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Impact of Coronavirus disease 2019 on patients with toothache

Analysis of tweets on Weibo

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Abstract

Objective: The aim of this study is to investigate the impact of Coronavirus disease 2019 (COVID-19) on toothache patients through posts on Sina Weibo.

Methods: Using Gooseeker, we searched and screened 24,108 posts about toothache on Weibo during the dental clinical closure period of China (February 1, 2020–February 29, 2020), and then divided them into 4 categories (causes of toothache, treatments of toothache, impacts of COVID-19 on toothache treatment, popular science articles of toothache), including 10 subcategories, to analyze the proportion of posts in each category.

Results: There were 12,603 postings closely related to toothache. Among them, 87.6% of posts did not indicate a specific cause of pain, and 92.8% of posts did not clearly indicate a specific method of treatment. There were 38.9% of the posts that clearly showed that their dental treatment of toothache was affected by COVID-19, including 10.5% of the posts in which patients were afraid to see the dentists because of COVID-19, and 28.4% of the posts in which patients were unable to see the dentists because the dental clinic was closed. Only 3.5% of all posts were about popular science of toothache.

Conclusions: We have studied and analyzed social media data about toothache during the COVID-19 epidemic, so as to provide some insights for government organizations, the media and dentists to better guide the public to pay attention to oral health through social media. Research on social media data can help formulate public health policies.

Abbreviation: COVID-19 = Coronavirus disease 2019.

Keywords: Coronavirus disease 2019, social media, toothache, Weibo

1. Introduction

The novel coronavirus disease 2019 (COVID-19), an international-concerned public health emergency declared by the world health organization (WHO), is a respiratory illness caused by a novel coronavirus. This rapidly evolving pandemic initially appeared in December 2019 and quickly swept the whole world, affecting >200 countries and regions.[1,2] Up to October 31, 2020, the cumulative number of worldwide confirmed cases is 45,678,440, and the cumulative number of deaths is 1,189,945. Although the epidemic in some countries has been controlled generally, the global epidemic situation is still severe.

The main symptoms of infection with COVID-19 are fever, cough, and difficulty breathing. Some patients have mild symptoms such as fever and fatigue. In some cases, the symptoms

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Compliance with ethics guidelines: CL, XL, NL, FY, MZ, YL, and JZ declare that all procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000 (5).

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All data generated or analyzed during this study are included in this published article [and its supplementary information files].

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of infection are severe, with organ dysfunction and even death.[3] The new coronavirus is highly contagious and highly susceptible in the population. Studies showed that the major approaches of the transmission of COVID-19 are saliva,[4] droplet, and aerosol.[5] However, during the dental clinical treatment, droplets and aerosols from dental appliance such as high-speed handpiece and ultrasonic dental unit may cause direct or indirect cross-transmission of coronavirus between patients and medical personnel.[6] Therefore, during the 1-month period from February 1 to February 29 in 2020, most dental practices were suspended in China, except for emergencies. This caused a lot of inconvenience for dental patients, including those with toothache.

During this special period of COVID-19, social media played a crucial role. Through social media people can express their feelings and thoughts in real time and share with other users, as well as seek guidance and helps.[7] It was social media that provided an effective way in the communication of oral health-related information among the public during COVID-19. Sina Weibo is one of the biggest social media platforms in China, with 516 million monthly active users by the end of 2019. Users can log in to Sina Weibo through mobile phones, computers, and other terminals to realize real-time information sharing and communication, which is convenient and efficient. Therefore, people are increasingly inclined to express their feelings about medical treatment as well as seek help and guidance on Sina Weibo in terms of medical treatment in China.[8] During COVID-19, a large number of posts were posted on Sina Weibo every day,[9] which gave us materials to study how people react to toothache, as well as how they get information and guidance during the period when most dental clinics in China were closed due to neo-coronary pneumonia.

Considering the impact of the COVID-19 outbreak on people's lives, we proposed the following research question: what dental-related information will people post on Weibo during the epidemic. The purpose of this study is to analyze toothache-related posts on Weibo during the COVID-19 epidemic, and to understand patients' emotional activities and coping measures after toothache occurs, hoping to provide some overview and references for the supply and demand of dental services during epidemics on social media.

2. Materials and methods

2.1. Data collection

A new Sina Weibo account was created in this study to exclude the interfering data caused by the search habit. Gooseeker was used to collect data. Firstly, we logged in to Gooseeker and selected the toolbox module of Weibo collection. Secondly, we selected the tool of keyword search, and entered the keyword "toothache." Thirdly, the search was set to run from February 1, 2020 to February 29, 2020, and then the collection was started. After collection, all data were packaged, downloaded, and saved to an excel list for collation and analysis.

2.2. Data screening

After data collection, manual screening was performed. Firstly, comments or retweets were excluded. Then, the remaining blog posts were manually analyzed by item to exclude the following blog posts: if they were advertised by a company and/or dentist, detached from their contexts, and therefore not understandable were posted in the third person (e.g., toothache of publishers' kids or parents), were irrelevant, incoherent, or retrospective posts.

2.3. Data analysis

We grouped the filtered data into 4 main categories (Fig. 1). The first category was the causes of toothache, which was divided into 4 subcategories: toothache caused by inflammation of wisdom teeth, toothache caused by acute pulpitis, toothache caused by eating sweets and spicy food, and toothache without specific reason. The second category was the treatments of toothache, which was further specifically divided into 3 subcategories: the use of western medicine for pain relief, the use of Chinese medicine for pain relief, and no specific treatment to relief the pain. The third category was the impact of the epidemic on toothache treatment, which was divided into 2 subcategories:

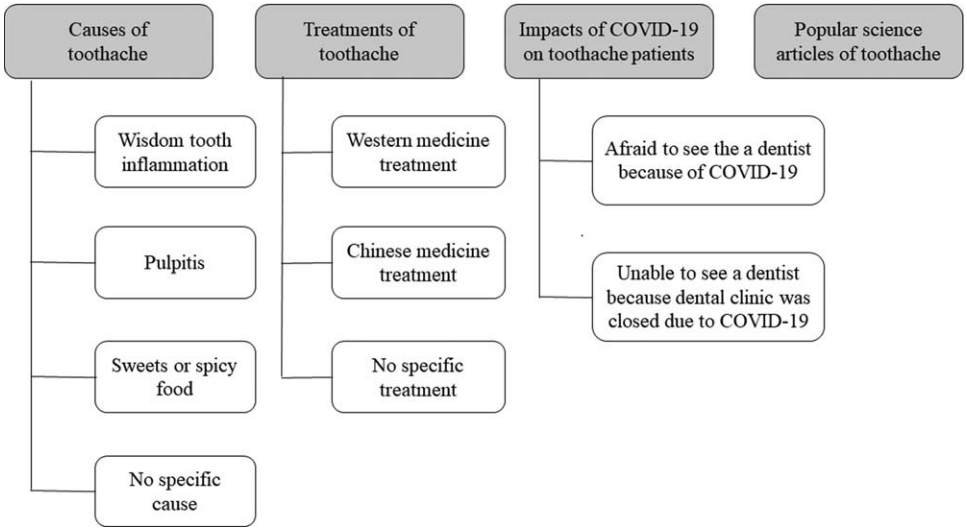

Figure 1. The data were divided into 4 main categories, which were subdivided into 10 subcategories.

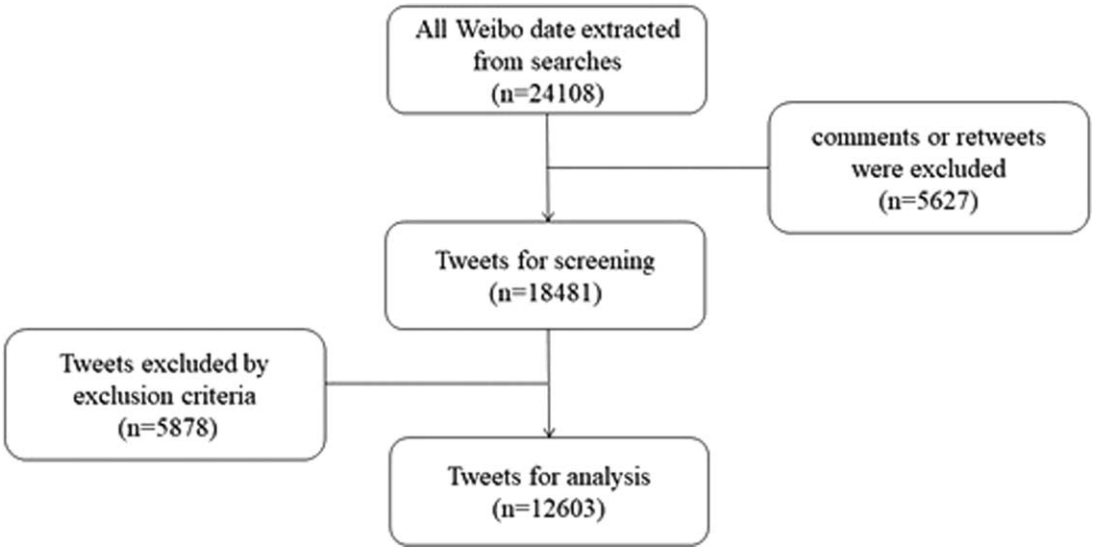

Figure 2. A total of 24,108 tweets were obtained from the search. Excluding irrelevant posts based on the exclusion criteria yielded a total of 12,603 posts that were closely related to toothache.

afraid to see a doctor because of COVID-19, and unable to see a doctor because dental clinic was closed due to COVID-19. The fourth category was related to the popular science articles of toothache. Based on these categories, we organized the data.

3. Results

Using "toothache" as a keyword, we searched a total of 24,108 tweets. Then we excluded irrelevant posts based on the exclusion criteria, getting a total of 12,603 posts that were closely related to toothache (Fig. 2).

In terms of the causes of toothache, among all the posts related to toothache, 641 posts (5.1%) were caused by inflammation of wisdom teeth, 221 posts (1.8%) were caused by pulpitis, and 698 posts (5.5%) were caused by eating sweets or spicy foods. There were 11,043 posts (87.6%) that did not indicate a specific cause of pain (Fig. 3).

In terms of the treatments of toothache, 687 posts (5.4%) opted for western medicine while 216 posts (1.7%) opted for traditional Chinese medicine treatment. There were 11,700 posts (92.8%) indicated no specific treatment (Fig. 4).

As for the impact of COVID-19 on the treatment of toothache, there were 4906 posts (38.9%) that clearly indicated that the treatment of toothache was affected by the epidemic, including 1328 posts (10.5%) in which the patients themselves were afraid to see dentists because of the epidemic, and 3578 posts (28.4%) in which they were unable to see dentists because the dental clinic was closed (Fig. 5). The number of posts related to popular science of toothache in all posts was 437.

4. Discussion

The most common conditions that require prompt treatment in the dental clinic include oral and maxillofacial trauma as well as toothache (which includes different types such as acute pulpitis,

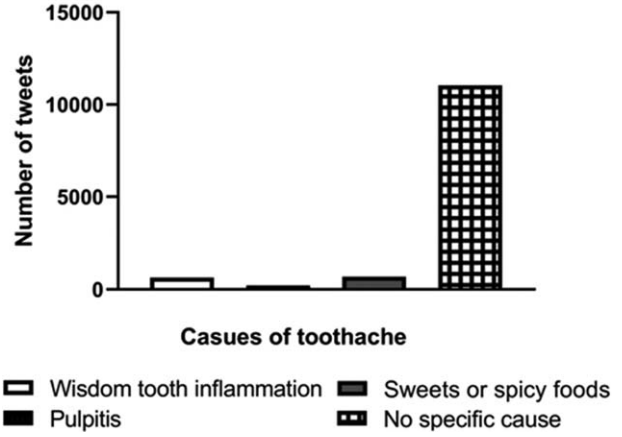

Figure 3. According to Weibo tweets, 5.1% toothache were caused by inflammation of wisdom teeth, 1.8% toothache were caused by pulpitis, 5.5% toothache were caused by eating sweets or spicy foods, and 87.6% toothache did not indicate a specific cause of pain.

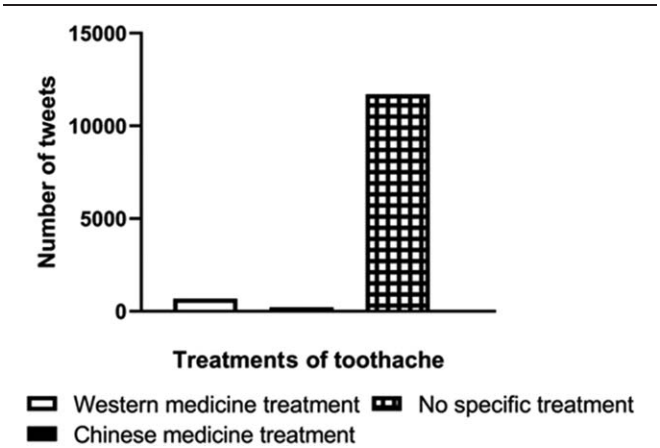

Figure 4. According to Weibo tweets, 5.4% toothache chose western medicine treatment, 1.7% toothache chose traditional Chinese medicine treatment, and 92.8% toothache did not indicate a specific treatment.

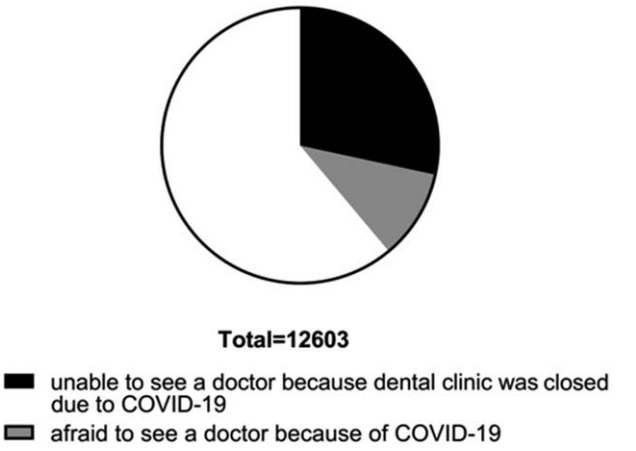

Figure 5. According to Weibo tweets, 28.4% posts indicated that they were unable to see dentists because the dental clinic was closed, and 10.5% posts indicated that they were afraid to see dentists because of the epidemic.

acute periapical inflammation, and pericoronitis of the wisdom teeth).[10] During the period of COVID-19, patients with oral and maxillofacial trauma were usually treated promptly, whereas patients with toothache were usually not. This is because unlike the treatment of trauma patients, patients with toothache, especially those with acute pulpitis and acute periapical inflammation, typically require pulp-opening treatment, a process that produces aerosols and increases the risk of cross-infection among medical staff.[6] However, painful disorders such as toothache often have a significant impact on patients, causing psychological stress such as anxiety, fear, and anger.[11]

During the epidemic, since most people were isolated in their homes, social media became the major medium through which people communicated with each other. Research showed that contents related to toothache, such as the actions that were taken to relieve the pain, is widely shared by Twitter users.[12] In addition, contents related to other dental practice were also published on social media. For example, orthodontic patients used social media (e.g., Twitter) to express positive and negative feelings about braces.[13] According to Anthony survey,[14] about 34% of the public have used social networks to seek medical information and about 73% of patients continue to seek medical information online after their medical appointment. Among them, >60% of users believed that the health information they searched influenced their health decisions.[15] Moreover, a study by Khoong et al[16] also indicated that nearly one-third of the participants watched a Web-based health video or used email to communicate with their clinician.

Sina Weibo, one of the largest social media platforms in China, generates numerous posts daily and has been widely used in previous studies. For example, Tao et al[17] used Sina Weibo to analyze tweets related to dental services and oral health information during the COVID-19 epidemic, thus providing a source of insight for government organizations, media, and dental professionals. However, the analysis of tweets about toothache during the epidemic has yet not been seen. Therefore, we chose to collect information related to toothache during the specific period of COVID-19 from Sina Weibo and analyze the psychological thoughts as well as needs of patients, hoping to provide some references for the actions of dental healthcare during epidemics.

In this study, we found that the percentage of tweets with no specific cause of toothache was 87.6%. One of the reasons could be that most of the public do not know the specific cause of the pain. Since toothache is a complex problem that includes a variety of causes such as pulpitis, wisdom teeth inflammation, and dental caries, it may difficult for non-experts to understand the specific cause of it.[18,19] However, toothache can interfere with people's normal daily life such as work, study, talking, eating, household chores, and social interactions.[20] Toothache can also exacerbate psychological stress such as anxiety, fear, and anger in patients.[21] Therefore, during the epidemic, healthcare providers may need to publish more scientific content, such as the causes of toothache to educate the public and reduce their inner fear and anxiety.

In terms of the treatments of toothache, 5.4% of the posts chose western medicine treatment, 1.7% of the posts chose Chinese medicine treatment, and 92.8% of the posts did not specify a specific treatment method. The reason for this wide variation may be that the majority of the patients preferred conservative treatment. A study conducted in Maryland showed that most toothache patients initially chose conservative treatment, such as gargling, before finally seeking help from a dentist.[22] This indicated that when face with toothache, the majority of people are unable to manage it properly. In normal times, patients with toothache have the option to go to see the dentists. However, during the special period of COVID-19, on the one hand, because of the suspension of dental treatments of most dental clinic, and on the other hand, because of the fear of the epidemic, most people did not see the dentists for treatments,[23] which undoubtedly increased the psychological anxiety of the patients.

As for the posts related to popular science articles of toothache, there were only 437, accounting for 3.5% of all posts. Besides, most of the science posts were published by individuals or private accounts, while very few were published by professional medical institutions. This indicated a lack of information about toothache and a great need for knowledge of oral health among the public, especially scientific knowledge published by authorities. Similarly, a previous study also demonstrated that information about dental pain on social media is too simple, which could prevent people from seeking dental treatment and lead to untimely treatment of toothache.[24] In the future, dental medical institutions probably should post more basic information and popular science knowledge about dental problems such as toothache on social media, allowing the public to gain the basic knowledge about toothache, and to alleviate their negative emotions such as panic and anxious.

In this study, a total of 38.9% of the posts reported that the patients' visits to their dentists were affected by COVID-19. This indicated that the epidemic had a great impact on the treatment of toothache patients. An article published on February 12, 2020 confirmed for the first time the presence of SARS-CoV-2 in saliva,[4] indicating that COVID-19 can be transmitted through saliva and droplets. As a result, most of individuals adopted home isolation measures. A paper published on Feburary 20, 2020, announced for the first time that COVID-19 could be transmitted through aerosols generated during dental practice,[5] leading to the suspension of most dental practices activities in China. These prevented toothache sufferers from seeking timely medical attention so that they have to suffer from toothache, which

increases their anxiety. Patients therefore expressed their emotions and sought help on social media.

During the COVID-19, the Internet, especially social media, is becoming increasingly important, changing not only the way medical information is transmitted but also the way patients communicate with healthcare providers.[25] A study published in 2004 showed that patients with dental pain tend to discuss their condition with non-professionals on social media.[26] As for now, more and more patients are using social media to communicate with not only other patients, but also health care providers.

Due to the rapid development of Internet technology, social media is playing an increasingly important role in health maintenance and healthcare research. Besides, the use of social media for research in the medical field is increasing.[27] The Finnish Institute of Health and Welfare, for example, collected descriptive data on COVID-19 for risk assessment purposes through thematic analysis of public emails and social media messages.[28] Moreover, during the epidemic, people mainly used social media to learn about the situation, development of COVID-19, and to communicate with each other.[29]

Through our research, we can see that the epidemic has had a huge impact on patients' medical treatment, and social media has become an important tool for people to seek help. People have posted numerous posts about toothache on Weibo and asked for help. This reminds us that medical institutions should pay more attention to the role of social media, which can understand the needs of patients and publish some authoritative science content through it, so as to alleviate the adverse impact of the epidemic on patients.

However, there are potential limitations of this study. On the one hand, social media may not reflect all groups of people.[30,31] On the other hand, Weibo may only reflect the situation in China and not be applicable to other countries. Therefore, in the next study, we may be able to add social media from multiple countries to make the results more reliable.

5. Conclusions

As far as we know, this is the first social media data study that comprehensively analyzes information about toothache during the COVID-19 epidemic in China. Based on our analysis of tweets on Weibo, we found that the new coronary pneumonia had a significant impact on people suffering from toothache. Many people suffered the effects of toothache, and most were unaware of the specific cause of the pain and had no effective treatment methods. People's reactions to toothache during the epidemic were mostly negative in terms of anxiety and anger. This information can help medical institutions better understand the needs of patients, and disseminate dental public health information through social media, so as to better provide patients with adequate advice, guide patients to actively respond to the emergence of the disease, and reduce patients' negative emotions. In addition, the study provides insights for government organizations and dental professionals to efficiently affect and shape public awareness, and disseminate dental public health information through social media.

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Author contributions

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Writing – original draft: Chenglong Li, Xiaocan Liu.
Writing – review & editing: Xiaocan Liu, Jun Zhang.

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