

# The effect of COVID-19 lockdown on the epidemiology of maxillofacial trauma at tertiary health facilities in Pretoria

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## ABSTRACT

### Background

COVID-19 restrictions reduced the number of consultations of patients, including maxillofacial trauma patients.

### Aim

To analyse and compare the epidemiology of maxillofacial trauma during the four months of the lockdown period (2020) and compare it with the same months from the previous year (2019).

### Materials and method

A retrospective record-based study was conducted with data drawn from all maxillofacial trauma patients who presented in the maxillofacial and oral surgery unit of the University of Pretoria (UP) and Steve Biko Academic Hospital (SBAH) from April to July 2019 and April to July 2020. Data collected included age, gender, aetiology of injury, site of injury, severity and extent of injury, fracture pattern and site, waiting period for treatment and month of injury. A chi-square test was used to evaluate the association between variables. The level of significance was set at  $p \leq 0.05$ .

### Results

A total of 197 patients with maxillofacial injuries were seen in the two institutions for the years 2019 and 2020, with ages ranging from 1 to 81 years and a median of 34.00.

Most patients were males 167 (85%). Many patients were seen in 2019 at 139 (71%). There was no association between the fracture site and the aetiology. The mandible was significantly the most common site of injury and more conservative treatment was done as compared to other forms of treatment ( $p < 0.05$ ).

### Conclusion

More maxillofacial cases were seen in 2019 than in 2020 with more males as compared to females. Most injuries were assaults followed by motor vehicle accidents (MVA). The mandible was the common site of injury. More conservative treatment was done compared to other forms of treatment.

### Keywords

Maxillofacial trauma, aetiology of injury, site of injury, fracture pattern and mode of treatment

## INTRODUCTION

The use of the words “virus” and “maxillofacial trauma (MFT)” in the same sentence was previously unheard of. The recent outbreak of Severe Acute Respiratory Syndrome (SARS) Corona Virus 2 (Cov-2), which causes coronavirus disease 2019 (COVID-19), started in Wuhan City, in the Hubei Province of China. It has emerged as a global outbreak and a significant public health problem. On January 30 2020, the World Health Organization (WHO) declared COVID-19 a public health emergency of international concern<sup>1</sup>. To mitigate the spread of this disease, many countries were forced to introduce lockdowns, which came with several restrictions. Among the myriad restrictions in South Africa was the national curfew, which included limiting the movement of people out of their homesteads between the hours of 20:00 and 05:00, and banning of sale and use of alcohol and travelling. Furthermore, South Africa implemented a five-level COVID-19 alert system to manage the gradual easing of the lockdown. This risk-adjusted approach was guided by several criteria including levels of infections and rate of transmission, [capacity of health facilities, the extent of public health intervention and the social impact of continued restrictions. Alert level five started at midnight on March 26 2020 and, currently, South Africa is on adjusted level 1 as of October 1 2021<sup>2</sup>.

Violence and injury are one of the quadruple burdens of disease in South Africa<sup>3</sup>; its continuous analysis is of vital importance to develop strategies for prevention. Injury surveillance of MFT in a Johannesburg hospital revealed that 30.1% of patients who presented in a Level 1 trauma tertiary hospital in Johannesburg had head and neck injuries<sup>4</sup>. Seventeen years later, a similar study revealed that only 19% had head and neck injuries<sup>5</sup>.

The epidemiology of trauma reveals that assault-related maxillofacial fractures have become more frequent and are

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### Author's contribution:

|             |     |
|-------------|-----|
| N Khan      | 40% |
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| T Nevhutalu | 10% |

the most important cause of facial fractures in industrialised countries<sup>6</sup>. In Europe, assaults represented the most frequent aetiology of MFT, with a rate of 39%. In some countries within Europe, assaults accounted for more than 60% of MFT<sup>6</sup>, while in Canada and the US, assaults accounted for 73% and 37% respectively<sup>7</sup>. Almost all South African studies from 1960 and 2018 show a consistent pattern of interpersonal violence followed by MVA as the most common causes of maxillofacial fractures<sup>8-11</sup>. It has been suggested that a learned behaviour from political violence, with police playing a huge role, has been carried over to the new political dispensation as crime-related violence<sup>3,11</sup>. Some authors maintain that economic factors play a prominent role in interpersonal violence, but studies from other African countries that are poorer than South Africa show MVA is a major cause of facial fractures<sup>12</sup>. Studies on paediatric maxillofacial injuries (MFIs) show that road traffic accidents (RTA) are the most common cause of MFIs in South Africa<sup>13-14</sup>.

A study in Pakistan with a sample size of 535 patients found that falling is the most common cause of maxillofacial fractures<sup>15</sup>. Another study reported that the incidence and aetiology of MFT are also affected by age-related activities<sup>16</sup>. The differences in the aetiology of MFT could be due to differences in social, cultural and environmental factors from one country to another<sup>16</sup>.

Several studies report that alcohol use is increasingly becoming associated with MFT in Europe<sup>6</sup>, with alcohol contributing to 70.8%, 59% and 65% of MFT cases in Germany, New Zealand<sup>17</sup> and South Africa<sup>18</sup> respectively. Also, a study from the Gulf Cooperation Council (GCC), a political and economic coalition made up of six countries – namely the Kingdom of Saudi Arabia, Bahrain, United Arab Emirates, Kuwait, Qatar and Oman – reported alcohol as a causative factor of most interpersonal violence. Restrictions of alcohol in Islamic states has resulted in a low incidence of MFT due to interpersonal violence<sup>19</sup>.

It has also been reported in the literature that MFT tends to occur in the evenings<sup>7,20</sup>. In South Africa, it has been observed that MFT is usually a result of interpersonal violence and many victims who are attacked in the evenings are unaware of the identity of their assailants<sup>20</sup>.

The occurrence of MFT in the evenings and the association of MFT with alcohol consumption seems to contribute to the significant number of victims of MFT. An interesting dynamic about MFT among males in South Africa, however, is that when they do know the identity of their assailants, they are usually not related to them. This is in contrast to South Africa's female victims of MFT, who almost always know their assailants and describe them to be a partner or a former partner<sup>20</sup>.

Maxillofacial injuries seem to be a disease of males worldwide, with males accounting for 79% of cases in Germany<sup>21</sup>, 80.6% in New Zealand<sup>17</sup>, 68% in the US<sup>22</sup> and 82% in South Africa<sup>20</sup>. This suggests that MFIs are an undeclared pandemic, especially among men under the influence of alcohol. The majority of urban MFI patients in the US were profiled as single (85%), males (75%) between the ages of 18 and 30 years (33%) and unemployed (45%)<sup>23</sup>.

The South African lockdown period of 2020 included an Easter weekend. It has been seen in previous years that

a large number of people travel by road across provinces or towns during this time and this results in an increased frequency of road traffic accidents (RTA), which are the second most common cause of MFT in South Africa<sup>18,20</sup>. One study shows that in the Gulf Cooperation Council, RTA is a chief reason of MFIs. This study concluded that the aetiology of MFI differs from developed countries to developing countries, where social violence is the leading cause in developed nations and traffic accidents are the chief cause in developing countries<sup>19</sup>. It would be of interest to analyse the impact of the lockdown on MFT, and quantify and compare the volumes of MFT during the Easter period in South Africa.

Some studies present the mandible as the most commonly affected bone<sup>10</sup>, while others show that the nose was the most commonly affected bone<sup>23</sup>. Among paediatric patients, most fractures were those of the orbits, the frontal bone<sup>13-14</sup> and mandible<sup>15</sup>.

Canada's maxillofacial injury mapping showed that rural counties had higher rates of MFI-related emergency department visits<sup>7</sup>, while an American study revealed that maxillofacial injuries occur in urban settings<sup>23</sup>. The results of the North American studies differ from those of a South African study which did not show any statistically significant difference in maxillofacial injuries between rural and urban areas<sup>20</sup>.

The lockdown period has provided us with a unique and rare opportunity to carry out studies and prove a number of issues that would not have been possible under normal circumstances, such as preventing access to alcohol and restricting interprovincial travel which both contribute to road traffic accidents. Anecdotal evidence suggests that during the lockdown there was a reduction in crime, MVAs and, subsequently, MFT casualties in tertiary hospitals. The purpose of this study was to compare MFT over four months (April to July) in 2019 and four months of lockdown (April to July) in 2020.

## MATERIALS AND METHODS

Ethical approval was obtained from the Research Ethics Committee of the Faculty of Health Sciences, University of Pretoria (Ref: 844/2020). No personal details of the patients were disclosed and all information was strictly confidential and anonymous. A retrospective record-based study was conducted with data drawn from all maxillofacial trauma patients who presented in the maxillofacial and oral surgery unit of University of Pretoria (UP) at both Steve Biko Academic Hospital (SBAH) and the University of Pretoria Oral Health Centre, from April to July of 2019 and April to July of 2020.

Data taken from the files of the patients included age, gender, aetiology of injury, site of injury, severity and extent of injury (fracture/soft tissue/dental), fracture pattern and site, waiting period for treatment (time between injury and treatment) and month of injury.

Data was analysed with SPSS software (version 28; IBM, Somers, NY). Quantitative variables were summarised as proportions, frequencies, mean with their standard deviations, range and percentages. A chi-square test was used to evaluate the association between variables – age, gender, aetiology of injury, site of injury, severity and extent of injury (fracture/soft tissue/dental), fracture pattern and site. Level of significant was set at  $P \leq 0.05$ .

Table 1. Year, month and aetiology of the maxillofacial injury n=197

| Year n (%)     | Gender n (%)     | Month n (%)     | Aetiology n (%)   | Total            |
|----------------|------------------|-----------------|-------------------|------------------|
| 2019 139 (86)9 | Female 20 (14)   | April 49 (35.3) | Assault 71 (51.1) | 139 (86)         |
|                | Male 119 (86%)   | May 38 (27.3)   | Fall 15 (10.8)    |                  |
|                |                  | June 14 (10.1)  | GSW* 4 (2.9)      |                  |
|                |                  | July 38 (27.3)  | MVA* 32 (23)      |                  |
|                |                  |                 | PVA 7* (5)        |                  |
|                |                  | OTHER 10 (7.20) |                   |                  |
| 2020 58 (14)   | Female 10 (17.2) | April 9 (15.5)  | Assault 39 (67.2) | 58 (14)          |
|                | Male 48 (82.8%)  | May 9 (15.5)    | Fall 6 (10.3)     |                  |
|                |                  | June 19 (32.8)  | GSW* 1 (1.7)      |                  |
|                |                  | July 21 (36.2)  | MVA* 6 (10.3)     |                  |
|                |                  |                 | PVA* 1 (1.7)      |                  |
|                |                  | OTHER 5 (8.6)   |                   |                  |
| <b>Total</b>   |                  |                 |                   | <b>197 (100)</b> |

\*GSW (gunshot wound), \*MVA (motor vehicle accident), \*PVA (pedestrian vehicle accident)

## RESULTS

A total of 197 patients with maxillofacial injuries were seen in the two institutions for the years 2019 and 2020 with ages ranging from 1 to 81 years and a median of 34.00, suggesting that the majority of the patients were in the range of 34 years of age. The majority of patients were males 167 (85%). The majority of patients were seen in 2019 at 139 (71%). The rest of the demographics can be seen in Table 1.

Table 1 indicates that the majority of maxillofacial consultations were because of assault cases which were almost two thirds in both years followed by motor vehicle accidents. In both years, more than 80% of the patients were males. Most of the patients were seen in 2019 with a significant decrease in numbers in 2020. Table 2 below depicts the fracture sites and the treatment done on the patients.

As far as treatment is concerned, significantly more treatments were done on the mandible with significantly more conservative treatment (CON) done followed by ORIF and closed reductions  $p=0.001$ . As far as the site of injuries is concerned, significantly more injuries were reported in the mandible as compared to the other sites  $p=0.001$ , see Table 3. Association between fracture site and aetiology of the injury can be seen in table 4 below.

When an association between the fracture site and aetiology was done it was found that there was no association  $p>0.005$ . Although no association was observed it was

found that assault cases were in the majority followed by motor vehicle accidents, with falls following closely. When association between gender and maxillofacial injuries and treatment were done it was found that there was no association between the variables  $p>0.005$ ; this was even though significantly more males consulted as opposed to females.

## DISCUSSION

Significantly more maxillofacial injury patients consulted in 2019 as compared to 2020 (139 versus 58) and this showed the effect of COVID-19 as the impact was only felt in 2020, when there were restrictions. The restrictions included that only emergencies to relieve pain and sepsis and that meant patients whose injuries did not seem to be emergencies could be postponed. For admissions patients had to provide a negative COVID test, which could also have contributed to low numbers during the COVID-19 era.

The majority of patients with maxillofacial injuries in this study were male and this agrees with several studies worldwide.<sup>17,21&22</sup>. A South African study conducted in 2018 also found that 82% percent of maxillofacial injuries were from males, and this is in line with the present study<sup>20</sup>. The influence of maxillofacial injuries was found to be related to alcohol in other studies, but this was not investigated in this study due to the alcohol ban during the COVID-19 lockdown in South Africa.

Table 2. Fracture and the type of treatment offered to patients n=197

| Year n (%)    | Fracture site n (%) | Treatment n (%)  | Total            |
|---------------|---------------------|------------------|------------------|
| 2019 139 (86) | Mandible 105 (76.3) | Closed 38 (27.3) | 139 (86)         |
|               | Midface 23 (16.5)   | CON* 65 (46.8)   |                  |
|               | Nil 10 (7.2)        | ORIF* 35 (25.5)  |                  |
|               |                     | RECON 1 (0.7)    |                  |
| 2020 58 (14)  | Mandible 33 (56.9)  | Closed 15 (25.9) | 58 (14)          |
|               | Midface 19 (32.8)   | CON* 22 (37.9)   |                  |
|               | Nil 5 (8.6)         | ORIF* 19 (32.8)  |                  |
|               | Upper face 1 (1.7)  | RECON* 1 (1.7)   |                  |
|               |                     | RHT* 1 (1.7)     |                  |
| <b>Total</b>  |                     |                  | <b>197 (100)</b> |

\*CRF (closed reduction and fixation), \*CON (conservative treatment), \*ORIF (open reduction and internal fixation), \*RECON (reconstruction)\*, RHT (refusal of hospital treatment)

Table 3. Association between fracture site and treatment n=197

| Fracture site | Treatment |           |           |          |          |            | p value |
|---------------|-----------|-----------|-----------|----------|----------|------------|---------|
|               | CRF*      | CON*      | ORIF*     | RECON*   | RHT*     | Total      |         |
| Mandible      | 47        | 42        | 49        | 1        | 0        | 139        | 0.001   |
| MID           | 6         | 29        | 5         | 1        | 1        | 42         |         |
| NIL           | 0         | 15        | 0         | 0        | 0        | 15         |         |
| UPP           | 0         | 1         | 0         | 0        | 0        | 1          |         |
| <b>Total</b>  | <b>53</b> | <b>87</b> | <b>54</b> | <b>2</b> | <b>1</b> | <b>197</b> |         |

\*CRF (closed reduction and fixation), \*CON (conservative treatment), \*ORIF (open reduction and internal fixation), \*RECON (reconstruction)\*, RHT (refusal of hospital treatment)

The epidemiology of maxillofacial injuries in this study was found to be in the majority from assaults, followed by motor vehicle injuries. This is in line with studies done in industrialised countries like Europe, Canada and the US<sup>6,7</sup>. Almost all South African studies from 1960 and 2018 show a consistent pattern of interpersonal violence followed by motor vehicle accidents as the most common causes of maxillofacial fractures<sup>8-10</sup> and the present study is in line with the past studies. In the present study assaults far exceeds motor vehicle injuries and it makes sense as the lockdown restricted movement but allowed families to be together.

The present study indicated that more than half of the injuries involved the mandible followed by the midface and this is in line with other studies which indicated the mandible as the common site for injuries<sup>10</sup>.

### CONCLUSION

There were more maxillofacial consultations in 2019 than 2020 due to the COVID regulations. Significantly more males had maxillofacial injuries as compared to females. Most injuries were due to assault followed by motor vehicle accidents with the mandible being the most common site of injury. As far as treatment was concerned, more conservative treatment was done as opposed to other forms of treatments.

### Limitations

This study is limited by the cross-sectional study design, and causality cannot be inferred. Despite the limitations, the current study provided useful information that may inform future studies in the institutions. It is recommended another study be done that will have a longitudinal design to understand the association of variables on a larger scale.

### Conflict of interest

The authors declare there are no conflicts of interest.

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Table 4. Association between fracture site and aetiology of the injury n=197

| Fracture site | AETIOLOGY  |           |          |           |          |           | Total      | p value |
|---------------|------------|-----------|----------|-----------|----------|-----------|------------|---------|
|               | Assault    | Fall      | GSW*     | MVA*      | PVA*     | Other     |            |         |
| Mandible      | 77         | 15        | 4        | 29        | 5        | 9         | 139        | 0.96    |
| Midface       | 23         | 3         | 1        | 7         | 3        | 5         | 42         |         |
| NIL           | 9          | 3         | 0        | 2         | 0        | 1         | 15         |         |
| Upper face    | 1          | 0         | 0        | 0         | 0        | 0         | 1          |         |
| <b>Total</b>  | <b>110</b> | <b>21</b> | <b>5</b> | <b>38</b> | <b>8</b> | <b>15</b> | <b>197</b> |         |

\*GSW (gunshot wound), \*MVA (motor vehicle accident), \*PVA (pedestrian vehicle accident)