

ORIGINAL ARTICLE

Reason for Tooth Extraction During Pandemic COVID-19 in Military Hospital, Ambon Indonesia

Indah Kartikasari¹, Fredy Mardiyantoro², Taufan Bramantoro³¹ Graduate Student of Dental Health Science, Faculty of Dental Medicine, Universitas Airlangga, Jl. Mayjen Prof. Dr. Moestopo 47, 60132, Indonesia² Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, Universitas Brawijaya, Jl. Veteran Malang. 65145, Indonesia³ Department of Dental Public Health, Faculty of Dental Medicine, Universitas Airlangga, Jl. Mayjen Prof. Dr. Moestopo 47, 60132, Indonesia

ABSTRACT

Introduction: Most dental clinics have limited dental procedures because of the risk of SARS-CoV2 transmission during the pandemic. In some cases, tooth extraction may potentially generate droplets and aerosols. **Objective:** To determine the characteristics of tooth extraction before and throughout the early COVID-19 pandemic. **Methods:** The data were collected from medical records at the dental clinic of Prof. Dr. J.A. Latumeten Military Hospital, Ambon, Indonesia, and split into two time periods—before the pandemic group (January 2019-March 2020) and early pandemic group (April 2020-August 2021). The collected data included gender, age, tooth type, and diagnosis. **Results:** The total number of patients before and during the early pandemic was 752 and 517, respectively. Patients under the age of 19 had the highest rate of tooth extraction both before (31.2%) and during the early pandemic (39.7%). Males accounted for 64% and 60.2% of all patients before and during the early pandemic. Molars were the most often extracted teeth before (55.8%) and during the early pandemic (62.3%). The major cause of tooth extraction before the pandemic was necrosis of pulp (41.6%), while pulpitis (45.7%) was the leading cause of extraction during the early pandemic. **Conclusion:** At the beginning of the COVID-19 pandemic, pulpitis was observed as the most often cause of tooth extraction, with a lower number of patients having extractions compared to the pre-pandemic period, indicating an altered patients' approach to dental treatment as a result of the pandemic.

Keywords: Pandemic; Reasons for tooth extraction; The pattern of tooth extraction; Oral health

Corresponding Author:

Fredy Mardiyantoro, DDS, MDSc, OMFS

Email: fredy.fre@ub.ac.id

Tel: 62(341)576161

INTRODUCTION

The coronavirus disease 2019 (COVID-19), caused by SARS-CoV2, was originally discovered in Wuhan, China, before rapidly spreading over the world and being declared a public health emergency of international concern by the end of January 2020(1). The main transmission modes of SARS-CoV2 include airborne and contact transmission. In addition, fomites and fecal-oral pathways are considered possible transmission. Because of the extremely contagious nature of SARS-CoV-2, many medical institutions have decided to suspend all elective treatments to lower the risk of infection (2,3). Routine procedures in dental settings may generate aerosols. Dental devices and office settings could be contaminated by saliva or

blood droplets inevitably produced during the use of ultrasonic devices and dental handpieces. Consequently, patients and dental professionals are at risk of contracting the infection. Dental office personnel should take precautions to minimize the risk of infection during procedures. Therefore, it is crucial to comprehend aerosol transmission and its ramifications in the dental setting. During this specific period, in addition to conventional safeguards, special precautionary measures should be taken as well (4,5) Dentists have expressed concern about SARS-CoV2 nosocomial transmission, which might put both dentists and patients at risk of virus contagion (6). On the clinical side, telemedicine is prioritized even though the examination process is limited. Telemedicine might affect the accuracy of diagnosis, resulting in inappropriate drug choices and treatment strategies. Moreover, the dentist faces challenges when using panoramic x-ray rather than intraoral radiography because of its limited accuracy to assess the stage of cavities, bone loss, dental practicality

index, and root canal structure. For example, an emergency pulpectomy is more unpredictable in the absence of a periapical x-ray which can precisely analyze the root canal shape (7). The frequency of conventional dental procedures has dramatically reduced during the COVID-19 outbreak, while dental surgery, conversely, has increased. The outbreak has an impact on the range of dental treatments carried out, particularly in the early stage (8). Our study aimed to compare the reason for tooth extraction and the number of cases before and during the early COVID-19 pandemic.

MATERIALS AND METHODS

This was an observational study through a medical record review undertaken from January 2019 to August 2021 at the dental clinic of Prof. dr. J.A. Latumeten Military Hospital, Ambon, Maluku-Indonesia. Data collection was split into two parts. The first part included patient demographic information. There were eight age groups of patients as follows: 0-9 years, 10-19 years, 20-29 years, 30-39 years, 40-49 years, 50-59 years, 60-69 years, and ≥70 years. The second part included the tooth type extracted, and the reasons for extraction including pulpitis (reversible/irreversible), necrosis of the pulp, periodontitis, retained primary tooth (persistent), and other reasons. The data were split into two time periods—before the pandemic group (January 2019-March 2020) and the early pandemic group (April 2020-August 2021). As of April 2020, Indonesia has reached a large number of confirmed cases based on official data released by the Indonesian government (9). The approval of this study was obtained from Research Ethics Committee (No.196/HRECC.FODM/IV/2022). The SPSS statistics 20 software was used for data analysis, while paired t-test was performed to test different factors with $P < 0.05$.

RESULTS

A total of 1269 patients underwent tooth extraction during the study period. Patients undergoing tooth extraction are distributed according to patient status, gender, and age range in two periods (Table I).

The number of patients undergoing tooth extraction before the pandemic (n = 752) was higher than during the early pandemic (n = 517). However, no statistically significant difference was found between the two groups ($p = 0.053$). Among patients in the study, males accounted for 64% and 60.2% in BPG and EPG, respectively. The data showed most patients were aged 10-19 years in both BPG (31.2%) and EPG (39.7%) with no statistically significant difference being found ($p = 0.951$). Even though Prof. dr. J.A. Latumeten is a military hospital

in Ambon, Indonesia, the number of civilian patients was higher than the military ones in both groups. The numbers of military and civilian patients before the pandemic were 112 (14.9%) and 640 (85.1%), respectively. During an early pandemic, they were 87 (16.8%) and 430 (83.2%), respectively.

Table I : Distribution of patients undergoing tooth extraction according to patient status, gender and age range in two time periods.

	BPG	%	EPG	%
	(n)		(n)	
Patient status				
Soldier	112	14.9	87	16.8
Civil	640	85.1	430	83.2
Gender				
Male	481	64	311	60.2
Female	271	36	206	39.8
Age				
0 decade	104	16	64	14.1
1 st decade	202	31.2	180	39.7
2 nd decade	134	20.7	94	20.8
3 rd decade	149	23	69	15.2
4 th decade	78	12	35	7.7
5 th decade	60	9.3	40	8.8
6 th decade	21	3.2	30	6.6
7 th decade & over	4	0.6	5	1.1
Total patients	752	100	517	100

BPG, before pandemic group; EPG, early pandemic group.

Table II shows that the first/second molars were the most often extracted teeth before and during the early pandemic (55.8% and 62.3%, respectively). However, the tooth type between the two groups showed no significant difference ($p = 0.087$). Before the pandemic, necrosis of pulp (41.6%) was the major reason for tooth extraction, followed by pulpitis (38%) and persistent tooth (17%). During the early pandemic, pulpitis accounted for 45.3% as the leading cause of extraction, followed by pulp necrosis (39.4%) and persistent tooth (11.3%). In regards to the causes of tooth extraction, there was a statistically significant difference between the groups. ($p = 0.007$).

Table II : Distribution of patients undergoing tooth extractions according to tooth type and reasons for extraction in two time periods.

	BPG	%	EPG	%
	(n)		(n)	
Tooth type				
Incisors	133	17.3	95	12.5
Canines	28	3.6	17	3.2
Premolars	104	13.5	60	11.5
1 st /2 nd Molars	429	55.8	324	62.3
3 rd Molars	75	9.8	24	4.6
Reasons for ex- traction				
Pulpitis (reversible/ irreversible)	292	38	236	45.3
Necrosis of pulp	320	41.6	205	39.4
Persistent	131	17	59	11.3
Periodontitis	17	2.2	12	2.3
Other reasons	9	1.1	8	1.5
Total	769	100	520	100

BPG, before pandemic group; EPG, early pandemic group.

DISCUSSION

The COVID-19 outbreak has impacted dental practice worldwide. Dental practitioners opted to reduce their practice hours and confine the dental services only in urgent care due to the potential of COVID-19 spreading when the dental clinic reopened (10,11). The use of coolant water when performing dental procedures could generate aerosols. When mixed with physiological fluids, such as blood and saliva, bioaerosols are formed. A prior study found that aerosols may suspend in the air for hours and accordingly be inhaled by dentists and patients. It might allow the spread of airborne disease in the clinic (5,12).

Eastern Indonesia, Maluku, 14,384 people have been confirmed positive as of August 31, 2021. Ambon is the highest of all islands in Maluku. For this reason, the Ambon city government enforces inter-island PPKM (13). Prof. dr. J.A. Latumeten Army Hospital is on a referral hospital around Ambon city, which give treatment not only for military personel but also for civillians patient. The number of civilian patient was higher than military personel with total number is 199 (15.7%) military personel and 1070 (84.3%) civilians. This condition is

same with other study from Sutthavong et al that was also conduct in military hospital and the number of patient also higher in civilian patients (14).

Early in the pandemic, many primary healthcare centers closed for fear of COVID-19 spreading. Patients with emergency cases from peripheral healthcare centers or primary dental practices might be referred to this hospital. The study results showed that the overall dental patient count was reduced by 31.3% (Table I). Dental treatment services in this hospital were still available throughout the pandemic, particularly for emergency cases, with pharmacotherapy as the first choice and less invasive procedures as the last resort. A study by Chisini *et al.* also reported a considerable decrease in all types of dental care during the COVID-19 pandemic (15). Concerning the significant risk of contamination in dental clinics, health facilities and professional organizations released recommendations to restrict services to urgent/emergency care only (16,17). Dental team members are responsible to implement and maintain the recommended protective measure to minimize the risk of transmission in dental clinics (18).

Interestingly enough, the percentage distribution of patients undergoing tooth extraction between the groups was not significantly different. This may be because the susceptibility of different tooth types to a particular risk remained relatively constant over time. However, an obvious difference was observed between the total number of males (n=792) and females (n=477) during the study period. The ratio was 64% males to 36% females before the pandemic and 60.1% males to 39.8% females during the early pandemic (Table I).

It is in line with a previous study showing that men were more likely to seek emergency care than women and only sought treatment for serious dental issues (19). Urgent dental problems which could be treated with less invasive and not aerosol-generating procedures include pulp infections requiring tooth extraction, pain due to cracked teeth, the dry socket which might be treated with not aerosol-generating procedure, acute pericoronitis, periodontal or dental abscess, and gingival laceration caused by the orthodontic appliance (20,21). To minimize the risk of contagion, dental treatments with minimal or without aerosol generation provided by Prof. dr. J.A. Latumeten Military Hospital were limited to urgent conditions only.

According to the age range, the study results showed that the pattern of missing teeth was significantly different. Before and during the early pandemic, tooth extraction was most frequently performed in the first decade. The most common cause of tooth extraction

in that age range included necrosis of pulp, impacted teeth with pain, and persistence of deciduous tooth. The other study reported by Stennett dan Tsakos showed that the primary cause for hospitalization among patients <19 years old was tooth extraction, particularly in secondary dental care because of the variety of dental problems experienced during that age (22). Moreover, the age group over 60 years had a lower percentage before (3.8%) and during the early pandemic (7.7%) compared to the younger ones. This is in concordance with the study conducted by González-Olmo et al. which found that geriatric patients and those with systematic ailment were more vulnerable to developing COVID-19 and postponing dental treatment (23).

The results of the study found that pulp necrosis was the primary cause of tooth extraction before the pandemic, while during the early pandemic, pulpitis was the predominant reason for tooth extraction. Before the pandemic, tooth extraction was only performed if teeth were unable to repair, thus pulp necrosis was recorded as the most frequent cause of extraction. Meanwhile, some patients with pulpitis in the early pandemic had the option of conservative or endodontic treatment, but they preferred tooth extraction even though it could be preserved. Accordingly, the frequency of pulpitis as the reason for extraction was high during an early pandemic. Necrosis of the pulp and pulpitis are related to dental caries since both of them involve in the caries process. In the pre-pandemic period, tooth decay was the leading cause of tooth extraction as reported by several studies (24–26).

Molar teeth were the most frequently extracted teeth due to necrosis of pulp or pulpitis before and during the early pandemic (55.8% and 62.3%, respectively). This tooth type is more susceptible to developing cavities due to its anatomy which has more pits and grooves than the other teeth. The early loss of first and second molars is a result of poor dental hygiene (25). Another study also found that the most often extracted teeth due to caries, periodontal diseases, and impaction problems were molars (27).

However, the present study acknowledges several limitations. First, the sample size was relatively small. Thus, in some cases, the sample size could not be representative of the reference population. Second, the duration of the study was limited which might have had an impact on the sample size. More large-scale population studies in diverse regions are required to comprehend the COVID-19 impact on dental treatment, particularly tooth extraction.

CONCLUSION

Dental treatment in Ambon, Indonesia, has been impacted by the COVID-19 outbreak. Necrosis of pulp was the primary reason for extraction before the pandemic, while during the early pandemic, pulpitis was the leading cause of extraction. Furthermore, molars were the most often extracted tooth for various reasons. Patients under the age of 19 had the highest rate of tooth extraction before and during the early pandemic. Hopefully, this study will provide healthcare professionals with a summary of dental treatment during the COVID-19 pandemic.

ACKNOWLEDGMENT

Special Thanks to Direktur of Military Hospital Prof. Dr. J.A.Latumeten, Ambon, Indonesia who has contributed and supported this research so this study can run properly and be completed in time.

REFERENCES

1. Wu D, Wu T, Liu Q, Yang Z. The SARS-CoV-2 outbreak: What we know. Vol. 94, *International Journal of Infectious Diseases*. Elsevier B.V.; 2020. p. 44–8.
2. Peng X, Xu X, Li Y, Cheng L, Zhou X, Ren B. Transmission routes of 2019-nCoV and controls in dental practice. Vol. 12, *International Journal of Oral Science*. Springer Nature; 2020.
3. Guo YR, Cao QD, Hong ZS, Tan YY, Chen SD, Jin HJ, et al. The origin, transmission and clinical therapies on coronavirus disease 2019 (COVID-19) outbreak- An update on the status. Vol. 7, *Military Medical Research*. BioMed Central Ltd.; 2020.
4. Sebastiani FR, Dym H, Kirpalani T. Infection Control in the Dental Office. Vol. 61, *Dental Clinics of North America*. W.B. Saunders; 2017. p. 435–57.
5. Ge Z yu, Yang L ming, Xia J jia, Fu X hui, Zhang Y zhen. Possible aerosol transmission of COVID-19 and special precautions in dentistry. Vol. 21, *Journal of Zhejiang University: Science B*. Zhejiang University Press; 2020. p. 361–8.
6. Meng L, Hua F, Bian Z. Coronavirus Disease 2019 (COVID-19): Emerging and Future Challenges for Dental and Oral Medicine. *J Dent Res*. 2020 May 1;99(5):481–7.
7. Wu KY, Wu DT, Nguyen TT, Tran SD. COVID-19's impact on private practice and academic dentistry in North America. Vol. 27, *Oral Diseases*. Blackwell Publishing Ltd; 2021. p. 684–7.
8. Nijakowski K, Cieřlik K, Łaganowski K, Gruszczynski D, Surdacka A. The impact of the

- covid-19 pandemic on the spectrum of performed dental procedures. *Int J Environ Res Public Health*. 2021 Apr 1;18(7).
9. Djalante R, Lassa J, Setiamarga D, Sudjatma A, Indrawan M, Haryanto B, et al. Review and analysis of current responses to COVID-19 in Indonesia: Period of January to March 2020. *Progress in Disaster Science*. 2020 Apr 1;6.
 10. Guo H, Zhou Y, Liu X, Tan J. The impact of the COVID-19 epidemic on the utilization of emergency dental services. *J Dent Sci*. 2020 Dec 1;15(4):564–7.
 11. 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 Dec 1;20(1).
 12. Harrel SK, Molinari J. Aerosols and splatter in dentistry: A brief review of the literature and infection control implications. *Journal of the American Dental Association*. 2004;135(4):429–37.
 13. Pemerintah Provinsi Maluku. Press release Satgas Provinsi Maluku - 18 Nopember 2021 [Internet]. Ambon; 2021 Nov [cited 2022 Mar 18]. Available from: http://www.covid19maluku.com/download.php?file_id=192
 14. Sutthavong S, Cae-Ngow S, Rangsin R. Oral health survey of military personnel in the Phramongkutkiao Hospital, Thailand. *J Med Assoc Thai*. 2009 Feb 1;92:S84-90.
 15. Chisini LA, dos Santos Costa F, Sartori LRM, Corrka MB, D'avila OP, Demarco FF. COVID-19 Pandemic impact on Brazil's Public Dental System. *Braz Oral Res*. 2021;35:1–11.
 16. Jiang CM, Duangthip D, Auychai P, Chiba M, Folayan MO, Hamama HHH, et al. Changes in Oral Health Policies and Guidelines During the COVID-19 Pandemic. *Frontiers in Oral Health*. 2021 May 20;2.
 17. Deana NF, Seiffert A, Aravena-rivas Y, Alonso-coello P, Mucoz-mill6n P, Espinoza-espinoza G, et al. Recommendations for safe dental care: A systematic review of clinical practice guidelines in the first year of the covid-19 pandemic. Vol. 18, *International Journal of Environmental Research and Public Health*. MDPI; 2021.
 18. Torabinia N, Nilchian F, Razavi SM. Dental team and infection control for the COVID-19:(A short review of the current guidelines). *Dental Research Journal*. 2020 Dec 10;17(6):409–11.
 19. Tramini P, al Qadi Nassar B, Valcarcel J, Gibert P. Factors associated with the use of emergency dental care facilities in a French public hospital. *Special Care in Dentistry*. 2010 Mar;30(2):66–71.
 20. Alharbi A, Alharbi S, Alqaidi S. Guidelines for dental care provision during the COVID-19 pandemic. *Saudi Dental Journal*. 2020 May 1;32(4):181–6.
 21. Benzian H, Niederman R. A Dental Response to the COVID-19 Pandemic—Safer Aerosol-Free Emergent (SAFER) Dentistry. *Front Med (Lausanne)*. 2020 Aug 12;7.
 22. Stennett M, Tsakos G. The impact of the COVID-19 pandemic on oral health inequalities and access to oral healthcare in England. *Br Dent J*. 2022 Jan 28;232(2):109–14.
 23. Gonz6lez-Olmo MJ, Ortega-Martinez AR, Delgado-Ramos B, Romero-Maroto M, Carrillo-Diaz M. Perceived vulnerability to Coronavirus infection: Impact on dental practice. *Braz Oral Res*. 2020;34.
 24. Al-Shammari KF, Al-Ansari JM, Al-Melh MA, Al-Khabbaz AK. Reasons for tooth extraction in Kuwait. *Medical Principles and Practice*. 2006 Oct;15(6):417–22.
 25. Passarelli PC, Pagnoni S, Piccirillo GB, Desantis V, Benegiamo M, Liguori A, et al. Reasons for tooth extractions and related risk factors in adult patients: A cohort study. *Int J Environ Res Public Health*. 2020 Apr 1;17(7).
 26. Richards W, Ameen J, Coll AM, Higgs G. Reasons for tooth extraction in four general dental practices in South Wales. Vol. 198, *British Dental Journal*. 2005. p. 275–8.
 27. Sharif RA, Chaturvedi S, Suleman G, Elmahdi AE, Elagib MFA. Analysis of tooth extraction causes and patterns. *Open Access Maced J Med Sci*. 2020;8(D):36–41.