



Impact of Transmission Control Measures on the Epidemiology of Maxillofacial Injuries in Wuhan City During the COVID-19 Epidemic

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Abstract: In December 2019, a novel coronavirus (severe acute respiratory syndrome coronavirus 2) emerged in Wuhan City. The present study aimed to assess the demographic variables, causes, and patterns of maxillofacial injuries managed at a teaching hospital in Wuhan City during the transmission control measures in the coronavirus disease 2019 (COVID-19) epidemic. In this retrospective study, all patients treated for maxillofacial injuries in the hospital between January 23 and April 7 (2019 and 2020) were involved. Epidemiologic information, including the number of patients, gender, age, etiology, time since injury to the clinic visit, and type of maxillofacial injuries, was recorded. Data of the 2 periods (2019 and 2020) were compared and analyzed. A total of 337 patients had maxillofacial injuries at the 2-time intervals: 74 in 2020 and 263 in 2019. The characteristics of maxillofacial injuries had changes during the transmission control measures in the COVID-19 epidemic, which included the number of patients, gender, age, etiology, time since injury to the clinic visit, and type of maxillofacial injuries. The transmission control measures during the COVID-19 epidemic had a significant impact on the epidemiology of maxillofacial injuries in Wuhan City.

Key Words: COVID-19, epidemiology, maxillofacial injuries, pandemic, transmission control measures

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In December 2019, a novel coronavirus named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) emerged in Wuhan City, Hubei Province, China.¹ Wuhan, the capital of Hubei Province, is a city of 11 million inhabitants and the largest transport hub in Central China. To prevent further diffusion of the novel coronavirus, China implemented a national emergency response, which included suspension of public transport, closure of entertainment venues, and banning public gatherings in the coronavirus disease 2019 (COVID-19) epidemic.² The government shut down transit in and out of Wuhan City from 10:00 AM on January 23, 2020, and orchestrated a massive lockdown with school and office closures, plus later strict stay-at-home orders centered around Wuhan. Wuhan City removed all travel restrictions in and out of the city on April 8th considering that the outbreak was under control.

Because of the unique nature of dentistry, droplets, and aerosols generated during dental procedures, which posing potential risks of infection transmission.³ To be specific, electromedical machinery is atomized and carry the virus as an aerosol to the surfaces, the latter could remain infectious for hours or days. Copper has shown antiviral properties.⁴ Although plastic has the longest persistence times of the virus inactive form. Low temperature (4°C) is also conducive to the persistence of the virus.⁵ The target organs of COVID-19 infection are mainly lungs, and respiratory devices can assist or replace respiratory function. The majority of hospitals do not have sufficient respiratory equipment to cope with the surge in demand. An Italian engineer has ideated a 3D Printing respiratory device suitable to be connected to medical oxygen supply pipes.⁶ This, to some extent, solves the problem of “respiratory hunger.” Due to exposure to saliva, blood, and other body fluids, and aerosol, maxillofacial surgery is correlated with a high risk of COVID-19 transmission.⁷ Screening coronavirus, triage the management, determining priority patient groups, and equipping with standard personal protection for surgeons is necessary.⁸ At present, novel Coronavirus has a very small probability of self-disappearance, and the only way to control the development of this epidemic is to develop a vaccine. Most COVID-19 vaccine development activity is in North America, however, there is currently no public information in Africa or Latin America.⁹

The pandemic leaves many people vulnerable to mental health problems and suicidal behavior. Mental health problems may occur longer than the actual pandemic and may peak later.¹⁰ Over one-third of patients with COVID-19 in Wuhan had neurological symptoms such as neuralgia and aphasia. In New York^{11,12} and UK,¹³ mental health problems and suicidal thoughts are higher among those experiencing socio-economic disadvantage, unemployment, disability, chronic physical illness, mental disorder, and COVID-19 diagnosis. Besides, gun sales in America have skyrocketed.¹⁴ Relative to the UK, the US may be more susceptible to suicide due to the differences in government welfare provisions.¹⁵ Moreover, the psychological impact of the epidemic on Indians is even more pronounced.¹⁶ Of note, telemedicine, smartphones, and apps could

perform quick diagnosis and management to stabilize the patient’s physiological emotions.¹⁷ It cannot be ignored that the pandemic have a severe and long-lasting psychological impact on frontline healthcare workers.¹⁸ Rotas and breaks, getting sufficient sleep, team working and practical support from employers may be appropriate.¹⁹

However, as far as is known, no report has elucidated whether the transmission control measures had an impact on the epidemiology of maxillofacial injuries. This study aimed to explore the characteristics of maxillofacial injuries in Wuhan City during the transmission control measures in the COVID-19 epidemic.

MATERIALS AND METHODS

All patients treated for maxillofacial injuries in the Hospital of Stomatology at Wuhan University between January 23 and April 7 (2019 and 2020) were included in this retrospective study. The hospital has the largest patient center with maxillofacial trauma in Hubei Province. To investigate the impact of transmission control measures in the COVID-19 epidemic on the epidemiology of maxillofacial injuries, the researchers compared 2 timelines: the period from January 23, 2020, to April 7, 2020 (period 1), and the period from January 23, 2019, to April 7, 2019 (period 2). Ethical approval for this study was given by the ethics committee at the authors’ university.

The epidemiologic information included the number of patient (total, the monthly distribution of daily visits, and daily visits across days of the week), gender, age (categorized as follows: <12, 13–19, 20–59, and ≥60 years old), aetiologies (including falls, traffic accidents, sporting injuries, interpersonal violence, occupational accident, etc), time since injury to the clinic visit (categorized as follows: ≤2, 2–24, 24–48, and >48 hours) and types of maxillofacial injuries (including tooth trauma, soft tissue damage, and fractures).

SPSS version 26 software was utilized for data analysis. The data were described using means and standard deviation for continuous variables and using frequency and percentages for categorical variables. Average daily visits by month from January to April between the 2 periods were compared with independent *t*-test. Comparison of proportion analysis was evaluated by Chi-square test. The results were considered statistically significant at *P* value less than 0.05.

RESULTS

A total of 337 patients were treated for maxillofacial injuries in the hospital during the 2 periods. The total number of patients were 74 in 2020 and 263 in 2019 with a period 1-to-period 2 ratio of 0.28:1 (Supplementary Digital Content, Table 1, <http://links.lww.com/SCS/C317>). The number of daily visits by month between January and April decreased in 2020. In 2019, the monthly distribution of daily visits reached its lowest point in February (*P* < 0.001) with an average of 2.68 patients per day. In 2020, there were relatively more daily visits in March (average: 1.35) and April (average: 1.29) compared with January (average: 0.56) and February (average: 0.64). The majority of patient visits occurred on the weekdays (especially Monday and Friday) in 2019, with less patients on the weekends. The average daily visits on weekdays and weekends remained at the same level in 2020 (Fig. 1).

In 2019, 164 patients were male (62.36%), and 99 were female (37.64%). In 2020, 40 patients were male (54.05%), and 34 were female (45.95%). Under the transmission control measures, the ratio of male to female was close to 1.18:1, but there was no significant difference in terms of gender ratio between the 2 periods (*P* > 0.05, Supplementary Digital Content, Table 1, <http://links.lww.com/SCS/C317>).

Age group distribution of patients in the 2 periods is represented in Figure 2. The majority of patients in 2019 were 20 to 59 years old (50.57%) followed by 0 to 12 years old (38.02%). However, the majority of patients in 2020 were 0 to 12 years old (52.70%)

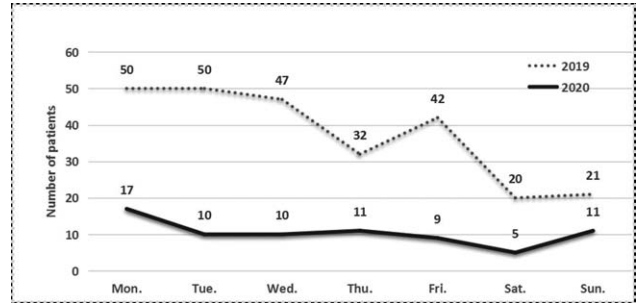


FIGURE 1. Changes in the number of patients across days of the week in 2019 and 2020.

followed by 20 to 59 years old (33.78%). A statistically significant difference was found between the 2 periods in the groups of 0 to 12 and 20 to 59 years of age (*P* < 0.05). Moreover, the mean age in 2019 was approximately 25.49 ± 20.18 years, and that in 2020 was 22.01 ± 21.63 years. However, no statistical differences were observed in the mean age of both periods (*P* > 0.05).

In terms of etiology, the most frequent cause of injury was falling with 131 patients (49.81%) in 2019 and 66 patients (89.19%) in 2020, followed by motor vehicle accidents with 66 patients (36.50%) in 2019 and 6 patients (8.11%) in 2020. For occupational accidents, sporting injuries, and other causes, the percentage dropped to 0 in 2020. Statistically significant associations aetiologically were found between 2019 and 2020, especially in terms of falls and traffic accidents (*P* < 0.001, Supplementary Digital Content, Table 1, <http://links.lww.com/SCS/C317>). In 2019, 67.19% of patients visited the hospital within 24 hours, 27.03% of patients visited the hospital after 48 hours, and the remaining 5.79% of patients visited the hospital within 24 to 48 hours. Of note, 82.43% of patients in 2020 visited the hospital within 24 hours. Amongst them, the proportion of patients who visited the hospital within 2 hours increased by 17.37%. The proportion of patients who visited the hospital within 24 to 48 h was 2.70%, whereas that of patients who visited the hospital over 48 hours was 14.86% (Fig. 3). Statistically significant associations were found in the proportion of patients who visited the hospital over 48 hours between the 2 periods (*P* < 0.05). There was a highly significant difference in the proportion of patients visiting the hospital within 2 hours between the 2 periods (*P* < 0.01). Moreover, the mean time since injury to the clinic visit was approximately 41.581 ± 91.27 hours in 2020 and 115.29 ± 315.06 hours in 2019 (*P* < 0.001).

Concerning the type of injury between the 2 periods (Supplementary Digital Content, Table 1, <http://links.lww.com/SCS/C317>),

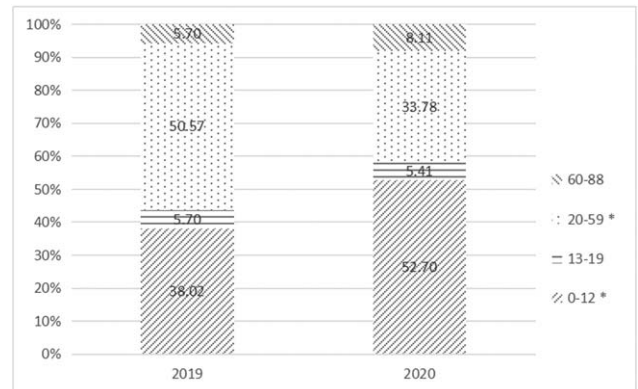


FIGURE 2. Age group distribution of patients in 2019 and 2020 (**P* < 0.05).

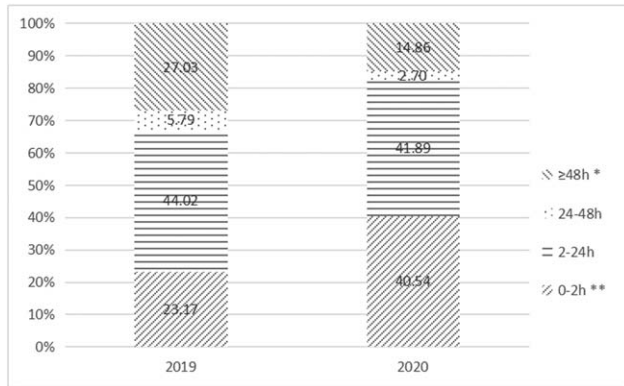


FIGURE 3. Changes in the time since injury to the clinic visit in 2019 and 2020 (* $P < 0.05$, ** $P < 0.01$).

most patients suffered from tooth trauma (70 patients, 26.62%, 2019; 26 patients, 35.14%, 2020) or soft tissue injury (82 patients, 31.18%, 2019; 33 patients, 44.59%, 2020). The percentage of fractures remarkably decreased from 30.41% in 2019 to 5.40% in 2020. Moreover, the proportion of injuries involving the tooth, soft tissue, and bone simultaneously decreased from 18.25% (2019) to 2.70% (2020). A highly statistically significant association was observed between 2019 and 2020, especially in injuries involving the tooth, soft tissue, and bone simultaneously ($P < 0.01$).

DISCUSSION

This study showed that the number of patients can be a characteristic of maxillofacial injuries caused by varying circumstances. When comparing both periods, a decrease in the number of patients was seen under the transmission control measures in the COVID-19 epidemic. As far as is known, it was the largest attempted movement restriction or quarantine in human history to prevent infectious disease spread.

The distribution of daily visits by month from January to April showed that the lowest number of average patients per day was seen in February 2019 due to the Spring Festival holiday. An increasing trend can be seen in the average number of patients per day from February to March, which is associated with work resumption and start of the semester after the Spring Festival Holiday. In 2020, there were relatively more daily visits in March and April compared with January and February as a result of the partial lifting of traffic restrictions on March 25 (people outside could enter Wuhan after March 25 but could not leave Wuhan until April 8), and some of the patients were referred from other hospitals outside Wuhan.

According to the data in this study, the daily visits across days of the week in 2019 showed that the major prevalence of trauma occurred on Monday and Tuesday. This is associated with “Monday syndrome,” which is frequently seen among employees, causes people to start the week with complaints such as stomach pain, headache, malaise, and weakness. Conversely, weekends recorded the less injuries because most people rest at home during this time. This finding is inconsistent with those of previous studies.^{20–22} On the contrary, the distribution of injuries across the days of the week showed a predominant distribution of accidents causing injuries on the weekends, particularly on Sunday and Saturday. These are the days of great opportunity for outdoor and sports activities, little travel and recreation because these are rest days. Such differences may be linked to people’s living habits and outlook on life varying in different countries and cultures. Interestingly, average patient visits on weekdays and weekends in 2020 did not show a significant difference. This situation may be attributed to the closure of the city for non-working days and non-school days.

In the current study, we compared the distribution of gender between periods 1 and 2 and found no statistical difference. However, the proportion of male patients in 2020 (54.05%) was lower than in 2019 (62.36%). In general, men are more likely to be involved in traffic accidents than women because they drive more frequently and in many cases under the influence of alcohol.²³ This can also be attributed to the fact that men participate in working outdoors, engaging in more high-risk occupations. Due to the transmission control measures during the COVID-19 epidemic, men and women were under the same environment exposed to risks and injuries. Therefore, the male-to-female ratio of maxillofacial injuries in 2020 was close to the ratio of male to female population in Wuhan City.

In addition, the characteristics of maxillofacial injuries may be attributed to different social roles played by each age group. Patients between 20 and 59 years old are more likely to be exposed to risks and injuries because they tend to be more engaged in work and social activities. This finding is consistent with international literature.^{24,25} Due to the outbreak of the epidemic, the community was quarantined, people were not allowed to enter or leave freely, and home quarantining became the norm. Increased family activities in people of all age groups reversed the results in 2020.

The literature reported that falls are the most common etiology of maxillofacial injuries in individuals younger than 16 years of age.^{26–28} This study also confirmed that falls were the leading cause of trauma. Traffic accidents were the second cause of facial trauma in both periods. In 2019, the high prevalence of falls amongst children may have been due to children being more involved in activities such as playing, running, and jumping at school. Another study reported that the motor coordination of children is not yet optimal, and as such they are a group of people who can stumble and fall easily.²⁹ Surprisingly, the percentage of falls increased to 89.19% in 2020, whereas the percentage of traffic accidents decreased to 8.11%, which is associated with the increase in home activities and traffic restrictions. No occupational accidents or sporting injuries were reported in 2020. Most occupational accidents in 2019 were related to injuries at construction sites. In addition, the potential of self-isolation to exacerbate adverse home environments for children as well as adults, including domestic violence and abuse,¹⁹ which also increases the risk of maxillofacial trauma. The cause of maxillofacial trauma may be concealed at first visit.

For the intervention timing of the entire population, most injured patients visited the hospital within 24 hours in both periods. Approximately 40.54% of cases visited the hospital within 2 hours in 2020, which may be due to the lack of social activities and thus having sufficient time for seeking treatment. The average of time since injury to the clinic visit in 2019 was much higher than in 2020, which was closely related to that most patients had previously visited private health facilities before presenting at our center for definitive treatment. Accident disputes and traffic jam in 2019 were also possibly latent reasons.

If the patient suffers from more than 2 types of injuries or bone involvement, he/she can be classified as serious trauma. The literature indicates that most serious maxillofacial fractures are caused by road traffic accidents.^{30–33} The proportion of maxillofacial injuries caused by traffic accident decreased greatly in 2020, because the implementation of traffic control measures had greatly reduced the incidence of traffic accidents. In this study, injuries that involve only soft tissue or teeth accounted for the majority of injuries during the epidemic, which was in connection with the overwhelming majority of falls. The injuries caused by falls are often minor. Notably, the proportion of involved in the defined serious types decreased in 2020, which could be attributed to home quarantine and certainly to the fact that some non-Wuhan patients who had serious injuries could not be transferred to our hospital.

In summary, the transmission control measures during the COVID-19 epidemic have an important influence on the epidemiology of maxillofacial injuries in Wuhan City. The collection and analysis of data in times of public health emergencies may improve our understanding of similar public events and may also provide reasonable decisions for oral and maxillofacial surgeons.

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