



Research Article

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Impact of COVID-19 Pandemic on Dental Care in Izmir Province in the West of Turkey

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ABSTRACT

This study aimed to investigate provision of dental care services before and during the COVID-19 pandemic in western Turkey. Data was screened between 1 December 2018-1 June 2022 from the hospital database of Izmir Training Dental Hospital, Izmir, Turkey. All dental procedures including oral and radiographic examination, dental fillings, restorative/reconstructive treatments, extraction, endodontic treatment, treatment of parafunctional habits, periodontal treatment, emergency dental treatments. Data envelopment analysis model was applied to measure the efficiency of decision-making units. Total number of dental and auxiliary staff worked in the selected hospital was 84±15 (mean±SD) and 105±0 (mean±SD) respectively and the number of active dental chair was 150±0 (mean±SD). In this study, it was concluded that the most oral examination was performed as a dental care service in the selected years, however, all treatment procedures were affected by the pandemic in the selected years. When the scale efficiency value is examined, it is observed that the most effective year was 2019 (scale efficiency value: 1), the second effective year was 2020 (0.987), and the third effective year is 2022 (0.886), and 2021 (0.875) was the least effective year. Non-aerosol generated procedures were least effected oral care services during the pandemic. It is concluded that COVID-19 pandemic has caused marked impairments in routine dental care services during the year 2020 and 2021. The policy makers should be well-prepared for future pandemics to dedicate uninterrupted dental care services as well as public health.

Keywords: Covid-19, Data envelopment analysis, Dental care, Pandemic

Türkiye'nin Batısında İzmir İlinde COVID-19 Pandemisinin Diş Bakımına Etkisi

ÖZ

Bu çalışma, Türkiye'nin batısındaki COVID-19 salgını öncesinde ve sırasında diş sağlığı hizmetlerinin sunumunu araştırmayı amaçlamıştır. Veriler, 1 Aralık 2018-1 Haziran 2022 tarihleri arasında İzmir Eğitim Diş Hastanesi, İzmir, Türkiye hastane veri tabanından tarandı. Ağız ve radyografik muayene, diş dolguları, restoratif/rekonstrüktif tedaviler, çekim, endodontik tedavi, parafonksiyonel alışkanlıkların tedavisi, periodontal tedavi, acil diş tedavileri dahil olmak üzere tüm diş işlemleri. Karar verme birimlerinin etkinliğini ölçmek için veri zarflama analizi modeli uygulanmıştır. Seçilen hastanede çalışan toplam diş hekimi ve yardımcı personel sayısı sırasıyla 84±15 (ortalama±SS) ve 105±0 (ortalama±SS) ve aktif dişçi koltuğu sayısı 150±0 (ortalama±SS) idi. Araştırmada seçilen yıllarda diş bakım hizmeti olarak en çok ağız muayenesi işleminin yapıldığı

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buna rağmen seçilen yıllar içerisinde tüm tedavi işlemlerinin pandemiden etkilenmesi sonucuna varıldı. Ölçek etkinlik değeri incelendiğinde en etkin yılın 2019 (ölçek etkinlik değeri: 1), ikinci etkin yılın 2020 (0,987), üçüncü etkin yılın 2022 (0,886) ve 2021 (0,875) en az etkili yıldır. Pandemi sürecinde aerosol üretmeyen işlemler en az etkilenen ağız bakım hizmetleri olmuştur. COVID-19 pandemisinin 2020 ve 2021 yıllarında rutin diş bakımı hizmetlerinde belirgin bozulmalara neden olduğu sonucuna varılmıştır. Politika yapıcılar, halk sağlığının yanı sıra kesintisiz diş bakımı hizmetlerine tahsis etmek için gelecekteki pandemilere iyi hazırlıklı olmalıdır.

Anahtar Kelimeler: Covid-19, Veri zarflama analizi, Diş bakımı, Pandemi

1 Introduction

Coronavirus Disease-2019 (COVID-19) has been declared a pandemic by the World Health Organization (WHO) and had a global influence since March 2020. [1] It has been known that the disease is transmitted through droplets and/or direct contact. [2] Therefore, dental professionals are at higher risk due to both their close working conditions with patients and aerosols generated during dental procedures. [3]

Since the outbreak of COVID-19 pandemic, Ministry of Health as well as Turkish Dental Association have released guidelines for the best practice and safety for dental care providers and patients. Our Ministry of Health in Izmir took control of the applicability of the guidelines for the same measures in the province of Izmir Education Dental Hospital. Basically, guidelines include disinfection and treatment protocols, anamnesis and consent forms and safety recommendations for the patients, dentists, and auxiliary staff.[4] During the lock-down period, all emergency and/or urgent dental treatments (limited to pre-defined clinical procedures under strict infection prevention/control measures) have been performed within “slow dentistry concept”. In the literature, still data is scarce or vague among which dental procedures have been performed during this special period including the lock-down. Therefore, the present study aimed to compare provision of dental care before and during the pandemic.

2 Methodology

Present observational study was approved by the Ethics Committee of the Dokuz Eylul University (7477-GOA). Data was screened between 1 December 2018-1 June 2022 from the hospital database/patient records of Izmir Training Dental Hospital, Izmir, Turkey. All dental procedures, the number of actively working dental staff, auxiliary staff, and dental chairs in the hospital during defined period were recorded. Investigated parameters were oral and radiographic examination, dental fillings, restorative/reconstructive treatments, extraction, endodontic treatment, treatment of parafunctional habits, periodontal treatment, emergency dental treatments (e.g., abscess treatment).

Data envelopment analysis (DEA) model was applied using the EMS 1.3 program to measure the effectiveness of Izmir Education Dental Hospital by years, covering the years 2019-2022. Input-oriented CCR (Charnes, Cooper, and Rhodes) and BCC (Banker, Charnes and Cooper) models were used to evaluate total, technical and scale efficiency. [5]

3 Results

In the present study, the distribution of number of dental professionals, total number of patients registered to the hospital per defined years was demonstrated in table 1. Total number of dental and auxiliary staff worked in the selected hospital was 84 ± 15 (mean \pm SD) and 105 ± 0 (mean \pm SD) respectively and the number of active dental chair was 150 ± 0 (mean \pm SD) (Table 1).

Table 1: In the present study, the distribution of number of dental professionals, total number of patients registered to the hospital per defined years was demonstrated

Years	Dental professionals (number)	Patients registered per year (number)	Patients registered per day (number)
2019	102	14.280	21
2020	80	11.200	13
2021	65	9.100	10
2022	88	12.320	16

The number of dental services in the selected years range is shown in Figure 1. While most oral examinations were performed in the selected period, other treatments changed depending on the pandemic as seen in Figure 1.

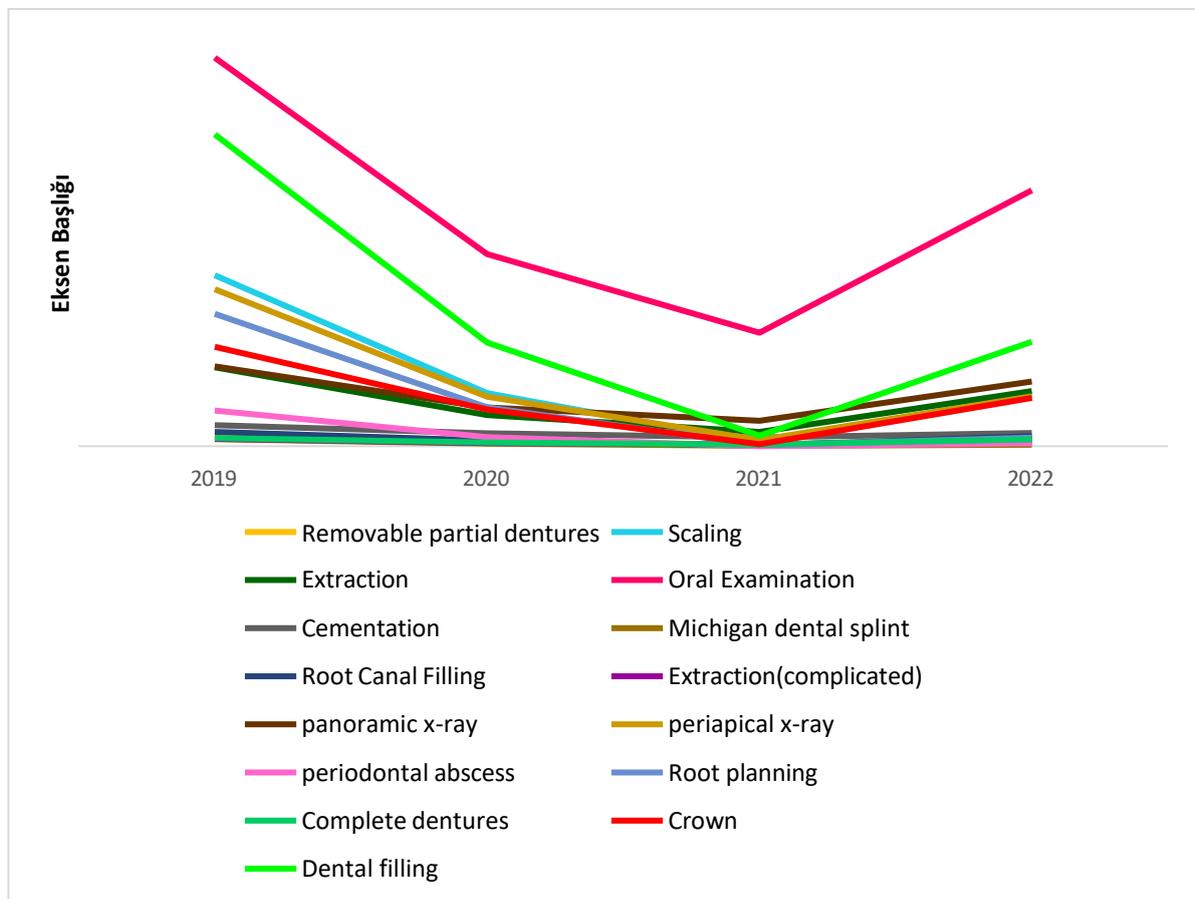


Figure 1: The number of each dental care services performed per selected year was depicted

Variables selected for DEA model were presented in table 2. Homogeneity of the data according to the treatment type was tested and among them most homogenous variables were Michigan splint (2268+2299) (mean+SD) and extraction (3545+2026) (mean+SD) (Table 2).

Table 2: Variables selected for DEA model

Variables	2019	2020	2021	2022
Input variables (number)				
Oral examination	90.218	308.925	188.835	92.504
Panoramic x-ray	63.430	30.711	20.237	51.391
Periapical x-ray	124.742	39.352	4905	39.630
Dental Filling	247.900	82.395	8390	83.051
Root canal filling	11.210	4439	403	7925
Scaling	135.851	42.146	2310	40.906
Root planning	105.133	30.714	669	6650
Periodontal abscess	28.279	7158	35	2320
Crown	78.947	29.253	1599	38.373
Removable partial dentures	7490	3178	954	5515
Complete dentures	6423	2908	1293	5311
Cementation (within emergency dental treatment)	16.601	10.197	6880	10310
Extraction	62.686	24.804	11.343	43.817
Extraction (complicated)	5841	2440	1351	4547
Michigan dental splint	5561	2009	341	1160

Variables were sorted from the most efficient to the least to test distribution of output data (Table 3). Efficiency scale value 1 was defined as efficient, whereas years under 1 represented inefficient years. Accordingly, the least efficient year was 2021 with an efficiency scale value 0.756, whereas 2019 was the most efficient year with an efficiency scale value 1 and it was followed by the year 2020 (Table3).

Table 3: Variables were sorted by year to test the distribution of output data

CRR Model (Total efficiency)			BCC Model (Technical efficiency)		Scale efficiency
Years	Relative total efficiency	Relative order of total efficiency	Relative technical efficiency	Relative order of technical efficiency	
2019	1	1	1	1	1
2020	0.987	2	0.989	2	0.997
2021	0.756	4	0.864	4	0.875
2022	0.886	3	0.896	3	0.988

4 Discussion

Efficiency measures has mainly been focused on provision of health care to facilitate a common understanding about the adequacy of followed policies as well as methods. [6] Therefore, we have decided to perform efficiency analysis for routine dental care services performed between 1 December 2018 and 1 December 2020 which was defined as pre-pandemic period with regular workflow and 1 June 2020 and 1 June 2022 as pandemic. Along the investigated four years only the year 2019 was defined as efficient. This could be interpreted as in our country first case was recorded in 2020 and therefore, dental practices have not been influenced at that period yet. Nevertheless, on 11 March 2020 WHO declared as pandemic and the year became ineffective thereafter.

Worldwide, protocols for dental care applications were released by either scientific committees and/or governmental authority straight after the pandemic but in an empiric fashion. [7,8,9] In Turkey, with the declaration of the pandemic, Ministry of Health declared a state of emergency that the dental staff assigned to duty of filiation. Therefore, the average number of active dentists in Izmir Training Dental

Hospital was decreased in 2020. Despite this decline, there was a small change in the efficiency of dental practices in the same year. Within the selected four years, due to fluctuations of the COVID-19 pandemic, considering the average number of active dentists 2021 was recorded as ineffective year. In 2022, Ministry of Health of Turkey, declared normalization period for health care services and therefore, the average number of active dentists and their performance has increased coordinately.

A linear association was observed between the oral examination and extractions, which were non-aerosol generated procedures. Along the year 2019 the number of crowns were declined to a fifth. Also, it is possible that all those crowns were fabricated previously and re-cemented due to de-cementation. Scaling-root planning, periodontal abscess treatment, crown-bridge work, endodontic treatment as well as dental filling treatment approaches demonstrated a heterogeneous trend.

In 2022 total number of root canal treatment was reached its highest level. It is assumed that dental caries that cannot be treated in 2020 and 2021 lead to an increase in more complicated and costly treatment (i.e., root canal treatment) needs in 2022.

Lock-down rule was applied to patients aged 65 or over during the pandemic which explains why the number of partial and complete dentures' applications showed a plateau even they do not generate an aerosol. Similarly, treatment for para-functional habits demonstrated heterogeneous trend. This finding could be related to the exclusion of Michigan splints from declared emergency treatment list during the pandemic.

A questionnaire-based study investigating the impact of COVID-19 on dental care in the states of New York and Georgia reported a statistically significant decrease in all dental procedures, particularly, dental prophylaxis. [10] Briefly, in the USA, from March to August 2020, emergency procedures, including extractions and endodontic treatment, declined to a lesser extent across both states. New York dental respondents reported a decrease of 20% and 21% for extractions and endodontic treatment, respectively. Georgia dental respondents reported a decrease of 4% and 6% for extractions and endodontic treatment, respectively. [10] These findings differ from the 83.8% of Brazilian dentists who reported via web-based survey that their patients looked for elective care during the pandemic. [11] In Brazil, during quarantine, 64.6% of the dentists attended only urgency/emergency treatments, while 26.1% maintained routine appointments, and 9.3% closed the dental offices [11] Furthermore, dentists that maintained routine dental care were younger and presented a significantly lower level of concern about dental treatments and oral health conditions of their patients. In the present data dental staff having chronic diseases or being pregnant were on an administrative leave meaning age of the dental staff was considerable young.

These contradictory findings, highlight the international inconsistencies among the regulations and management of the COVID-19 pandemic. In the present study, in line with the evidence, limited to city of Izmir, within the emergency dental treatments root canal treatment and extractions were the least effected treatment modalities (SD value higher than 1).

It is clearly observed from the current evidence that health care providers are not well prepared for pandemic events like COVID-19. To increase the quality and safety of dental care services for our patients more comprehensive data is needed originated from urban cities like Izmir. In this way, burden of oral care services could be prevented, and governments would be ready in both economical and work force scales.

5 Conclusion

It is concluded that COVID-19 pandemic has caused delays as well as unseen consequences in most of the routine dental care services during the year 2020 and 2021. Therefore, it is paramount important to

consider available evidence and adapt governmental health care policies for future outbreaks to protect health-care workers, patients as well as economy.

6 Declaration

6.1 Funding Source

Research expenses were provided by the researchers.

6.2 Acknowledgement

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6.3 Conflict of Interest

The authors declare no conflict of interest in this publication.

6.4 Author Contribution

Corresponding Author Akın COŞKUN: Developing ideas or hypotheses for the research and/or article, planning the materials and methods to reach the results, taking responsibility for the experiments, organizing and reporting the data, taking responsibility for the explanation and presentation of the results, taking responsibility for the literature review during the research, taking responsibility for the creation of the entire manuscript or the main part, reworking not only in terms of spelling and grammar but also intellectual content or other contributions.

7 Human and Animal Related Study

7.1 Ethical Aspects

This study was conducted by Dokuz Eylul University Non-Interventional. With the decision of the Research Ethics Committee dated 21.09.2022 and numbered 2022/30-19 has been approved.

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