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A Retrospective Study of Oral Emergency Services During COVID-19

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ABSTRACT

Objectives: This study was performed to examine changes in the number of patient visits and types of oral services in an oral emergency department from the beginning to the control stage of the coronavirus disease 2019 (COVID-19) outbreak in Beijing.

Methods: The numbers of daily oral emergency visits from January 20 to March 24, 2020, at a dental university hospital in Beijing and daily newly confirmed COVID-19 cases in Beijing during the same period were collected and analysed. All oral emergency patient information (including sex, age, and oral diagnosis) was also collected and analysed. Patients with incomplete medical data were excluded.

Results: In total, 12,416 patients were included in this study. The number of daily emergency visits was negatively correlated with the number of newly confirmed local COVID-19 cases in Beijing ($P < .001$). The number of daily emergency visits during the COVID-19 stable period in Beijing was greater than that during the outbreak period ($P < .001$). Compared to those in the COVID-19 outbreak period, the percentages of females, children and adolescents, patients with acute toothache, and patients with nonurgent cases were higher in the stable period, and the numbers of patients with toothache, trauma, infection, and nonemergency conditions increased in the COVID-19 stable period ($P < .001$).

Conclusions: COVID-19 significantly influenced the number of patient visits and the percentages of patients with oral emergency situations in the oral emergency department. There were obvious differences in treatment seeking for oral emergencies between the COVID-19 periods in Beijing. There was an inverse relationship between daily oral emergency visits and daily confirmed COVID-19 cases in Beijing.

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Introduction

Many countries acoss the globe have been impacted by coronavirus disease 2019 (COVID-19) since the initial outbreak in December 2019, and the general population is susceptible.[1,2] Since the first report of a confirmed COVID-19 case on January 20, 2020, the cumulative number of confirmed cases quickly increased in Beijing, China.[3] A series of prevention and control measures, such as intensive surveillance, epidemiological investigations, active treatment of confirmed and suspected patients, limitations on outdoor activities, and the suspension of businesses and classes, have been implemented by the Chinese government to control the COVID-19 pandemic.[4]

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The common transmission routes of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) include direct transmission (coughing, sneezing, and inhalation of respiratory secretion droplets) and contact transmission (contact with oral, nasal, or eye mucous membranes).[5] There is also a possibility for aerosol transmission in a relatively closed environment in which there is exposure to high concentrations of aerosols. During oral examination and treatment, there is a high risk of transmission between doctors and patients. At the beginning of the outbreak, more patients chose not to see a dentist, even for oral emergencies.[6,7] With the effective control of the pandemic in Beijing and China, the number of newly confirmed COVID-19 cases per day in Beijing has shown a downward trend since February 17, 2020, and people's fear of transmission has decreased. However, has their willingness to seek dental treatment increased?

To analyse the impact of COVID-19 on oral emergency services during the ongoing pandemic, we conducted a retrospective study in an oral emergency centre by analysing data from the beginning stage to the control stage of the COVID-19 outbreak in Beijing.

Materials and methods

A retrospective analysis was conducted, which retrieved information about patients seeking oral and dental emergency services in a public tertiary stomatological hospital that functions as one of the two 24-hour emergency dental centres in Beijing, China.

Dental departments in hospitals and private dental clinics were closed from January 20 to March 24, 2020, in China. We retrospectively reviewed the files of the patients seen in the oral emergency centre during this period, eliminating the confounding impact of the availability of other dental clinic services, to determine the effect of COVID-19 on oral emergency services.

All patients who visited the emergency department of Peking University Hospital of Stomatology from January 20 to March 24, 2020, were included in the study. All medical information relating to the patients (including sex, age, and diagnosis) was collected. Patients with incomplete medical data were excluded. To avoid duplicating data, only the first visit was recorded when the same patient visited multiple times on the same day.

We divided the patients into 3 groups according to age: children and adolescents (0-17 years), youth and middle-aged individuals (18-65 years), and elderly individuals (older than 65 years). According to the common chief complaints of oral emergency patients, diagnoses were classified into groups for analysis.

The diagnoses were coded using the International Classification of Diseases and Related Health Problems, 10th Revision, Beijing Clinical Edition (ICD-10-BJ). Postoperative complications were diagnosed according to the ICD-10 codes of the original diseases and postoperative symptoms (eg, pain after treatment of acute pulpitis [K04.002]).

The oral emergency types were divided into 6 groups (Table 1):

Acute toothache: endodontic, periapical, or periodontal pain.

Table 1 – Classification of oral emergency diseases and their corresponding codes.

Classification	ICD-10-BJ code
Toothache	K04, K05.001, K05.002, K05.103, K05.104, K05.110, K05.201–205, K05.501, K05.504, K08.802
Infection	K10.201–303, K11.201–301, K12.103, K12.201–219, K13.004, K13.707–709, K14.002
Trauma	S00-S03 (excluding ocular, ear, nasal, and craniocerebral trauma)
Postoperative Complications	Pain, swelling, or bleeding caused by treatment or surgery for K00–K14
Other urgent conditions	K06.804, K08.803, K06.814, K07.601–605, K10.802, K12.001–111(excluding K12.103), K13.001, K13.006, K13.007, K13.017, K10.711, K14.001, K14.801
Nonurgent conditions	Other K00–K14

Infection: abscess, interstitial infection, and swelling caused by inflammation of maxillofacial tissues (except for swelling after tooth extraction or maxillofacial surgery, which was a postoperative complication).

Trauma: dental and dento-alveolar trauma, maxillofacial soft tissue trauma, and maxillofacial bone fractures.

Postoperative complications: postoperative pain from root canal treatment, tooth extraction, implantation, etc.

Other urgent conditions: temporomandibular joint emergencies, nontraumatic bleeding, oral mucosa emergencies, temporary restoration, loose or broken fillings or prostheses, etc.

Nonurgent conditions: caries, periodontitis and gingivitis without pain and abscess, deciduous tooth retention, residual crowns, residual roots, etc.

The numbers of daily newly confirmed COVID-19 cases in Beijing reported by the Beijing Municipal Health Commission[3] from January 20 to March 24, 2020, were collected. No newly confirmed COVID-19 cases amongst residents of Beijing have been reported since March 4, 2020. Considering March 4 as the demarcation point of the COVID-19 pandemic in Beijing, the Standing Committee of the Political Bureau of the CPC Central Committee held a meeting on March 4 and demanded targeted and solid measures to push for work resumption. The study period was divided into 2 time periods: the outbreak period (from January 20 to March 4, 2020) and the stable period (from March 5 to March 24, 2020).

All data were analysed with SPSS Statistics (Version 20.0, IBM Corp.). Descriptive analyses were performed to obtain the distribution of sex, age and numbers and percentages of person-time per day of different oral emergency types [n(%), average, medians, and standard deviations]. A nonparametric Mann-Whitney test was used to compare the person-time per day numbers of different oral emergency types in the outbreak and stable periods. The Pearson chi-square test was used to compare the percentage of person-time per day of different oral emergency types in the outbreak and stable period. The Kendall test was used to determine the correlation of person-time per day and the number of newly confirmed local COVID-19 cases in Beijing. The level of statistical significance was set at $P < .05$.

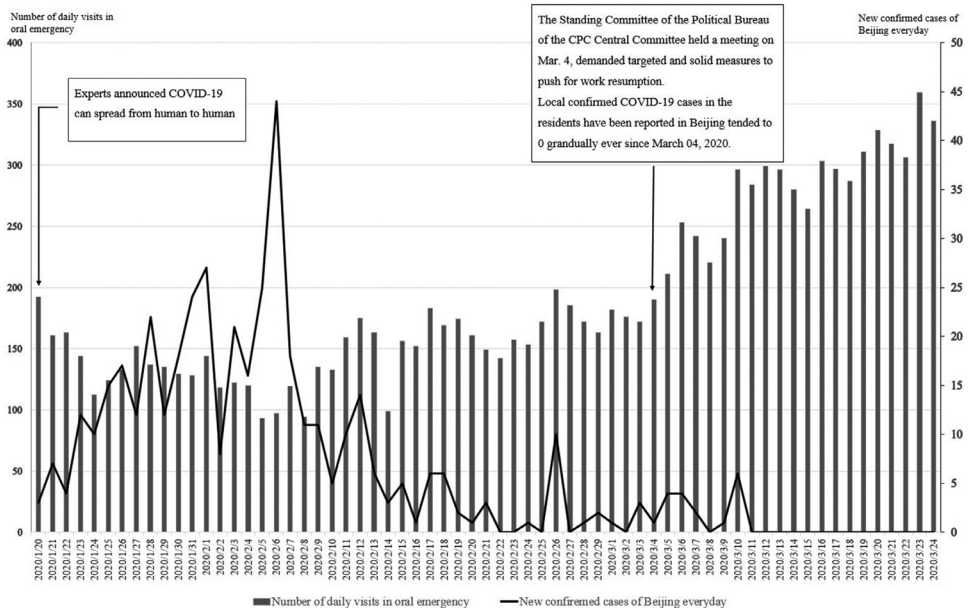

Figure – Number of oral emergency patients treated in the Peking University Hospital of Stomatology), and number of new confirmed cases with coronavirus disease 2019 (COVID-19) in Beijing from January 20, 2020, to March 24, 2020.

The study was approved by the Institutional Review Board of Peking University School and Hospital of Stomatology and was conducted under the guidance of international ethical standards (PKUSSIRB-202054051).

Results

A total of 12,416 patients were included in this study. Of all the patients who visited the department, 6508 were males and 5908 were females, with a male to female ratio of 1.10:1. The youngest patient was 5 months old and the oldest was 100 years old, with a median age of 39 years. The number of daily visits to the oral emergency department negatively correlated with the number of newly confirmed local COVID-19 cases in Beijing (Kendall test, $r = -0.583$, $P < .001$) from January 20 to March 24, 2020. During the outbreak period, the number of new daily confirmed COVID-19 cases increased and the number of daily oral emergency visits decreased. As the COVID-19 outbreak in Beijing was gradually controlled, the number of new daily confirmed COVID-19 cases decreased and the number of daily visits to the oral emergency department gradually increased (Figure).

A total of 6971 patients visited during the outbreak period, with a median of 155 patients per day. During this period, there were 3743 males and 3228 females, with a male to female ratio of 1.16:1. The youngest patient was 5 months old and the oldest was 100 years old, with a median age of 39 years (Table 2). There were 5445 patients who visited the department during the stable period, with a median of 314 patients per day. Of these, 2765 were males and 2680 were females, with a male to female ratio of 1.03:1. The youngest patient was 9 months old and the oldest was 95 years old, with a median age of 38 years (Table 2). More patients visited the oral emergency department during the stable period than during the outbreak period ($P < .001$). The percentage of female patients was higher and that of male patients was lower in the stable period than in the outbreak period ($\chi^2 = 7.101$, $P < .001$) (Table 2). During the stable period, the percentage of children and adolescent patients increased, and the percentage of patients in the 18- to 64-year-old age group decreased compared with that in the outbreak period ($\chi^2 = 38.429$, $P < 0.001$) (Table 2).

The most common emergency problems amongst patients in both the outbreak and stable periods were acute toothache,

Table 2 – Comparisons of sex and age between the outbreak period and stable period.

		n (%)		χ^{2*}	P
		Outbreak period	Stable period		
Sex	Male	3743 (53.7%)	2765 (50.8%)	$\chi^2 = 7.101$	<.001
	Female	3228 (46.3%)	2680 (49.2%)		
Age	<18	988 (14.2%)	972 (17.9%)	$\chi^2 = 38.429$	<.001
	18–65	5141 (73.7%)	3801 (69.8%)		
	>65	842 (12.0%)	672 (12.3%)		
Total		6971 (100%)	5445 (100%)		

* Pearson Chi-square test.

Table 3 – Person-times associated with different oral emergency types during the outbreak period and stable period.

	Outbreak period			Stable period			P¶
	n (%)	Aver. ± SD	Median	n (%)	Aver. ± SD	Median	<.001
Acute toothache*	3676 (52.7%)	79.0 ± 21.78	75	3199 (58.8%)	183.1 ± 32.44	190.5	<.001
Infection	1377 (19.8%)	30.0 ± 7.03	31	792 (14.5%)	42.7 ± 10.16	41.5	<.001
Trauma	755 (10.8%)	16.5 ± 5.32	17	536 (9.8%)	30.3 ± 5.19	30	<.001
Postoperative complications†	488 (7.0%)	10.8 ± 5.32	10	169 (3.1%)	8.8 ± 2.88	9	.151
Other urgent conditions‡	386 (5.5%)	8.4 ± 3.62	8	260 (4.8%)	14.1 ± 3.89	13	<.001
Nonurgent conditions§	289 (4.1%)	6.0 ± 3.84	4.5	489 (9.0%)	28.4 ± 8.89	28	<.001
Total	6971 (100%)	150.4 ± 27.98	155	5445 (100%)	307.2 ± 51.86	314	<.001

* Acute toothache: endodontic, periapical, or periodontal pain.
† Postoperative complications: postoperative pain from root canal treatment, tooth extraction, implantation, etc.
‡ Other urgent conditions: temporomandibular joint emergencies, nontraumatic bleeding, oral mucosa emergencies, temporary restoration, loose or broken fillings or prostheses, etc.
§ Nonurgent conditions: caries, retention of primary teeth, residual crowns, residual roots, etc.
¶ Nonparametric Mann-Whitney test.

infections, and oral and maxillofacial trauma (including dental trauma, soft tissue injury, and jaw fracture) (Table 3). Compared with the outbreak period, the daily visits associated with different oral emergency types, except for postoperative complications, increased in the stable period, and the differences were statistically significant ($P<0.001$) (Table 3). The percentages of acute toothache and nonurgent cases increased in the stable period, whilst the percentages of others decreased, and the differences were statistically significant (Table 4).

Discussion

COVID-19 is caused by a coronavirus similar to the SARS virus that circulated in 2003.[8] The virus can be spread through saliva, bodily fluids, and airborne droplets when people cough or sneeze, which is the major route of transmission.[5,9] Since dental treatment can induce considerable saliva splatter from the patient, it carries a high risk of virus transmission.[10,11] Since the outbreak of COVID-19, several dental practice guidelines have been published, and the suspension of nonemergency dental treatment whilst providing only emergency dental services was initially recommended.[12,13,14] According to previous studies, the number of oral emergency department visits decreased at the beginning of the pandemic.[6,7,15] Similar results were found in our study; there was a negative correlation between the number of oral emergency visits and newly confirmed COVID-19 cases in Beijing. During the outbreak period of COVID-19, the number of daily oral emergency visits decreased as the number of new daily confirmed COVID-19 cases increased. This might be due to the government's implementation of prevention and control measures, such as a limiting traffic during the epidemic, which decreased participation in outdoor activities, various sports, and group activities, including visits to hospitals for nonurgent reasons. In addition, the decrease in the use of various forms of transportation might have reduced traffic accidents, including those resulting in oral and maxillofacial damage. Sun's questionnaire study results revealed that a considerable percentage of patients thought that the dental environment was more dangerous and there was a higher risk of infection in dental environments than in other medical departments or other places[16]; therefore, the number of dental visits was reduced. Moreover, the number of oral emergency patients increased gradually after the pandemic was effectively controlled. On March 4, 2020, the Chinese government loosened restrictions and isolation requirements and allowed work resumption. With the lifting of lockdown measures and changes in the understanding of infection risk at dental visits, an increased number of people visited the oral emergency department.

Previous studies found that, compared with that in the nonpandemic period, the percentage of women seeking dental services decreased in the pandemic period.[6,7,15] As shown in previous studies, females have a higher degree of self oral service than males, and a higher percentage of females visit dentists.[17,18] However, female patients may be more concerned than male patients about being infected with COVID-19 during oral treatment and outdoor activities. According to the current results, the number of female patients seeking dental services was lower than that of male patients during the outbreak period. After COVID-19 was controlled effectively, the percentage of female patients seeking dental services increased significantly, which demonstrates that the dentist-visiting behaviour of females was greatly impacted by COVID-19.

The percentage of children and adolescents (<18 years) seeking dental services during the COVID-19 outbreak period was relatively low. This may be related to concern by parents or guardians about children being infected with COVID-19 in the hospital. Sun et al. found that the fear of COVID-19 and the presence of toothache greatly affected the quality of life of children.[16] When the COVID-19 situation in Beijing was under control, parents were more willing to seek treatment for a child's toothache. Therefore, the percentage of children and adolescents seeking dental services increased significantly after COVID-19 was effectively controlled in Beijing.

Previous studies have found that due to the lockdown and isolation policy during the outbreak period, after the outbreak, the percentages of patients with traumatic diseases decreased significantly compared with those in 2019.[6] When the COVID-19 situation in Beijing was controlled and people gradually returned to work and production was restored, people's activities increased, resulting in an increase in the

Table 4 – Proportions of different oral emergency types during the outbreak period and stable period.

	Acute toothache*		Infection		Trauma		Postoperative complications†		Other urgent conditions‡		Nonurgent conditions§		Total
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	
Outbreak Period	3676	3295	1377	5594	755	6216	488	6483	386	6585	289	6682	6971
	52.7%	47.3%	19.8%	80.2%	10.8%	89.2%	7.0%	93.0%	5.5%	94.5%	4.1%	95.9%	
Stable Period	3199	2246	792	4653	536	4909	169	5276	260	5185	489	4956	5445
	58.8%	41.2%	14.5%	85.5%	9.8%	90.2%	3.1%	96.9%	4.8%	95.2%	9.0%	91.0%	
P¶	<.001	<.001	.044	<.001	.011	<.001							

* Acute toothache: endodontic, periapical, or periodontal pain.
† Postoperative complications: postoperative pain of root canal treatment, tooth extraction, implantation, etc.
‡ Other urgent conditions: temporomandibular joint emergencies, nontraumatic bleeding, oral mucosa emergencies, temporary restoration, loose or broken fillings or prostheses, etc.
§ Nonurgent conditions: caries, retention of primary teeth, residual crowns, residual roots, etc.
¶ Pearson Chi-square test.

number of daily injuries compared with that in the outbreak period.

According to previous studies, toothache is a common oral emergency.[6,19] In both the outbreak stage and stable stage of COVID-19 in Beijing, the number and percentage of patients with acute toothache were the highest that were seen. Nontraumatic oral emergencies, such as toothaches and abscesses, are thought to be related to caries and periodontal disease that had not been effectively treated.[20] Oral health awareness and oral hygiene status are poor amongst people in developing countries, and the incidences of toothaches and infections caused by the development of caries or periodontal diseases are very high.[21] Acute toothache is, in many cases, debilitating and is often described as one of the most severe issues a person can experience in everyday life, resulting in a significant impact on quality of life. Patients often experience pain for over 2 weeks before seeking treatment, which may have a significant impact on their quality of life.[22] Because of COVID-19, patients may have suffered longer than they normally would.

When dental clinics and departments were closed during the COVID-19 outbreak period, a large number of patients with toothache did not receive treatment. In addition, in the early stage of the pandemic, patients whose pain was relieved after initial pulp treatment often did not receive follow-up treatment and may have experienced recurrent pain due to the continuous closures of outpatient departments and clinics. Therefore, there was a substantial increase in treatment for toothache in the COVID-19 stable period. Many oral outpatient services and private dental clinics ceased complex oral treatment activities during the pandemic, such as complex wisdom tooth extraction and endodontic or periodontal surgery. These factors may have led to a significant decrease in the percentage of patients with acute postoperative complications in the emergency department during the whole COVID-19 period.[6] Until March 24, dental institutes did not operate normally. As a result, in the stable period, the number of patients with postoperative complications did not change significantly compared with the outbreak period. During the outbreak period, patients with other oral problems were not treated. This may have led to a substantial increase in the number of patients with nonurgent needs during the stable period. Some patients with nonurgent cases visited the emergency room because although the cost of emergency treatment was the same as that of treatment in outpatient departments in public hospitals, registration was easier; others came to the emergency room due to an urgent need for treatment, such as the need to extract primary teeth. Azim proposed that as the pandemic continues, strategies to manage patients will need to evolve from a palliative to a more permanent/definitive treatment approach.[23]

Conclusions

During the different pandemic periods in Beijing, there were obvious differences in the number of oral emergencies. There was an inverse relationship between daily visits and daily confirmed COVID-19 cases in Beijing. After reaching the stable period, the percentages of females and children and adolescents increased compared with those in the outbreak

period; the numbers of patients with toothache, trauma, infection, and nonemergency conditions also increased.

Author contributions

Hua-Qiu Guo and Tao Xu contributed equally to this work.

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Conflict of interest

None disclosed.

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