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Original Article

Impact of the COVID-19 pandemic on the utilization of medical and dental services in Taiwan: A cohort study

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Introduction

The coronavirus disease 2019 (COVID-19) is a serious global public health crisis and poses a severe health and socio-economic impact till now. The COVID-19 caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) began to infect the world from late December 2019 and caused lockdowns in many cities and countries. Up to January 17th, 2021, COVID-19 has resulted in over 2 million deaths and over 95 million confirmed cases worldwide.[1] Beside the huge health impact to people, the economic impact on many industries has been profound.

As the SARS-CoV-2 continued to be transmitted, measures such as quarantine and social distancing have been used to restrict and prevent the spreading of the disease. In order to prevent the nosocomial infection, more strictly restrict rules in hospitals were performed including asking people to wear a face mask before entering hospitals, recording body temperature, collecting the history of travel, occupation, contact, and cluster (TOCC) of all visitors, limiting the numbers that accompany the patients, and following the triage and workflow protocol for suspected COVID-19 patients from January 23rd, 2020, Taiwan.[2,3] All suspected and confirmed cases would be sent to 116 designated isolation hospitals and 22 COVID-19 network-district response hospitals.[4]

The medical services personnel on the front lines of fighting the COVID-19 pandemic, apart from bearing high personal risks, are impacted by the public's fear of infection and the associated policies influencing their seeking-care behavior. This places a burden on hospitals' finances and even results in the loss of hospital employment and operational crisis.[5–7] Based on previous studies,[8–13] medical utilization reductions were observed in ambulatory services, inpatient care, and emergency care in different countries during major infectious disease epidemics such as Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS). According to Dr. Chung's study, the significant reductions were found in ambulatory care (23.9%), inpatient care (35.2%) and dental care (16.7%) at the peak of SARS in Taiwan.[12] From the further Dr. Chu's study,[10] it took 2 years to achieve approximately 80% recovery at an infection response hospital after the SARS lockdown. Some nonurgent treatments were restricted and the rate of elective surgery fell by over 15% in Toronto during the SARS periods.[8] The impact on the medical utilization in the emergency department (ED) was also noticed. The ED visits decreased by 40% during the SARS period and patients visited the ED with more critical conditions than before in Taiwan.[9] Similarly, the number of emergency room visits decreased by 33.1% during the peak of MERS epidemic in South Korea and the more reduction was observed on low-acuity diseases than of high-acuity diseases.[11]

COVID-19 is one of the most severe pandemics in human history. However, impact of the COVID-19 pandemic on the utilization of medical and dental services has not been extensively studied. This study aimed to investigate the utilization of medical and dental services in different levels of hospitals, local clinics and a designated COVID-19 network-district response hospital before and during the peak COVID-19 period in the early pandemic in Taiwan.

The main transmission routes of COVID-19 comprise droplet infection, including inhalation and contact infection of the patient's blood, saliva, and other body fluids through contacting the oral and nasal mucosa.[14] The dental procedures are thought of as having a high risk of spreading the COVID-19.[15–17] However, the studies regarding the impact of COVID-19 on the utilization of dental services and the influences of dental procedures are limited. This study would further compare the number of main dental treatments performed before and during the COVID-19 peak period and analyzed patterns for the changes, if any.

Materials and methods

Study design

This study compared the monthly utilization of medical and dental ambulatory services from January to March, 2019 with those from January to March, 2020, the peak COVID-19 period in Taiwan. We also examined the trends of medical care service utilization in outpatient visits, dental visits, and some main dental treatments from January 2019 through April 2020 to explore the changes in Taipei City Hospital (TCH), the only COVID-19 network-district response hospital in Taipei.

Data sources

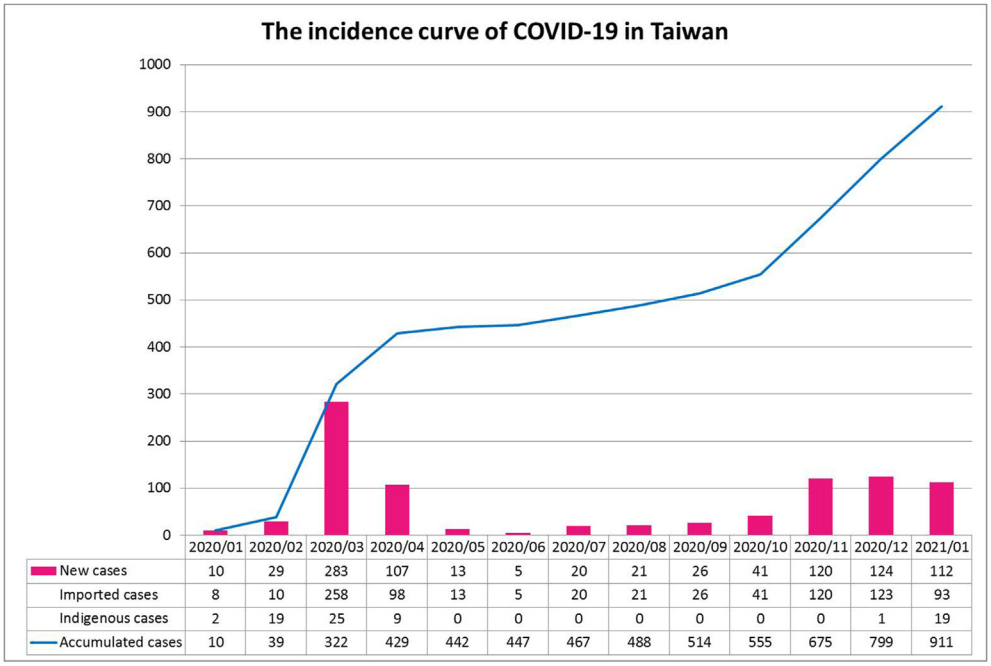
Data were collected from the Taiwan National Health Insurance between January to March in 2019 and 2020. The medical ambulatory and dental utilization of Taipei City Hospital from January 2019 to April 2020 were used. Moreover, this study used Taiwan center of disease control (CDC) COVID-19 surveillance data to calculate the incidence curve of laboratory-confirmed SARS-CoV-2 cases in Taiwan.[18] The study protocol was approved by the institutional review board (TCHIRB-10904009-E).

Outcome variable

Medical utilization included ambulatory medical and dental visits at different levels of hospitals (medical centers, regional hospitals, and district hospitals) and clinics. January–March 2019 was defined as before the pandemic and January–March 2020 as during the pandemic. The reduction ratio of ambulatory utilization = visits [(2020/01 to 03) - (2019/01 to 03)] ÷ (2019/01 to 03). The reduction rate between dental and medical visits = the reduction ratio of dental visits ÷ the reduction ratio of medical visits.

The utilization of dental services included for comparison were tooth decay filling, tooth extraction, impacted tooth extraction, emergency periodontal treatment, tooth scaling, periodontal surgery, emergency endodontic treatment, and root canal treatment.

This study compared the utilization of medical and dental services in different levels of hospitals before and



	2020/01	2020/02	2020/03	2020/04	2020/05	2020/06	2020/07	2020/08	2020/09	2020/10	2020/11	2020/12	2021/01
New cases	10	29	283	107	13	5	20	21	26	41	120	124	112
Imported cases	8	10	258	98	13	5	20	21	26	41	120	123	93
Indigenous cases	2	19	25	9	0	0	0	0	0	0	0	1	19
Accumulated cases	10	39	322	429	442	447	467	488	514	555	675	799	911

Figure 1 The incidence curve of COVID-19 in Taiwan. There was a total of 911 cases and 91% of confirmed cases were imported carriers in Taiwan from January 2020 to January 2021.

during COVID-19 pandemic. In Taiwan, the hospitals are classified into medical center, regional hospital, and district hospital according to the hospital accreditation system by hospital scale, hospital management, medical quality, manpower training and research et al.[19] There was a total of 25 medical centers, 82 regional hospitals, 364 district hospitals, and 10480 medical clinics and 6746 dental clinics until March 2020.[20]

Statistical analysis

Medical utilization was compared throughout the month during the range of comparison. Linear regression was conducted to analyze the trends of ambulatory medical and dental visits, and various dental treatments. Statistical significance was set at 5% and all analyses were conducted using SAS (version 9.4; SAS Institute, Inc, Cary, NC).

Results

The incidence of COVID-19 in Taiwan

The first COVID-19 case was reported on January 21st, 2020, in Taiwan, and the number of COVID-19 cases peaked in March, 2020, with 322 accumulated cases. Following that, the number of new cases decreased to 107 in April, 2020. The number of new cases drastically decreased to only 13 and 5 cases in May and June, respectively. There was no new indigenous cases from April 12th till December 22nd. In

Table 1 Utilization of ambulatory medical and dental visits during COVID-19.

	Medical visits		Dental visits		Dental/medical reduction rate[c]
	n[a] (10,000)	reduction ratio[b]	n[a] (1000)	reduction ratio[b]	
Overall[d]	6681	−6.8%	8009	−5.1%	0.8
Hospitals[d]	2264	−5.7%	600	−13.8%	2.4
Medical center	678	−5.9%	255	−16.1%	2.7
Regional hospital	910	−6.1%	247	−13.3%	2.2
District hospital	676	−4.8%	98	−8.4%	1.8
Clinic	4417	−7.3%	7409	−4.3%	0.6
Taipei City Hospital[e]	65	−7.8%	13	−25.2%	3.2

[a] Ambulatory visits during 2020/01-03.
[b] Reduction ratio = visits of (2020/01-03 - 2019/01-03) ÷ visits of (2019/01-03).
[c] Reduction rate of dental/medical = reduction ratio of dental ÷ reduction ratio of medical.
[d] Data from National Health Insurance.
[e] Data from Taipei City Hospital, a COVID-19 response hospital.

December there was only one indigenous case. Fortunately, the infection did not expanded. In January 2021, a hospital cluster infection occurred, 19 people were infected and one of those deceased. Taiwan CDC continues to observe the cluster infection carefully.[18] From January 2020 to January 2021, there were 911 cases in total and 91% of confirmed cases were imported carriers in Taiwan (Fig. 1).

Medical and dental ambulatory visits during COVID-19 in different levels of hospitals and local clinics

From January to March 2020, compared with the same period in 2019, the total ambulatory medical visits in all medical institutions in Taiwan decreased by 6.8%, while the total number of dental visits decreased by 5.1% (Table 1).

For medical visits, the reduction ratios in medical centers, regional hospitals, district hospitals and clinics were 5.9%, 6.1%, 4.8%, and 7.3%, respectively. Clinics were the most affected. For dental visits, the reduction ratios were 16.1%, 13.3%, 8.4%, and 4.3% in medical centers, regional hospitals, district hospitals, and in dental clinics respectively. Medical centers were most affected, while dental clinics were least affected.

Among hospitals, the total reduction of dental visits (reduction ratio = 13.8%) is 2.4 fold greater than medical visits (reduction ratio = 5.7%). However, among clinics, the total reduction of dental visits is only 0.6 fold of that of medical clinics.

Medical utilization and trends analysis in a COVID-19 network-district response hospital

TCH is a regional hospital and is one of the COVID-19 network-district response hospitals in northern Taiwan. The reduction ratios in ambulatory medical services and dental visits in TCH were 7.8% and 25.2%, respectively, both were more severe than other hospitals and clinics in Taiwan. The reduction of dental visits was 3.2 folds of that of medical visits, and the reduction rate was the highest among all levels of hospitals and clinics (Table 1).

Analysis of the number of ambulatory visits in TCH showed a fluctuation of medical utilization without a directed trend between January 2019 and December 2019. However, a significant decrease trend of ambulatory visits and dental visits were found from December 2019 to April 2020 ($p = 0.024$ and $p = 0.012$, respectively) (Fig. 2).

Influences of COVID-19 on different dental procedures

Besides the significant reduction of dental visits during the COVID-19 period observed, this study investigated the trend of the main dental treatments at TCH from January 2019 to April 2020. The numbers of emergency periodontal treatments, tooth scaling, and periodontal surgeries were all significantly reduced (p-value of the trend test: 0.007, 0.019, and <0.001, respectively [Fig. 3A]); the other dental treatments did not show significant changes (Fig. 3B).

Discussion

This cohort study found that during the COVID-19 period, there were reductions in both ambulatory medical and dental visits among all hospitals and medical clinics or dental clinics. The overall reduction in medical visits was greater than that in dentistry. The most severe reduction in ambulatory medical visits was at clinics, while the most severe reduction in dental visits was at hospitals.

During the COVID-19 pandemic, about 10 percent of all confirmed cases in Taiwan admitted to the hospitals.[4] Physicians other than infection doctors and nurses were required to take care of COVID-19 patients. The restrictive policies of hospitals, medical manpower rescheduling, and delayed arrangements for chronic disease and non-emergency visits would reduce the ambulatory medical and dental visits. Due to concerns about COVID-19 and nosocomial infections, some patients may choose to cancel the appointment.

The same reason might explain the most severe reduction of ambulatory utilization of TCH compared to other hospitals and clinics. TCH has been the network-district response hospital with the most confirmed COVID-19 cases in Taipei during this pandemic. The public's fear resulted in a more severe reduction in medical and dental visits at TCH. In 2003, the SARS epidemic severely led to serious nosocomial infection and lockdown of Heping Hospital,[21] which is one of the branches of TCH. After the SARS epidemic, it was subsequently renovated and became a designated infection control hospital. According to Dr. Chu's study,[10] the percentage of outpatient visits in 2003 was reduced to 55% compared to those in 2002 and only recovered to 84% in 2005.

Regardless of the levels of hospitals, the reduction in dental visits was far higher than that of medical ambulatory utilization especially at TCH whose number of dental visits was decreased by 25.2%, which is 3.2 times that of reduction in ambulatory medical visits during the COVID-19 peak period.

Dentistry is considered to have a higher risk than other medical consultation and treatments, since patients need to open their mouth for dental procedures. Therefore, the reduction in dental visits is greater than those of medical visits. Because the number of dental clinics in Taiwan far exceeds the number of dental departments in hospitals, it is more convenient to seek dental services from dental clinics. In addition, more restrictions imposed on hospitals, and fear of nosocomial infection led many dental patients to seek dental treatments in private clinics instead of going to hospitals for dental treatments. This causes the more reduction of dental utilization in higher-level hospitals, while the reduction in dental clinic visits is lower. However, the reduction in visits to dental departments in TCH, the network-district COVID-19 response hospital is far higher than medical centers and other hospitals.

As infection from COVID-19 is mainly via droplets and aerosol transmission, dental treatments that produce aerosol will cause the spread of SARS-CoV2. Therefore, dentistry has a high risk of spreading COVID-19.[15–17] During this period, many countries have implemented different restrictions on dental care. For example, throughout the

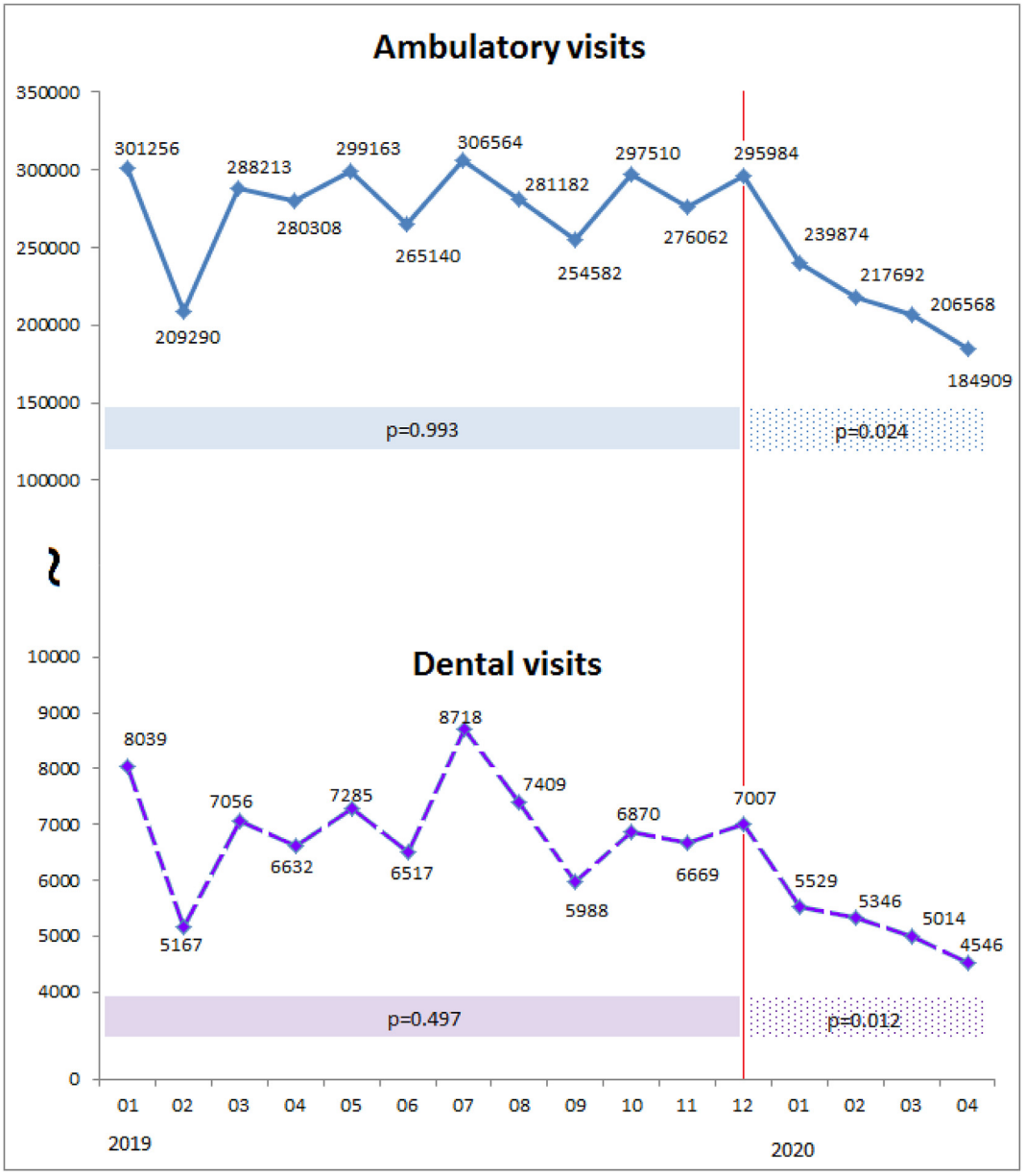


Figure 2 Ambulatory medical and dental visits at a COVID-19 response hospital, trend test. A significant decrease trend of ambulatory visits and dental visits in Taipei City Hospital were found from December 2019 to April 2020.

severe COVID-19 period, the United States Center for Disease Control (CDC) has ordered a complete or partial stop to elective dental treatments. Countries such as China,[22,23] the United States,[7,24] Canada, France,[25] Spain,[26] Argentina,[27] Italy,[28] Norway, Denmark,[29] Australia,[30] etc., followed similar rules of waiting until the pandemic has gradually eased before reinstating full recovery in stages. In South Korea, the Philippines, Poland,[31] and parts of Japan and Singapore,[32] although there were no restrictions on the operations of dental clinics, there were explicit restrictions or guidelines on the specifics of dental procedures. In Taiwan, because there was no large-scale community infection, neither the government nor the dental associations restricted hospitals or private dental clinics from offering medical services.[18] The recommendation for dental practitioners was to have enough personal protective equipment (PPE) protection, and there were no restrictions or regulations on the specifics of dental procedures.

Some dental intervention involving aerosol-generation procedures would increase the risk of COVID-19 transmission, such as ultrasonic tooth scaling and periodontal treatments. These treatments are suggested to be postponed by government health ministries of many countries and relative dental associations to prevent the transmission of COVID-19.[7,24]

The results of this study showed that periodontal treatments including emergency periodontal treatment, tooth scaling, and periodontal surgery were all significantly reduced during the COVID-19 period. The results of another survey from Germany also showed that the ratio of

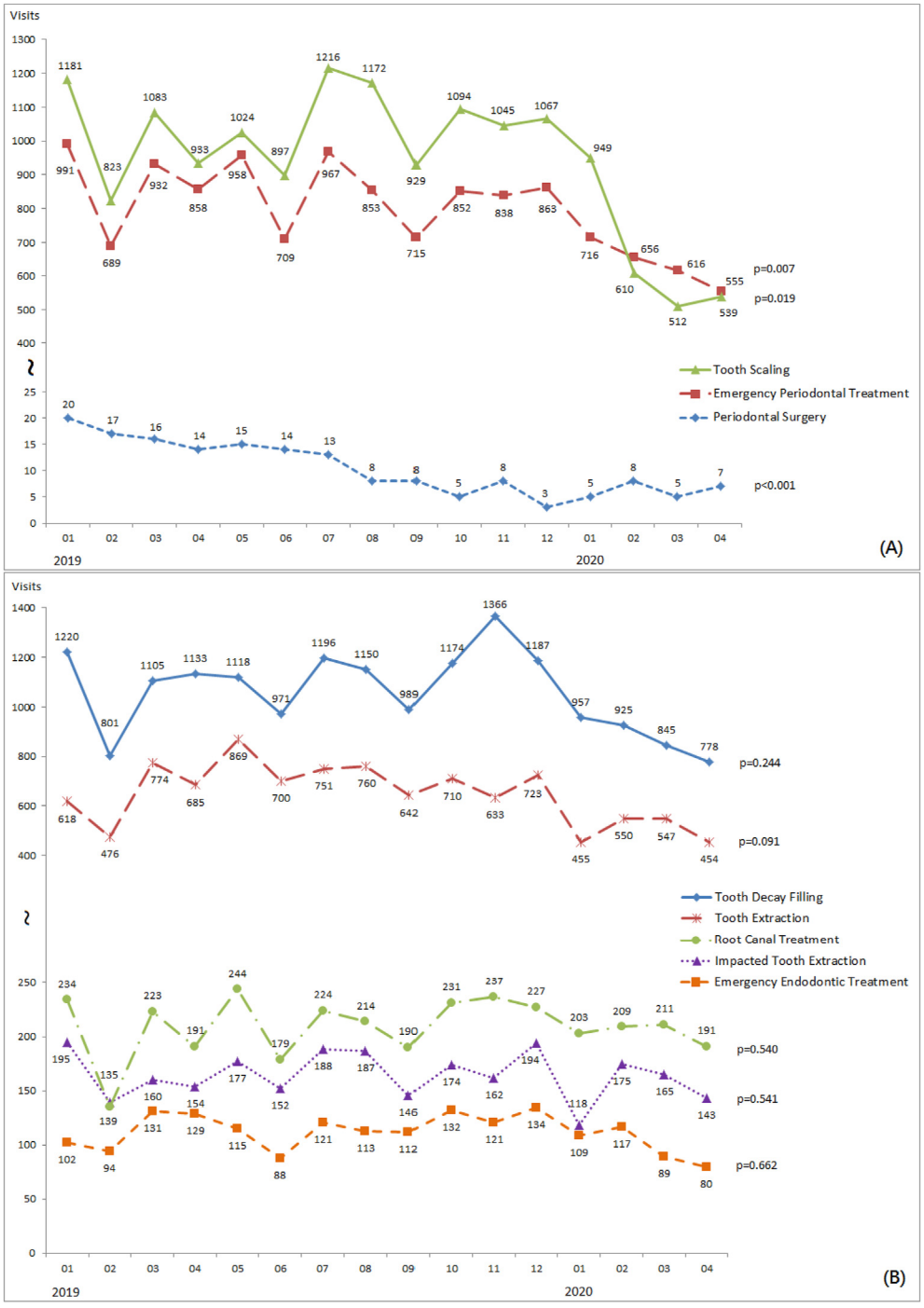


Figure 3 The influence of COVID-19 on main dental treatments at a COVID response hospital. (A) Treatments with significant trend of reduction. (B) Other treatments. From January 2019 to April 2020, the numbers of emergency periodontal treatments, tooth scaling, and periodontal surgeries were all significantly reduced; the other dental treatments did not show significant changes.

periodontal treatments carried out by dentists decreased by 76%.[6]

Our study showed that the reduction in some dental procedures were not significant. Among these dental procedures, emergency endodontic treatment is an urgent dental treatment to relieve severe pain caused by acute pulpitis. However, the emergency endodontic treatment, root canal treatments, and the tooth decay filling can be performed with a rubber dam application, which can isolate the sick tooth from the oral environment in order to decrease contamination with saliva and blood.[33,34] The use of a rubber dam and high-power suction are suggested to reduce the risk of aerosol transmission.

Another study from China also found that their overall dental emergency care reduced by 38% and the main reason for dental emergency visits was dental pulpal diseases

(44.7%), including periapical lesions during the COVID-19 epidemic. The non-urgency dental treatments reduced to three-tenths of those before COVID-19.[13]

The results of studies showed that COVID-19 resulted in postponement of many non-emergency or highly infectious dental procedures. Therefore, the investigators anticipate that more severe dental problems or complications may occur in the post-COVID-19 period.

An important limitation of this study is the external validity of our findings. Since Taiwan CDC successfully contained the spreading of SARS-CoV-2 in the community, limited patients were diagnosed with SARS-CoV-2 infection during the COVID-19 pandemic.[18] It will be important to explore these issues in other countries and over time.

The restrictive policies of hospitals increased the expenditure on medical services and the burden on hospitals. The public's fear of COVID-19 influenced people's care-seeking behavior and reduced the utilization of medical and dental services and hospital revenue, and even result in an operational crisis in medical institutions. The different severity of reduction of medical utilization among different affiliation institutions, especially at the COVID-19 designated isolation and network-district response hospitals may worth further evaluation of its effect on people's health status and future public and medical models. Measures should be taken by the government to make up for losses and to maintain operations in medical institutions to combat COVID-19 during the pandemic.

Declaration of competing interest

The authors have no conflicts of interest relevant to this research.

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References

1. National Center for High-performance Computing (NCHC). *Covid-19 dashboard*. 2020. https://covid-19.nchc.org.tw/index_en.php. [Accessed 15 January 2021].
2. Centers of Disease Control, R.O.C.(Taiwan). *Infection control protocol for dental care (covid-19)*. 2020. https://www.cdc.gov.tw/File/Get/qjZ0JzzFZwRA9l6EYpu0Bg. [Accessed 15 January 2021].
3. Chen CC, Tseng CY, Choi WM, et al. Taiwan government-guided strategies contributed to combating and controlling covid-19 pandemic. *Frontiers in public health* 2020;8:547423.
4. Centers of Disease Control, R.O.C.(Taiwan). *Infection control protocol for medical institutions (covid-19)*. 2020. https://www.cdc.gov.tw/Category/ListContent/NO6oWHDwvVfwb2sbWzvHWQ?uaid=UDXo5Wd2jDnm__vJUU9PjQ. [Accessed 15 January 2021].
5. Cutler David. *How will covid-19 affect the health care economy?*. 2020. https://jamanetwork.com/channels/health-forum/fullarticle/2764547. [Accessed 15 January 2021].
6. Schwendicke F, Krois J, Gomez J. Impact of SARS-CoV2 (covid-19) on dental practices: economic analysis. *J Dent* 2020;99:103387.
7. Simon Lisa. *How will dentistry respond to the coronavirus disease 2019 (covid-19) pandemic?*. 2020. https://jamanetwork.com/channels/health-forum/fullarticle/2766388. [Accessed 15 January 2021].
8. Schull MJ, Stukel TA, Vermeulen MJ, et al. Effect of widespread restrictions on the use of hospital services during an outbreak of severe acute respiratory syndrome. *CMAJ* 2007;176:1827—32.
9. Chen T, Lai K, Chang H. Impact of a severe acute respiratory syndrome outbreak in the emergency department: an experience in Taiwan. *Emerg Med J* 2004;21:660—2.
10. Chu D, Chen RC, Ku CY, Chou P. The impact of SARS on hospital performance. *BMC Health Serv Res* 2008;8:228.
11. Lee SY, Khang YH, Lim HK. Impact of the 2015 middle east respiratory syndrome outbreak on emergency care utilization and mortality in South Korea. *Yonsei Med J* 2019;60:796—803.
12. Chang HJ, Huang N, Lee CH, Hsu YJ, Hsieh CJ, Chou YJ. The impact of the SARS epidemic on the utilization of medical services: SARS and the fear of SARS. *Am J Public Health* 2004;94:562—4.
13. 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;15:564—7.
14. Ong SWX, Tan YK, Chia PY, et al. Air, surface environmental, and personal protective equipment contamination by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) from a symptomatic patient. *Jama* 2020;323:1610—2.
15. Lucaciu O, Tarczali D, Petrescu N. Oral healthcare during the covid-19 pandemic. *J Dent Sci* 2020;15:399—402.
16. Peng X, Xu X, Li Y, Cheng L, Zhou X, Ren B. Transmission routes of 2019-nCoV and controls in dental practice. *Int J Oral Sci* 2020;12:9.
17. Lv N, Sun M, Polonowita A, Mei L, Guan G. Management of oral medicine emergencies during covid-19: a study to develop practise guidelines. *J Dent Sci* 2021;16:493—500.
18. Centers of Disease Control, R.O.C.(Taiwan). *Taiwan national infectious disease statics system*. 2020. https://www.cdc.gov.tw/. [Accessed 15 January 2021].
19. Cheng FC, Chang JY, Lin TC, Tsai PF, Chang YT, Chiang CP. The status of hospital dentistry in Taiwan in October 2019. *J Dent Sci* 2020;15:505—12.
20. National Health Insurance Administration, R.O.C.(Taiwan). *Statistics of medical institutions*. 2020. https://www.nhi.gov.tw/English/. [Accessed 15 January 2021].
21. Chen KT, Twu SJ, Chang HL, et al. SARS in Taiwan: an overview and lessons learned. *Int J Infect Dis* 2005;9:77—85.
22. Meng L, Hua F, Bian Z. Coronavirus disease 2019 (covid-19): emerging and future challenges for dental and oral medicine. *J Dent Res* 2020;99:481—7.
23. Yang Y, Zhou Y, Liu X, Tan J. Health services provision of 48 public tertiary dental hospitals during the covid-19 epidemic in China. *Clin Oral Invest* 2020;24:1861—4.
24. Panesar K, Dodson T, Lynch J, Bryson-Cahn C, Chew L, Dillon J. Evolution of covid-19 guidelines for university of Washington oral and maxillofacial surgery patient care. *J Oral Maxillofac Surg* 2020;78:1136—46.
25. Association dentaire française. *Covid-19 - ressources à l'usage des chirurgiens-dentistes*. 2020. https://www.adf.asso.fr/fr/covid-19. [Accessed 15 January 2021].

26. Abogados Ramon y Cajal. *Spanish royal decree 463/2020, of march 14th, 2020, declaring the state of alarm in Spain to manage the health crisis situation caused by covid-19*. 2020. https://www.ramonycajalabogados.com/en/spanish-royal-decree-4632020-march-14th-2020-declaring-state-alarm. [Accessed 15 January 2021].
27. Ministerio de Salud Argentina. *Covid-19 atención odontológica programada inicial*. 2020. http://www.msal.gob.ar/images/stories/bes/graficos/0000001937cnt-covid-19-recomendaciones-atencion-odontologica-programada.pdf. [Accessed 15 January 2021].
28. *Quotidiano online d'informazione sanitaria website. Fase 2. dal triage alla disinfezione degli studi. pronte le linee guida per l'attività odontoiatrica*. 2020. http://www.quotidianosanita.it/lavoro-e-professioni/articolo.php?articolo_id=84891. [Accessed 15 January 2021].
29. Dental Tribune International website. *Dentists in Denmark and Norway go back to work*. 2020. https://coronavirus.dental-tribune.com/news/dentists-in-denmark-and-norway-go-back-to-work/. [Accessed 15 January 2021].
30. Dental Board Ahpra. *Covid-19 update: restrictions on dental practice have changed*. 2020. https://www.dentalboard.gov.au/News/2020-04-23-COVID19-update-to-dental-practitioners-23-April. [Accessed 15 January 2021].
31. Dominiak M, Różyło Kalinowska I, Gedrange T, et al. Covid-19 and professional dental practice-the polish dental association working group recommendations for procedures in dental office during an increased epidemiological risk. *J Stoma* 2020;73:1—10.
32. Ministry of health Singapore. *Clinical workflow for patients presenting for dental care at private dental clinics*. 2020. http://www.sda.org.sg/sda_content/pdf/MOH_Cir_No_91_2020_4Apr20_Workflow_for_Dental_Patients.pdf. [Accessed 15 January 2021].
33. Jingjing Y, Tian Z, Dan Z, Markus H, Ya S. Characteristics of endodontic emergencies during coronavirus disease 2019 outbreak in wuhan. *J Endod* 2020;46:730—5.
34. Ather A, Patel B, Ruparel NB, Diogenes A, Hargreaves KM. Coronavirus disease 19 (covid-19): implications for clinical dental care. *J Endod* 2020;46:584—95.