurya RK, Sharma P, Kapoor P, Mittal T. Aerosol generating procedural risks and concomitant mitigation strategies in orthodontics amid COVID-19 pandemic - An updated evidence-based review. *Int Orthod.* 2021 Sep;19(3):329–45.
6. El-Boghdadly K, Cook TM, Goodacre T, Kua J, Blake L, Denmark S, et al. SARS-CoV-2 infection, COVID-19 and timing of elective surgery: A multidisciplinary consensus statement on behalf of the Association of Anaesthetists, the Centre for Peri-operative Care, the Federation of Surgical Specialty Associations, the Royal College. *Anaesthesia.* 2021 Jul;76(7):940–6.
7. Pierre-Bez AC, Agostini-Walesch GM, Bradford Smith P, Hong Q, Hancock DS, Davis M, et al. Ultrasonic scaling in COVID-era dentistry: A quantitative assessment of aerosol spread during simulated and clinical ultrasonic scaling procedures. *Int J Dent Hyg.* 2021 Aug;
8. Alkhamis MA, Al Youha S, Khajah MM, Haider N Ben, Alhardan S, Nabeel A, et al. Spatiotemporal dynamics of the COVID-19 pandemic in the State of Kuwait. *Int J Infect Dis.* 2020;98:153–60.
9. Amato A, Ciacci C, Martina S, Caggiano M, Amato M. COVID-19: The Dentists' Perceived Impact on the Dental Practice. *Eur J Dent.* 2021 Jul;15(3):469–74.
10. Rehman R, Jawed S, Ali R, Noreen K, Baig M, Baig J. COVID-19 Pandemic Awareness, Attitudes, and Practices Among the Pakistani General Public. *Front public Heal.* 2021;9:588537.

11. Alkhalifah FN, Tobbal AY, Fried JL. COVID-19 impact, knowledge and preparedness among dental hygienists in Saudi Arabia: A cross-sectional study. *Int J Dent Hyg*. 2021 Aug;
12. Ali S. Dental practice during the era of COVID-19 pandemic: An Egyptian experience. *Oral diseases*. 2021.
13. Ostrc T, Pavlović K, Fidler A. Urgent dental care on a national level during the COVID-19 epidemic. *Clin Exp Dent Res*. 2021 Jun;7(3):271–8.
14. Abdulkareem AA, Abdulbaqi HR, Alshami ML, Al-Rawi NH. Oral health awareness, attitude towards dental treatment, fear of infection and economic impact during COVID-19 pandemic in the Middle East. *Int J Dent Hyg*. 2021 Aug;19(3):295–304.
15. Iurcov R, Pop LM, Ciavoi G, Iorga M. Evaluating the Practice of Preventive Behaviors and the Fear of COVID-19 among Dentists in Oradea Metropolitan Area after the First Wave of Pandemic; a Cross-Sectional Study. *Healthc (Basel, Switzerland)*. 2021 Apr;9(4).
16. Pietrzak P, Hanke W. COVID-19 and dentistry - safety issues regarding doctor and patient situation in time of vaccine availability. *Med Pr*. 2021 Aug;
17. Vernon JJ, Black EVI, Dennis T, Devine DA, Fletcher L, Wood DJ, et al. Dental Mitigation Strategies to Reduce Aerosolization of SARS-CoV-2. *J Dent Res*. 2021 Aug;220345211032885.
18. Aravind A, Nair S, Aparna TK, Thomas AJ, Oommen S, Vijayan A. Attention to COVID-19 Pandemic among Dental Experts of Kerala State, India: A Knowledge, Attitude, and Practice Study. *J Pharm Bioallied Sci*. 2021 Jun;13(Suppl 1):S836–40.
19. Melo P, Barbosa JM, Jardim L, Carrilho E, Portugal J. COVID-19 Management in Clinical Dental Care. Part I: Epidemiology, Public Health Implications, and Risk Assessment. *Int Dent J*. 2021 Jun;71(3):251–62.
20. Martina S, Amato A, Faccioni P, Iandolo A, Amato M, Rongo R. The perception of COVID-19 among Italian dental patients: an orthodontic point of view. *Prog Orthod*. 2021 Apr;22(1):11.
21. Umeh OD, Utomi IL, Isiekwe IG, Aladenika ET. Impact of the coronavirus disease 2019 pandemic on orthodontic patients and their attitude to orthodontic treatment. *Am J Orthod Dentofac Orthop Off Publ Am Assoc Orthod its Const Soc Am Board Orthod*. 2021 May;159(5):e399–409.
22. Quan S, Guo Y, Zhou J, Zhang G, Xing K, Mei H, et al. Orthodontic emergencies and mental state of Chinese orthodontic patients during the COVID-19 pandemic. *BMC Oral Health*. 2021 Sep;21(1):477.