

The Impact of the COVID-19 Pandemic and Vaccination on Dental Restorative Practices in the Geriatric Population

Zeynep Ceren Celik¹ , Gul Dinc Ata¹ 

¹Department of Restorative Dentistry, Faculty of Dentistry, Bursa Uludag University, Bursa, Turkiye

ORCID ID: Z.C.C. 0000-0002-6900-2632; G.D.A. 0000-0003-0025-5356

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ABSTRACT

Objective: Vaccines were considered as one of the most important public health measures during the coronavirus disease 2019 (COVID-19) pandemic. The aim of this study was to quantify and compare restorative dental practices of geriatric patients during pre-pandemic, pre-vaccination, and post-vaccination periods.

Materials and Methods: Dental records of patients aged older than 65 who presented to Bursa Oral and Dental Health Training and Research Hospital were included in the study. Restorative dental practices during the three periods: pre-pandemic period (01.01.2019–10.03.2020), pre-vaccination period (11.03.2020–13.02.2021) and post-vaccination period (14.02.2021–01.09.2021) were reviewed according to the patient's age (young-old, middle-old and old-old), sex, tooth number (anterior and posterior), restoration type (occlusal, proximal, or cervical) and the type of restoration material (amalgam or composite).

Results: Anterior restorations accounted for more than half (53%) of all restorations in the pre-COVID-19 pandemic period and 46.5% and 55.4% of restorations in the pre- and post-vaccination periods, respectively. The distribution of posterior amalgam restorations in the pre-pandemic period (31.5%) was higher than the pandemic period; in contrast, the composite restorations were higher during the pandemic pre-vaccination (73.9%) and post-vaccination (76.3%) periods ($p < 0.001$). The males (odds ratio (OR): 1.17, 95% CI: 1.03-1.34, $p = 0.02$) and middle-old (OR: 0.79, 95% CI: 0.64-0.96, $p = 0.019$) were more likely to use restorative dental services as compared to females and young-old age, respectively.

Conclusion: Vaccination had a noticeable effect on increased admissions of geriatric patients and restorative dental treatments compared to the pre-vaccination period. In addition, in the post-COVID-19 vaccination period, composite restorations seem to have replaced amalgam restorations.

Keywords: COVID-19, geriatrics, dental health services

INTRODUCTION

After coronavirus disease 2019 (COVID-19) was detected in Wuhan, China on December 2019 (1, 2), the virus quickly spread worldwide, leading to a COVID-19 pandemic. The first recorded case in Turkey was on March 11, 2020 (3). Shortly after that, on April 1, 2020, the Ministry of Health in Türkiye published a circular recommending that all elective procedures, except emergency treatment should be delayed in dental clinics (4). The circular included instructions

aimed at preventing horizontal transmission of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) and included environmental disinfection and regulations. After the virus is transmitted to a person, infection with SARS-CoV-2 activates the immune system. Vaccines can help to prevent the spread of infection by stimulating the body's immune response (5). Vaccines are one of the most important and effective public health practices in terms of their cost, reliability, and ability to prevent infectious diseases (6).

Corresponding Author: Zeynep Ceren Celik **E-mail:** zeynepceren@uludag.edu.tr

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In early 2021, the China National Medical Products Administration authorized the use of CoronaVac, a two-dose β -propiolactone-inactivated, aluminum hydroxide-adjuvanted vaccine, for the prevention of COVID-19. Since its authorization, 260 million doses have been distributed to domestic and overseas markets, including Türkiye. In Türkiye, a vaccination priority was given to healthcare workers in public and private healthcare facilities on January 14, 2021, and to geriatric individuals older than 65 years on February 11, 2021.

With the commencement of the vaccination, a period called the 'new normal' emerged in Türkiye, during which COVID-19 prevention measures continued in health care facilities, but the range of available treatments, including dental restorations, expanded (7). In the pre-vaccination period of the pandemic, it was recommended that only emergency dental treatment (endodontic and surgical characterized by pain and swelling) could be performed (4, 8). After the commencement of the vaccination program, restorative dental treatments and other elective procedures were resumed. Restorative dental treatments include restoration of hard tissue affected by dental caries using restorative materials, such as amalgam and composites. The main purpose of restorative dental treatment is to improve patient aesthetics and function (9, 10). The aim of this study was to quantify and compare restorative dental practices of geriatric patients during pre-pandemic, pre-vaccination, and post-vaccination periods.

MATERIALS AND METHODS

Ethical approval was obtained from the ethics committee of Bursa Uludag University (2021-12/26). Prior to commencement, this study was approved by the Ministry of Health Türkiye (Prot No: 2021-08-26T13_55_16) and the Bursa Governorship Provincial Health Directorate (Prot. No: E-67508481-799).

The survey population was comprised of adults older than 65 who presented to Bursa Oral and Dental Health Training and Research Hospital for general dental treatment. The initial data consisted of the medical records of all geriatric patients who presented between 01.01.2019 and 01.09.2021. The non-dental records and dental procedures (endodontic, prosthodontic, surgical, radiological, periodontal, and orthodontic) that did not match within the definition of restorative dental practices according to the Healthcare Implementation Communique were excluded.

Data on the patient's age, sex, tooth number, cavity type, and type of restoration material were reviewed retrospectively. Based on the criteria of the World Health Organization, individuals aged 65–74, 75–84 and ≥ 85 years were defined as young-old, middle-old and old-old, respectively.

Study flowcharts are demonstrated in Figure 1.

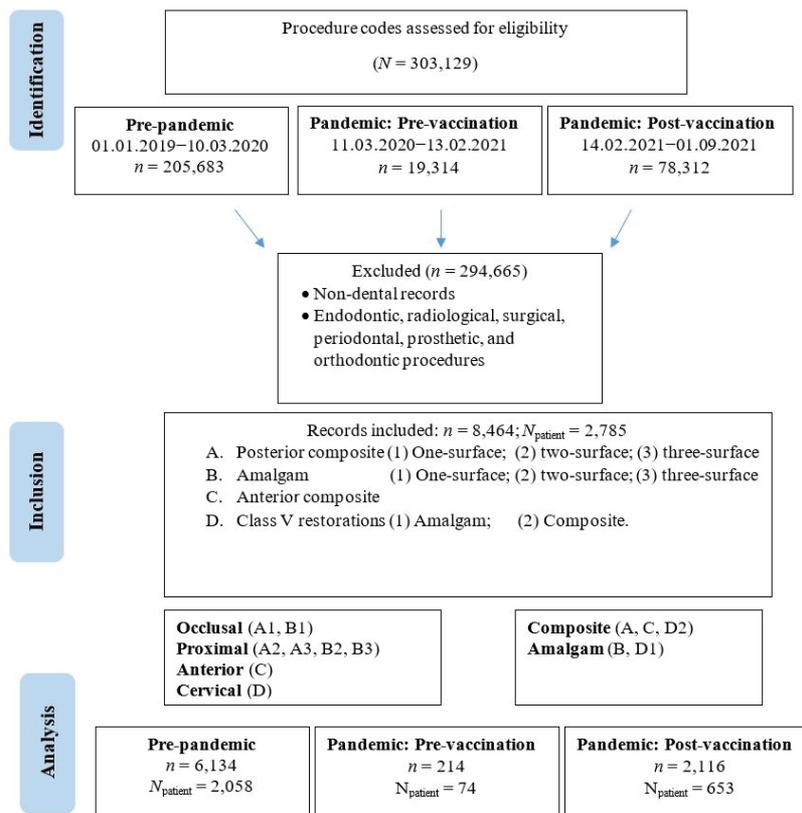


Figure 1. The study flow chart in line with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement (<http://www.strobestatement.org>).

Following assessment of eligibility, a total of 2,058 patients with 6,134 restorations during the pre-pandemic period; 74 patients with 214 restorations during the pandemic pre-vaccination period; and 653 patients with 2,116 restorations during the pandemic vaccination period were analyzed retrospectively.

Statistical Analyses

Statistical analysis was performed using the IBM SPSS ver. 23.0 (IBM Corp., Armonk, NY). The results are presented as frequencies and percentages. Binary logistic regression was performed, and crude odds ratios (ORs), along with their 95% confidence intervals (CIs), are reported. $p < 0.05$ was considered significant.

RESULTS

Table 1 provides information on the patient population and restorative treatments according to the patient presentation dates. In all three periods, more males ($n=1138, 55.3\%$; $n=41, 55.4\%$, $n=387, 59.3\%$) than females and more young-olds $n=1778, 85.8\%$; $n=63, 86.4\%$; $n=565, 86.5\%$) presented for treatment. In this study, young-olds (65-74 year olds) accounted for the majority (85.9%) of the patient population.

Anterior teeth were distributed for slightly more than half (53%) of all restorations in the pre-pandemic period, whereas they accounted for 46.5% and 55.4% of restorations after the pandemic in the pre-vaccination and post-vaccination periods, respectively (Table 1). Besides, a majority of posterior restorations were performed on proximal cavities in all periods ($p < 0.001$).

In the year before COVID-19 pandemic, 1,474 (31.5%) posterior amalgam restorations were performed. After the pandemic, there were 29 (26.1%) and 216 (23.7%) posterior amalgam

restorations performed in the pre-vaccination period and post-vaccination periods, respectively. The opposite was found for composite restorations, where the number increased to 3,207 (68.5%), 82 (73.9%), and 695 (76.3%) in the pre-pandemic, pre-vaccination, and post-vaccination periods, respectively (Figure 2). The difference in the number of amalgam versus composite restorations performed in the pre-pandemic period versus the other two periods (pre- and post-vaccination) was statistically significant ($p < 0.001$).

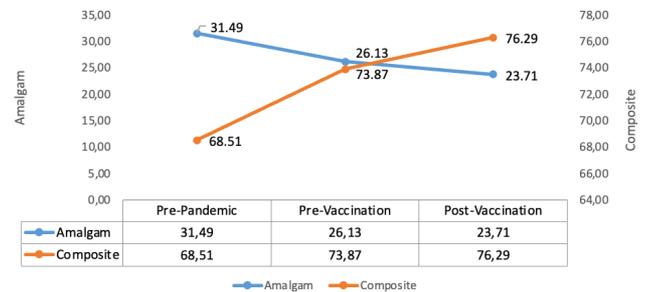


Figure 2. Trajectory of posterior amalgam and composite restorations in the geriatric patient population before and during the COVID-19 pandemic.

Considering the number of dental visits of all geriatric patients in a year, males (OR: 1.17, 95% CI: 1.03-1.34, $p=0.02$) and middle-olds (OR 0.79, 95% CI: 0.64-0.96, $p=0.019$) were more likely to use restorative dental services than were females and young-olds.

DISCUSSION

Elderly individuals have an increased risk of caries due to the inability to perform oral hygiene and the prolongation of expo-

Table 1. Patient population and dental restorations in the three periods.

		COVID-19 Pandemic			p	
		Pre-pandemic n=2,058	Pre-vaccination n=74	Post-vaccination n=653		
Patients n (%)	Sex	Male	1,138 (55.3)	41 (55.4)	0.390	
		Female	920 (44.7)	33 (44.6)		266 (40.7)
	Age	65-74	1,778 (85.8)	63 (86.4)	565 (86.5)	0.668
		75-84	269 (13.1)	10 (13.5)	83 (12.7)	
≥ 85		11 (0.5)	1 (1.4)	5 (0.8)		
Restorative dental practices n (%)	Anterior		n=6,134	n=214	n=2,116	<0.001
			3,253 (53.0)	100 (46.7)*	1,173 (55.4)	
	Posterior	Occlusal	563 (9.2)	24 (11.2)	183 (8.6)	
		Proximal	2,203 (35.9)*	87 (40.7)*	728 (34.4)*	
		Cervical	115 (1.9)	3 (1.4)	32 (1.5)	

* indicates statistical significance.

sure to cariogenic factors with advancing age, as well as physiological changes caused by aging or general health problems (11, 12). The main purpose of restorative dental treatments is considered as rehabilitating dental hard tissues affected by caries. After COVID-19 was defined as a pandemic, dental elective procedures, except emergency treatments were delayed until the vaccination period. The present study investigated restorative dental practices of geriatric patients during the pre-pandemic, pre-vaccination, and post-vaccination periods.

During the post-vaccination period of the COVID-19 pandemic, there was approximately a 10-fold increase in the number of patients who presented for restorative dental treatments compared to the pre-vaccination period. In this study, we detected a marked decrease in all types of restorative dental practices during the COVID-19 pandemic (pre- and post-vaccination periods) in accordance with the literature (13-15).

The number of anterior composite restorations performed prior to the COVID-19 pandemic was higher than that during the pandemic (pre- and post-vaccination periods). The number decreased to 46.7% during the pre-vaccination period. Considering that the majority of anterior restorations are performed for aesthetic purposes (16), this decline could be explained by the restrictions placed on elective procedures during the pandemic (4). Another finding of this study was the observed increase of approximately 10% in anterior restorations performed in the post-vaccination period. This finding may have resulted from patients' expectations in terms of aesthetics (16). It may also reflect dental-related characteristics of the geriatric patient population. These characteristics include a shortened dental arch (17) and limited posterior teeth to restore.

The choice of restorative material depends on patients' expectations in terms of aesthetics and caries risk, in addition to the location and severity of caries. According to the findings of this study, a composite was preferred as restorative material, both before and after the COVID-19 pandemic. Previous research concluded that cavity preparation of composites was less invasive than amalgam (18). The decrease in amalgam restorations from 31% to 23% during the pandemic may be associated with the preference for the use of less-aerosol generating techniques during this period.

The main factor underlying the preference for composite resins is the potential risk of mercury in amalgams (19, 20). Other factors are the preservation of more tooth structure and the aesthetic benefits of composite resin materials versus those achievable by amalgam restorations (19,20). Opdam et al. reported that the performance of composite restorations for large cavities was superior to that of amalgam restorations (21). In our study, proximal restorations were significantly higher when compared to occlusal. Consistent with our findings, other studies found that geriatric patients tended to present with extensively restored tooth structures and often larger restorations (9, 10, 22).

As found in our study, male patients (OR: 1.17, 95% CI: 1.03-1.34, p=0.02) were more likely than female patients were to present

for restorative dental treatments. This finding supports the results of an epidemiological study conducted by Gökalp et al. in Türkiye, in which the prevalence of restored teeth in males and females aged 65–74 years was 17.6 and 12.4, respectively (23). In this study, the majority of the patients requiring dental restorations were aged between 65–74 years (Table 1). The age profile of our patients is consistent with that of another study conducted in Türkiye (24). The reason for the higher number of dental visits among middle-old (74–85 year) (OR: 0.79, 95% CI: 0.64-0.96) may be associated with increased dental health problems and oral health conditions associated with aging (24, 25).

The results of our analysis of a comprehensive dataset suggest that the vaccination resulted in a marked increase in the number of geriatric patients presenting for dental restorative treatment and in composite restorations. Vaccination seems to hold promise as a means to offset the consequences of the current devastating pandemic in terms of restorative dental services provided to geriatric patients.

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Ethics Committee Approval: Ethical approval was obtained from the ethics committee of Bursa Uludag University (2021-12/26). Prior to commencement, this study was approved by the Ministry of Health Türkiye (Prot No: 2021-08-26T13_55_16) and the Bursa Governorship Provincial Health Directorate (Prot. No: E-67508481-799).

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REFERENCES

1. Lu H, Stratton CW, Tang YW. Outbreak of pneumonia of unknown etiology in Wuhan, China: The mystery and the miracle. *J Med Virol* 2020; 92(4): 401-2. [CrossRef]
2. Sohrabi C, Alsafi Z, O'Neill N, Khan M, Kerwan A, Al-Jabir A, et al. World Health Organization declares global emergency: A review of the 2019 novel coronavirus (COVID- 19). *Int J Surg* 2020; 76: 71-6. [CrossRef]
3. Ince F, Evcil F. The first three weeks of the COVID-19 in Turkey. *Suleyman Demirel Uni J Health Sci* 2020; 11: 236-41.
4. Çelik H, Çelik ZC, Yanikoglu F Tağtekin D, Hıdıroğlu S. The Importance of Novel Coronavirus 2019 (COVID-19) for Oral and Dental Professionals and Treatments. *Türkiye Klinikleri J Dental Sci* 2021; 27(2): 318-23. [CrossRef]
5. Sell S. How vaccines work: immune effector mechanisms and designer vaccines. *Expert Rev Vaccines* 2019; 18(10): 993-1015. [CrossRef]
6. Xing K, Tu XY, Liu M, Liang ZW, Chen JN, Li JJ, et al. Efficacy and safety of COVID-19 vaccines: a systematic review. *Zhongguo Dang Dai Er Ke Za Zhi* 2021; 23(3): 221-8.

7. Kantrowitz-Gordon I. A New Normal After the COVID-19 Pandemic. *J Midwifery Womens Health* 2021; 66(3): 293-4. [\[CrossRef\]](#)
8. Peskersoy C, Gurlek O. Dental precautions and emergencies during COVID-19 outbreak: A review of the current literature. *EÜ Dişhek Fak Derg.* 2020; 41(1): 27-36. [\[CrossRef\]](#)
9. Huang Y, Song B, Zhou X, Chen H, Wang H, Cheng L. Dental restorative materials for elderly populations. *Polymers (Basel)* 2021; 13(5): 828. [\[CrossRef\]](#)
10. Jablonski RY, Barber MW. Restorative dentistry for the older patient cohort. *Br Dent J* 2015; 218(6): 337-42. [\[CrossRef\]](#)
11. Saunders RH, Meyerowitz C. Dental caries in older adults. *Dent Clin North Am* 2005; 49(2): 293-308. [\[CrossRef\]](#)
12. Allen PF, Da Mata C, Hayes M. Minimal intervention dentistry for partially dentate older adults. *Gerodontology* 2019; 36(2): 92-8. [\[CrossRef\]](#)
13. Ahmadi H, Ebrahimi A, Ghorbani F. The impact of COVID-19 pandemic on dental practice in Iran: A questionnaire-based report. *BMC Oral Health* 2020; 20(1): 354. [\[CrossRef\]](#)
14. Farooq I, Ali S. COVID-19 outbreak and its monetary implications for dental practices, hospitals and healthcare workers. *Postgrad Med J* 2020; 96(1142): 791-2.
15. Erdinç G, Yılmaz Çirakoğlu N. COVID-19 pandemic and its effects on dentistry: A retrospective study. *Clin Exp Health Sci* 2021; 11(4): 819-24. [\[CrossRef\]](#)
16. LeSage BP. Aesthetic anterior composite restorations: a guide to direct placement. *Dent Clin North Am* 2007; 51(2): 359-78. [\[CrossRef\]](#)
17. Khan S, Musekiwa A, Chikte UM, Omar R. Differences in functional outcomes for adult patients with prosthodontically-treated and -untreated shortened dental arches: A systematic review. *PLoS ONE* 2014; 9(7): e101143.
18. Anguswamy S, Adeni KM. Changing concepts and trends from dental amalgam to composites. *J Global Oral Health* 2021; 4(1): 38-41. [\[CrossRef\]](#)
19. Demarco FF, Corrêa MB, Cenci MS, Moraes RR, Opdam NJ. Longevity of posterior composite restorations: Not only a matter of materials. *Dental Materials* 2011; (28): 87-101.
20. Roeters FJ, Opdam NJ, Loomans BA. The amalgam-free dental school. *J Dent* 2004; (32): 371-7.
21. Opdam NJ, Bronkhorst EM, Loomans BA, Huysmans MC. 12-year survival of composite vs. amalgam restorations. *J Dent Res* 2010; (89): 1063-7.
22. Rodrigues JA, Lussi A, Seemann R, Neuhaus KW. Prevention of crown and root caries in adults. *Periodontol* 2000 2011; 55(1): 231-49. [\[CrossRef\]](#)
23. Gökalp S, Doğan BG, Tekçiçek M, Berberoglu A, Unluer S. The oral health profile of adults and elderly, Turkey-2004. *J Hacettepe Fac Dent* 2007; 31(4): 11-8.
24. Ozsoy HE, Atalay S, Azak AN. Assessment of oral and general health status in older adults. *J Clin Med Kaz* 2020; 3(57): 24-8. [\[CrossRef\]](#)
25. Razak PA, Richard KM, Thankachan RP, Hafiz KA, Kumar KN, Sameer KM. Geriatric oral health: a review article. *J Int Oral Health* 2014; 6(6): 110-6.