

# Changes in the Spectrum of Dental Emergencies Under the Influence of SARS-COV-2

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## Research article

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# Abstract

**Background**To master the distribution and changing characteristics of dental diseases is of great significance for the dental emergency center in order to strengthen the treatment abilities of medical staff and the effective use of emergency resources in the face of public health emergencies of highly infectious respiratory diseases.

**Methods**The medical records of 4260 cases of dental emergency patients from December 2019 to March 2020 were retrospectively analyzed, with patients being divided into the pre- Corona Virus Disease 2019 (SARS-COV-2) group and the during SARS-COV-2 group according to the date of their admittance to the dental emergency department. The patient demographics, occurrence of dental emergencies and treatment approaches were compared before and during the pandemic.

**Results**During the pandemic period, the number of dental emergency visits increased by 25.56% compared with those before the pandemic. From the view of demographic, the proportion of patients aged 0 – 17 years decreased by 10.6%, while the proportion of patients aged 46 – 65 years increased by 6.9%. The emergency patient amount reduced during the week and increased at the weekend, the distribution of the peak time of patient visits was 13:00 – 18:00, and the emergency patient amount at night decreased obviously compared with that before the outbreak of the epidemic. A major change is acute pulpitis/root peri-arthritis ratio increased by 9.2%, fell 17.9%, before the outbreak on dental and maxillofacial trauma stitch, the residual roots and residual crowns and other non-emergency diseases increased by 3.2%. Among the treatment methods, dental local drug irrigation, dental local hemostasis, and local treatment of pericoronitis were the main treatment approaches, accounting for 63.1% of the total cases. The use of local anesthesia decreased and the use of painkillers increased during the SARS-COV-2 pandemic.

**Conclusion**SARS-COV-2 led to changes in the spectrum of dental emergency cases. The dental emergency department should optimize the treatment procedures, optimize the staffing and reasonably allocate materials according to the changes, to improve the on-site treatment capacity and provide adequate dental emergency care.

## Background

Corona Virus Disease 2019 (SARS-COV-2) has spread globally and the World Health Organization has declared the novel coronavirus outbreak to be a global public health emergency.[1] The number of infected people in the world is increasing daily, and by April 15, 2020, the number of confirmed cases in

the world has exceeded 2 million[2]. The high prevalence and incidence of dental diseases is one of the major public health problems in the world, with 55% of people globally suffering from dental diseases of different degrees, especially among the elderly and low-income people. Dental diseases have become a major health burden[3], with the disease spectrum ranging from diseases that endanger peoples' health by different degrees in certain regions of the world. Different regions show specific characteristics in terms of dental disease occurrences, which are affected by environment, economy as well as social and cultural context[4]. Since SARS-COV-2 is transmitted by droplets and physical contact, people are advised or ordered to self-isolate at home to reduce contact opportunities via large gatherings or interpersonal meetings, leading to changes in the living environment and lifestyle of the population[5]. Due to the close contact between dentist and patient during a dental treatment, there is a high risk of cross-infection between them[6]. Most dental hospitals and clinics chose to reduce the outpatient service or stopped treatment altogether, or decided to only operate their dental emergency department. The dental emergency department has become the only outlet to treat patients, and consequently, the emergency dental medical treatment process has also changed. Dental emergencies progress quickly because of the acute and complex nature of the conditions in patients [7]. It is therefore important to master the distribution and variation of disease characteristics of dental emergencies in the face of a public health crisis, such as currently experienced with SARS-COV-2, with the strengthening of the emergency services and the reasonable allocation of emergency resources being of great significance[6]. Through a retrospective database analysis from December 2019 to March 2020, this study sought to identify the occurrence of dental emergency visits, including the treatments applied and drugs utilized. Both the utilization of these services before the SARS-COV-2 outbreak and during the pandemic were compared in terms of any differences in patient numbers seen. The results of this study seek to provide a scientific basis to similar situations in the future for the diagnosis and treatment of dental emergency cases and may provide a reference for the adequate provision of dental emergency services in terms of equipment, material, technology and personnel.

## **Materials**

### **Data sources**

Medical records from the database of the dental emergency system of the National Research Center for dental clinical medicine in China were selected for 4260 cases of dental emergency patients. These patients all received a definite diagnosis, had a complete medical record and attended the emergency department of the hospital from December 2, 2019 to March 8, 2020.

### **Classification Of Dental Diseases**

According to the standards of the International Classification of Diseases, 10th edition (ICD-10), the following seven categories of dental emergencies preliminarily diagnosed by pre-hospital physicians were included into this study: (1) acute pulpitis/root peri-arthritis (APP), (2) acute pericoronitis (AP), (3) gap

infection (including serious infections such as osteomyelitis) (GP), (4) periodontitis (including gingivitis and bleeding gums) (PD), (5) dental and maxillofacial trauma (TR), (6) temporomandibular joint dislocation (JD), (7) other (including stitches, residual roots and residual crowns) (OU).

## Study Groups

For this study, the first incidence of SARS-COV-2 reported by the Health Commission of Chengdu, was confirmed for January 20, 2020. Hence, patients admitted to the dental emergency department from January 20 to March 8, 2020 (7 weeks in total) were selected as the SARS-COV-2 pandemic group, and the patients admitted to the dental emergency department from December 2, 2019 to January 19, 2020 (7 weeks before the outbreak) were selected as the pre-pandemic group.

## Outcomes

A retrospective before-and-after comparative analysis was conducted to compare the patient characteristics during these two treatment periods: (1) the demographic characteristics: sex (male, female), age (0 ~ 18 years old in the juvenile group, 19 ~ 45 years old in the youth group, 46 ~ 65 years old in the middle-aged group, 66 years old and above in the elderly group); (2) the time period (weekly trend changes, daily trend changes); (3) the dental emergency treatment approaches (including dental local flushing and application of drugs, local treatment of pericoronitis, local dental hemostasis, pulp drainage, pulp inactivation, pulp cavity disinfection, pulp extraction, tooth defect bonding and repair, bonding, dressing change, and jaw adjustment); (5) drug use (local anesthetic drug use, dental drug use, external drug use).

## Statistical Methods

The statistical analysis was performed using the SPSS (version 20.0) software. The Kolmogorov-Smirnov test was used to determine normality of the obtained data. Data were normally distributed, shown as mean  $\pm$  standard deviation, and a one-way analysis of variance was used for inter-group comparison. The number of cases and the composition ratios were used for the calculation of data. The between-group comparison was conducted by using a paired t-test and Bonferroni correction was used for multiple tests. The linear regression model was used to test the inter-group trends. The significance level was set at 0.05.

## Results

As shown in Table 1, a total of 4260 cases of emergency patients were included in the study, which consisted of 1818 cases in the pre- SARS-COV-2 group and 2442 cases in the during SARS-COV-2 group. There were 931 males (51.2%) and 887 females (48.8%) in the pre- SARS-COV-2 group, with a sex ratio of

1.04:1. In terms of age composition, 591 patients (32.5%) were aged 0–17 years in the juvenile group, 910 (50.1%) were aged 18–45 years in the youth group, 225 (12.4%) were aged 46–65 years in the middle-aged group, and 225 (12.4%) were aged over 65 years in the elderly group. The mean age was  $27.39 \pm 19.77$  years. In the during SARS-COV-2 group, there were 1236 males (50.6%) and 1206 females (49.4%), with a sex ratio of 1.02:1. Among the age groups, 535 (21.9%) were 0–17 years old in the juvenile group, 1299 (53.2%) were 18–45 years old in the youth group, 468 (19.2%) were 46–65 years old in the middle-aged group, and 140 (5.7%) were over 65 years old in the elderly group. The mean age was  $33.06 \pm 19.37$  years. Age, day and time period were statistically significant ( $p < 0.05$ ).

Table 1  
Epidemiological characteristics of patients using dental emergency before and during SARS-COV-2

	per-SARS-COV-2	During SARS-COV-2	$\chi^2$	P value
N	1818(42.7%)	2442(57.3%)		
Gender				
male	931(51.2%)	1236(50.6%)	0.148	0.700
female	887(48.8%)	1206(49.4%)		
Age				
0–17yr	591(32.5%)	535(21.9%)	76.668	0.000
18–45yr	910(50.1%)	1299(53.2%)		
46–65yr	225(12.3%)	468(19.2%)		
≤ 66yr	92(5.1%)	140(5.7%)		
Day				
weekdays	1311(72.1%)	1680(68.8%)	5.479	0.019
weekends	507(27.9%)	762(31.2%)		
Time				
1:00–7:00	460(25.3%)	893(36.6%)	193.775	0.000
8:00–12:00	604(33.2%)	1015(41.6%)		
13:00–18:00	559(30.7%)	386(15.8%)		
19:00–24:00	195(10.7%)	148(6.1%)		

Before and during the SARS-COV-2 outbreak, the number of dental emergency patients during the pandemic period increased by 25.56% compared with the number of patients admitted to the emergency department before the pandemic, with the average daily emergency visits increasing from 37.1 to 49.8.

After a brief decline in the early stages of the pandemic, the number of patients in the dental emergency department of the pandemic group increased with raising numbers of patients diagnosed with SARS-COV-2. As the number of patients diagnosed with SARS-COV-2 peaked and remained stable for 12 days, the number of patients of the pandemic group admitted to the dental emergency department decreased significantly. Before the outbreak, the number of patients in the dental emergency department showed an uneven fluctuation, and there was a small peak in the number of patients at the end of every week (Fig. 1).

The changing characteristics of the disease spectrum are shown in Table 2. The disease spectrum of the pandemic group was composed of acute pulpitis/periapical periodontitis (35.1%), dental and maxillofacial trauma (20.1%), acute periapical coronitis (16.3%), other (including removal of stitches, residual roots, residual crowns, and others) (10.1%), periodontitis (including gingivitis and gingival bleeding) (9.3%), space infection (5.4%), and temporomandibular joint dislocation (1.3%). The disease spectrum in the pre-pandemic group consisted of dental and maxillofacial trauma (38.0%), acute pulpitis/periapical periodontitis (25.9%), acute pericoronary inflammation (14.6%), periodontitis (including gingivitis and gingival bleeding) (9.6%), other (including removal of stitches, residual roots, residual crowns, and others) (6.9%), space infection (3.5%), and temporomandibular joint dislocation (1.4%). There was a statistically significant difference in the number of patients per disease category between the two groups ( $\chi^2 = 191.152, P < 0.001$ ).

Table 2  
The spectrum of emergency dental diseases before and during the SARS-COV-2 pandemic

Diseases	Total	pre-SARS-COV-2	during-SARS-COV-2	Pvaule
N	4260(100%)	1818(42.7%)	2442(57.3%)	
APP	1329(31.2%)	471(25.9%)	858(35.1%)	$\chi^2 = 191.152 p < 0.000$
AP	664(15.6%)	266(14.6%)	398(16.3%)	
PD	195(4.6%)	64(3.5%)	131(5.4%)	
SI	402(9.4%)	175(9.6%)	227(9.3%)	
TR	1183(27.8%)	691(38.0%)	492(20.1%)	
JD	56(1.3%)	26(1.4%)	56(1.3%)	
OU	431(10.1%)	125(6.9%)	431(10.1%)	

According to the statistical data relating to the treatment methods of dental emergency patients, local dental rinsing and application of drugs, local treatment of pericoronitis, and local dental hemostasis were all common treatment methods before and during the pandemic (Table 3). The local treatment of dental hemorrhage and a change of dressings were performed 8.09% and 1.72% less before the pandemic than those in the early stage of the pandemic, respectively. Pulp drainage, pulp inactivation, and pulp extraction increased by 7.05%, 5.92%, and 0.55%, respectively, compared with those in the early stages of

the pandemic. Jaw adjustment, bonding, and tooth defect bonding restoration decreased by 0.82%, 2.22%, and 3.78%, respectively, compared with those in the early stage of the pandemic.

Table 3  
Dental emergency patient treatment program before and during SARS-COV-2

Treatment program	Total	pre-SARS-CoV-2	during-SARS-CoV-2	P value
Rinse and apply the medicine locally in the mouth	1345(30.8%)	512(30.1%)	833(31.3%)	$\chi^2 = 614.246$ $p < 0.000$
Local treatment for pericoronitis	806(18.5%)	313(18.4%)	493(18.5%)	
Dental local hemostasis	720(16.5%)	365(21.4%)	355(13.3%)	
Pulp drainage	344(7.9%)	61(3.6%)	283(10.6%)	
Dressing	408(9.3%)	177(10.4%)	231(8.7%)	
Pulp inactivation	255(5.8%)	38(2.2%)	217(8.1%)	
Pulp cavity disinfection	164(3.8%)	46(2.7%)	118(4.4%)	
Pulp extraction	71(1.6%)	22(1.3%)	49(1.8%)	
Adjustable jaw	91(2.1%)	44(2.6%)	47(1.8%)	
Bonding	163(3.7%)	126(7.3%)	37(1.5%)	
Total(n)	4367(100%)	1704(100%)	2663(100%)	

In terms of drug use, the dental emergency use of local anesthetics was 80.1% in the early stage of the pandemic but decreased to 65.8% during the pandemic period. For dental drugs, there was no significant change in anti-inflammatory drugs, while analgesics increased from 8.9% before the pandemic to 26.2% during the pandemic. There was no significant change in the proportion of topical drugs. These results are shown in Table 4.

Table 4  
Medication status of dental emergency patients before and during SARS-COV-2

Drug use	Total	pre-SARS-CoV-2	during-SARS-CoV-2	P value
N	683(100.0%)	282(41.3%)	401(58.7%)	$\chi^2 = 32.508$ p < 0.000
Local anesthetic	490(71.7%)	226(80.1%)	264(65.8%)	
Dental drug				
Anti-inflammatory drugs	50(7.3%)	25(8.9%)	25(6.2%)	
Analgesic drugs	130(19.0%)	25(8.9%)	105(26.2%)	
Drugs for external use	13(1.9%)	6(2.1%)	7(1.7%)	

## Discussion

During the SARS-COV-2 pandemic, the number of dental emergency visits increased by 25.56% compared to the number of dental emergency visits before the pandemic, and the number of daily visits increased by 12.7. Due to the droplet and contact transmission of SARS-COV-2 and the associated high risk of dental treatment involved for healthcare personnel and patients, all dental medical institutions were closed and emergency treatment was the only way for patients to get their dental emergencies solved. This led to an increase in the number of emergency department visits. During the pandemic period, the patients mainly visited the dental emergency department during daytime, which reduced the evening peak time (7 pm to 12 am) compared to before the pandemic. This may be related to the fact that during the SARS-COV-2 outbreak, the population adopted a lifestyle of home isolation and altered time arrangements, which may have reduced the frequency of going out during the evenings. In terms of dental emergencies experienced by patients, pulpitis/periapical periodontitis, dental and maxillofacial trauma, acute pericoronitis and periodontal disease (including hemorrhage) were the main types of dental emergencies, accounting for 80.8% of the total cases[8–10]. This is consistent with data on the impact of SARS-COV-2 on the utilization of emergency dental and other emergency services in specialized dental as well as general hospitals[11]. The main complaint was toothache, with its own characteristic nature of the pain, its location and duration. During the pandemic, admittance of patients with dental and maxillofacial trauma to the dental emergency department declined, but acute pulpitis/apicitis accounted for a significant increase. It may well be that during the outbreak, home quarantine and epidemic prevention measures let people stay at home more, thereby reducing the risk and occurrence of injury. The increase in the proportion of acute pulpitis has been related to the dietary habits of patients during the pandemic[12]. In addition, there was a significant increase in the proportion of non-emergency cases during the pandemic, such as repair, orthodontic and mucous membrane, which resulted in rapid disease progression and unbearable pain in patients due to their inability to return to their scheduled treatments and ultimately seeking emergency treatment. This may be due to the closure of dental medical facilities

during the pandemic, with patients unable to adhere to their scheduled follow-up treatments. Due to the high risk of SARS-COV-2 transmissions via dental emergency treatments, the use of therapeutic instruments and equipment has been limited, and the selection of emergency treatment programs was also affected according to the change of the pandemic situation. The selection of treatment instruments and equipment was mainly for the treatment of acute symptoms, and the principles of diagnosis and treatment during the pandemic are mainly to relieve pain, eliminate inflammation, hemostasis, debridement and suture.[13] Therefore, local dental flushing and application of drugs, as well as local dental hemostasis are still the most important treatments performed. In cases of acute pulpitis and apical periapical periodontitis, the emergency treatments performed were pulp drainage, or dental pulp inactivation and pulpectomy, hence, these treatment measures as well as medullary cavity disinfection and operation for pain treatments appeared to have increased during the pandemic. Acute pericoronitis mainly occurs in young people aged 18 to 30 years old, mostly in the lower jaw. During an acute inflammation, tooth extraction will lead to the spread of inflammation, and at the same time increases the risk of infection with SARS-COV-2. Therefore, the treatment of acute pericoronitis should be a local treatment, supplemented by antibiotic and anti-inflammatory drug therapy. For periapical inflammation with abscess formation, a small incision is needed for pus discharge, and in case of space infection, systemic anti-inflammatory treatment may be necessary. The present study showed that dental and maxillofacial trauma accounted for 20.1% during the pandemic, and although it had decreased from before the pandemic, it was still the main dental emergency among minors during the pandemic. According to a retrospective study on traumatic dental injuries in preschool children, dental and maxillofacial traumata can be tooth trauma, including tooth concussions, dislocations and fractures, soft tissue injuries, and fracture [14]. During the SARS-COV-2 pandemic, the emergency treatment principle of dental and maxillofacial trauma was to check the patient's overall condition, whether there was any injury to the brain, chest, abdomen and important organs, and to conduct surgical suturing of the maxillofacial injury after excluding any life-threatening conditions[15–16]. Data on dressing change, jaw adjustments, adhesion and other dental emergency treatments were also considered in the analysis. In terms of drug use, local anesthetic drugs significantly declined, with an obvious increase of analgesic drug use during the early stage of the outbreak. During the SARS-COV-2 outbreak, dental emergency services experienced an increase in their workload, reflecting the changes in the dental emergency spectrum as the pandemic progressed. The rational allocation of dental professional doctors could compensate for the experienced shortcomings in the dental emergency departments as well as more emergency resources of dental sub-professional doctors could be mobilized[17]. It would also be necessary to train stomatologists to have solid professional knowledge and surgical skills in dental medicine, in order to meet the technical requirements of potentially encountered dental emergencies and ensure that all conditions can be dealt with quickly and effectively within the emergency department[18]. At the same time, the dental emergency department should reasonably define and adhere to pandemic prevention measures and sufficiently stock common anti-inflammatory and analgesic drugs to meet the patients' medical needs. The result may be an improvement in the operation efficiency of emergency treatments in terms of professional technology, personnel and material available.

## Abbreviations

SARS-CoV-2

Severe acute respiratory syndrome CoV-2; ICD-10:International Classification of Diseases-10; APP:acute pulpitis/periapical periodontitis, AP:acute periapical coronitis, PD:periodontitis; SI:space infection; TR:maxillofacial trauma; JD:joint dislocation; OU:other.

## Declarations

## Ethics approval and consent to participate

This study was approved by the Institutional Review Board (IRB), West China Hospital of Stomatology, Sichuan University. In addition, consent to participate form was signed by each participant in the study.

## Consent for publication

Not applicable.

## Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

## Competing interests

The authors declare that they have no competing interests.

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## Authors' contributions

Kan Wu developed together with Chunjie Li the idea of the changes of spectrum of emergency dental patients under the SARS-COV-2. Zheng Yang and Sangchun Yang performed statistical part. Wenbing Yang contributed the manuscript writing. Chengge Hua provided the data of emergency patients of the hospital. All authors read and approved the final manuscript.

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## References

1. Li Q, Guan X, Wu P, et al. Early Transmission dynamics in Wuhan, China, of novel coronavirus-infected pneumonia. *N Engl J Med* 2020.
2. World Health Organization. Dental health, [http://www.who.int/dental\\_health//en](http://www.who.int/dental_health//en). Accessed 2 June 2019.
3. World Health Organization. Coronavirus disease (SARS-COV-2) Situation dashboard, [http://www.who.int/dental\\_health//en](http://www.who.int/dental_health//en).
4. Jing-Yang Huang a, Hui-Chieh Yu b, Yi-Tzu Chen b. Analysis of emergency dental revisits in Taiwan (1999–2012) from Taiwanese National Health Insurance Research Database (NHIRD). *Journal of Dental Sciences* (2019) 14:396-400.
5. Zhang SX, Wang Y, Rauch A. Unprecedented disruption of lives and work: Health, distress and life satisfaction of working adults in China one month into the SARS-COV-2 outbreak: *Psychiatry Res* 2020 Apr 04;288.
6. Huaqiu Guo YZ., Xiaoqiang Liu. The impact of the SARS-COV-2 epidemic on the utilization of emergency dental services. *Journal of Dental Sciences*, 2020, 5(36) : 179–182.
7. Shereen MA, Khan S, Kazmi A. SARS-COV-2 infection: Origin, transmission, and characteristics of human coronaviruses. *J Adv Res* 2020 Jul;24.
8. Wong N, Tran C, Pukallus M, et al. A three-year retrospective study of emergency visits at a dental health clinic in south-east Queensland. *Aust Dent J*, 2012, 57(2): 132–137.
9. Currie CC, Stone SJ, Connolly J, et al. Dental pain in the medical emergency department: A cross-sectional study. *J Dental Rehabil*, 2017, 44(2): 105–111.
10. T. Wall Recent trends in dental emergency visits in the United States – 1997/1998 to 2007/2008. *J Publ Health Dent*, 72 (2012), pp. 216–220.
11. Huang SM, Huang JY, Yu HC, Su NY, Chang YC. Trends, demographics, and conditions of emergency dental visits in Taiwan 1997–2013: a nationwide population-based retrospective study. *J Formos Med Assoc.* 2019;118:582–7.
12. Darling BG, Singhal A, Kanellis MJ. Emergency department visits and revisits for nontraumatic dental conditions in Iowa. *J Public Health Dent.* 2016;76:122–8.
13. Wong NH, Tran C, Pukallus M, Holcombe T. W.K. Seow. A three-year retrospective study of emergency visits at a dental health clinic in south-east Queensland. *Aust Dent J*, 57 (2012), pp. 132–137.
14. Hall E, Hickey P, Nguyen-Tran T, et al. Dental trauma in a pediatric emergency department referral center. *Pediatr Emerg Care*, 2016, 32(12): 823–826.

15. A 2-year retrospective study of pediatric dental emergency visits at a hospital emergency center in Taiwan *Biomed J*, 39 (2016), pp. 207–213.
16. Choi SC, Park JH, Pae A, Kim HR. Retrospective study on traumatic dental injuries in preschool children at Kyung Hee dental hospital, Seoul, South Korea. *Dent Traumatol*. 2010;26:70–5.
17. 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. *Spec Care Dent*. 2010;30:66–71.
18. Okunseri C, Okunseri E, Thorpe JM, Xiang Q, Szabo A. Medications prescribed in emergency departments for nontraumatic dental condition visits in the United States. *Med Care*. 2012;50:508–12.

## Figures

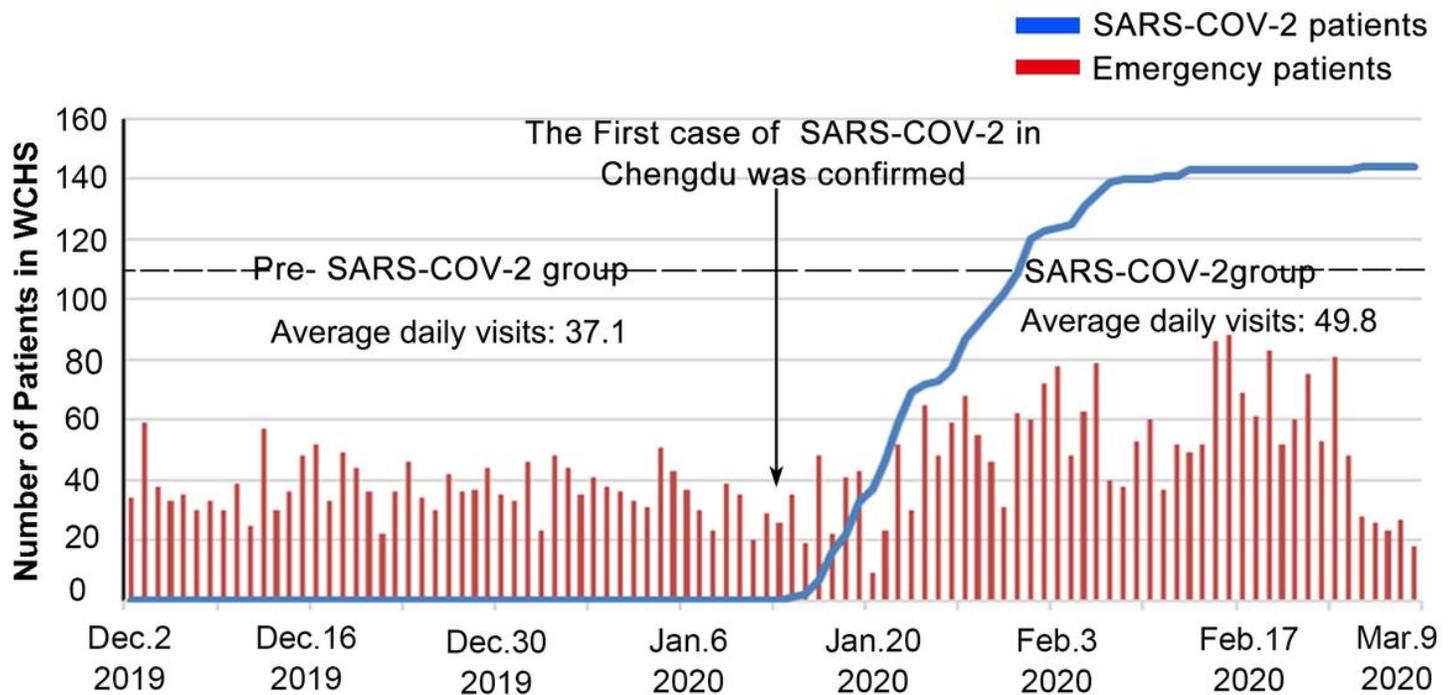


Figure 1