RESEARCH ARTICLE

# Maxillofacial trauma and its management presenting at a tertiary care hospital in Lahore during Covid-19 pandemic

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## Abstract

**Objective:** The objective of this study was to assess the patterns of maxillofacial injuries, aetiology and their management during the pandemic of Covid-19 in a tertiary care hospital in Lahore, Pakistan.

**Methods:** This is a single center, prospective cross-sectional study. Patients from all age groups who presented at the Emergency room of Jinnah Hospital Lahore and managed by the Oral and Maxillofacial Surgery Department during 1st December 2020 till 31st January 2021 were included. Data were analyzed using IBM SPSS for Windows, Version 20.0.

**Results:** Total 202 patient were analyzed, 161 (79.7%) were male and 41 (20.3%) were females. Male to female ratio was 4:1. About fifty three percent of patients belonged to the age group 15-35 years. The most common cause was road traffic accidents (RTA), followed by fall. Eighty-three (41.1%) had only soft tissue injuries without any bony fracture and 119 (58.9%) had facial bones fractures. Zygomatic bone fracture was most common (53.8%) followed by mandible fracture (31.1%). Sixty-one out of 119 patients with fractures were treated with Open Reduction Internal Fixation (ORIF). Three patients had complete loss of vision because of facial trauma. Only 56 (28%) patients were managed under General Anaesthesia.

**Conclusion:** During the initial pandemic era, a large majority of patients presenting with maxillofacial injuries were young male adults. The most common cause of maxillofacial trauma was RTAs. Soft tissue injuries were predominant followed by facial bone fractures and zygomatic bone was more frequent among the fracture cases. Covid-19 pandemic increased the difficulties faced in the management of maxillofacial trauma patients.

**Keywords:** Covid -19, Maxillofacial Injuries, Tertiary Care Centers.

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## Introduction

On 30th January 2020, Covid-19 outbreak was declared a public health emergency by World Health Organization (WHO).[1] A respiratory disease started from Wuhan, China.[1,2] SARS-CoV-2 virus infamously known as Covid-19 finally reached Pakistan with 2 confirmed cases on 26th February 2020.[1,3] On 11th March, 2020 WHO declared Covid-19 a pandemic and on 18th March country's first death by the SARS-CoV-2 virus was officially reported.[1] For an economically and politically debilitated, poor developing country with weak and struggling healthcare system, to accommodate the patients in its incapacitated healthcare facilities was a challenge.[1] The evolving information regarding the nature, mode of transmission, infectious rate and treatment created uncertainty impelling the provincial governments to impose lockdown.[1] On 24th March, 2020 the province of Punjab went in lockdown.

Already grappling with the menace of overburdened health facilities tackling and managing medical and traumatic surgical emergencies, this pandemic led to the shortage of basic resources and supplies.[1] The statistics of Rescue 1122 shows that around 311,444 road traffic accidents were responded by Rescue 1122 in Punjab in year 2020, out of which 66,319 were from Lahore alone.[4] Despite of the fact that the country was under lockdown and movement was restricted, an increase of 0.67% was witnessed from the year 2019.[4] The substantial number of the motor vehicle accidents was due to many factors.[5] The improperly planned, potholed roads with their poor management system, the inadequately lit streets at night, the failure to implement laws for the removal of boggled vehicles and under aged, over speeding riders or drivers out from the streets.[5] Issuance of driving licenses with testing of only elementary level driving skills and knowledge.[5] The lack of interest from the authorities to take responsibility and to improve traffic and vehicle laws and their management system.[5] The trivial penalties on disobeying the traffic laws lead to undaunted approach of masses and the reluctance in use of helmets on a ride with

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attitude towards reckless driving are some of the causes of this prodigious problem leading to loss of life and a huge economic burden on the country.[5] Some studies suggest that in developing countries more than 50% of victims suffer from maxillofacial injuries.[6]

Working and dealing with this much trauma in a tertiary care hospital in a city of more than 11 million population with scarce resources is challenging. Like some other specialties, maxillofacial surgery is also among the ones with very high risk of contracting the SARS-CoV-2 virus.[2,7,8] The reason is obvious as the specialty deals in the vicinity and the region with a very high viral load. [2,7,8] Initially the patients were managed with minimal contact time and due to limited testing all patients were considered as possible carriers of SARS-CoV-2 virus.[1,2,7,8] Only those procedures were performed which results in minimal generation of aerosol or sometimes by delaying the definitive treatment of non-life threatening injuries.[2,7,8] But the increasing number of patients and the severity of injuries required more timely management.[7,8]

WHO declared health emergency as a result of SARS-CoV-2 virus due to emerging data and uncertain or unproven treatment protocols, every center was propelled to come up with their own local or regional guidelines influenced by the international or WHO recommendations.[1,7,8] The health staff was trained and educated to properly wear and dispose-off the Personal Protective Equipment (PPE) to ensure efficient and proper utilization of PPE and good cross-infection control.[2,7] The pandemic of Covid-19 is not the first or the last respiratory disease outbreak. History is full of several respiratory pandemics and outbreaks. In the last 20 years only, there were several respiratory diseases outbreak e.g., SARS-CoV1 outbreak (2002-2004), Swine flu pandemic (2009), MERS outbreak (2012), and recently SARS-CoV2 (Covid-19) Pandemic. The maxillofacial surgeons and the professionals dealing with the respiratory region are highly exposed to such infectious diseases.

Maxillofacial trauma and the respiratory pandemic of Covid-19 pose several challenges for maxillofacial surgeons.[2,7,8] Management of patients presenting with the facial injuries or fractures with scarce and poorly managed distribution of the resources while struggling to maintain the cross-infection control among the patients and healthcare professionals.[7,8] The minimum protection was an N95 mask and an eye goggles to protect the health care professional.[2,7] The fractures that could be managed by the closed or conservative treatment or by using maxillomandibular fixation (MMF) technique were managed by either under local or general anesthesia depending on the type of fracture and patient specific factors.[2,7] General anaesthesia (GA) requires both intubation and extubation procedure which is a very high aerosol generating procedure.[2,7,8] The patients were managed with good pain management under good local anaesthesia to minimize the aerosol.[7] The duration of hospitalization was kept short and once the patient was stable, he/she was discharged immediately.[2,7] Open Reduction and Internal Fixation (ORIF) procedures were performed both under local and GA.[7] Frequent surveys and feedback were collected from the health staff to further improve the management protocols and address the difficulties, they were facing in carrying out their duties.

The objective of this study was to perform a prospective cross-sectional analysis to assess the pattern, site and type of maxillofacial injuries along with the most common causative factors presenting at a tertiary care hospital located in a metropolis of a developing country (Pakistan) during the pandemic of Covid -19. Further to share the experience with other professionals and encourage them to share their knowledge and experience, so that we could come up with more appropriate guidelines and recommend measures to appropriate policy makers, authorities, and healthcare institutions to modify the practices to help prevent and manage maxillofacial trauma and the spread of respiratory diseases like Covid-19 and the respiratory disease outbreaks we will face inevitably in the future. The world is preparing for future pandemics and WHO is ringing alarms. A developing country like Pakistan needs to develop a response to handle the outbreaks by considering its own local factors and upgrading its healthcare system to meet future challenges. For that purpose, we need more local data, and this study is one of the attempts to add to the local literature which is barely available on this topic.

## Materials and Methods

A single centre prospective cross-sectional study was conducted. Data collection was commenced after the approval from the institutional ethical review board. All patients who were presented at the Emergency room and were managed by the Oral and Maxillofacial Surgery Department of Jinnah Hospital Lahore from 1st December 2020 to 31st January 2021 were included in the analysis. The patients managed by other specialties e.g., ENT for nasal injuries or facial trauma presented in outpatient were excluded. The data was collected on patient's age, gender and mode of injury and presented as frequency and percentages for categorical or mean and standard deviation for continuous variables. The analysis was done in IBM SPSS Statistics for Windows, Version 20.0 (IBM Corp., Armonk, NY).

## Results

A total 202 patients presented with age ranging from 2 to 88 years, mean age was 28 ±16.3 years. There were 161 (79.7%) males and 41 (20.3%) females. The male to female ratio was 4:1. More than half 106 (52.5%) belonged to the age group 16-35 years followed by 39 (19.3%) in age range of 36-50 years, 38 (18.8%) patients were below 16 years and 19 (9.4%) belonged to age above 51 years. The most prevalent cause of facial injuries was RTA 133 (65.8%) and among RTA motorcycle accidents 107 (53%) were the most common cause. This was followed by falls, slips and trips 38 (18.8%), cases of violence were 24 (11.9%) and only 7 (3.5%) were due to other modes or causes. The details of mechanisms of trauma are presented in Table 1. Out of total 202 patients, 125 (61.9%) had soft tissue injuries ranging from laceration to tissue loss. Fractures presented in 119 (58.9%) patients and 83 (41.1%) had only soft tissue injuries without any bony fracture. Out of 202, 29 (14.4%) patients presented

**Table-1:** Mechanism of trauma.

| Mechanism of Trauma | Frequency | Percentage |
|---|---|---|
| Collision Between Two Motorcycles | 53 | 26.10% |
| Slip, Trip or Fall from height or Stairs | 38 | 18.80% |
| Fall from motorcycle due to Imbalance | 25 | 12.40% |
| Pedestrian Hit by Vehicle | 20 | 9.90% |
| Interpersonal or domestic violence | 17 | 8.40% |
| Collision Between Motorcycle and Car | 16 | 7.90% |
| Collision Between Motorcycle and Truck | 6 | 3% |
| Collision Between Rickshaw and Motorcycle | 4 | 2% |
| Stab or Knife Wound | 4 | 2% |
| Collision Between Car and Truck | 3 | 1.50% |
| Occupational or Machine Injuries | 3 | 1.50% |
| Firearm or Penetrating Trauma | 3 | 1.50% |
| Collision Between Rickshaw and Truck | 2 | 1% |
| Collision Between Car and Rickshaw | 2 | 1% |
| Collision Between Motorcycle and Cart | 1 | 0.50% |
| Collision Between Two Cars | 1 | 0.50% |
| Fork Injury | 1 | 0.50% |
| Animal or Dog bite | 1 | 0.50% |
| Fuel Canister Explosion Injury | 1 | 0.50% |
| Electrical Burn | 1 | 0.50% |

**Table-2:** Distribution of facial bone fractures

| Facial bones involved in fracture (n=119 patients) | Frequency | Percentage |
|---|---|---|
| Zygomatic Bone | 64 | 53.80% |
| Mandible | 37 | 31.10% |
| Maxillary Bone | 24 | 20.20% |
| Isolated Nasal Bone | 22 | 18.50% |
| Frontal Bone | 14 | 11.80% |
| Naso-Orbito-Ethmoid Fractures (NOE) | 5 | 4.20% |

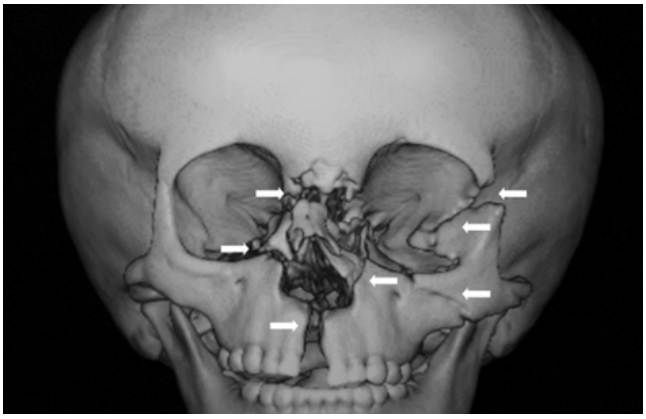

**Figure-1:** 3D reconstructed CT scan of a pediatric patient showing midface fractures with maxillary split because of fall.

**Figure-2:** Facial degloving injury in an adult female along with the open fracture of the nasal bone because of road traffic accident.

**Figure-3:** Picture showing a firearm injury suffered by an adult male in a maxillofacial region. The projectile entered from the left angle of the mandible and exited from the right side of face fracturing the mandible and maxilla along with massive soft tissue injury.

**Table-3:** Management of patients with maxillofacial injuries.

| Management of Facial Injuries | Frequency | Percentage |
|---|---|---|
| **Management of Fractures (n=119)** | | |
| Open Treatment (ORIF) | 61 | 51.30% |
| Conservative Treatment/Observation | 56 | 47% |
| Closed Treatment with MMF | 2 | 1.70% |
| **Type of Anaesthesia, (n=169)** | | |
| Local Anaesthesia | 113 | 56% |
| General Anaesthesia | 56 | 28% |
| **Location, (n=187)** | | |
| Injuries Managed in Minor OR | 117 | 58% |
| Elective Operating Room | 51 | 25% |
| Emergency Operating Room | 19 | 10% |
| **Timing of Treatment** | | |
| Early Treatment (Within 48 hours) | 139 | 69% |
| Observation or follow up | 33 | 16% |
| Delayed Treatment (After 48 hours) | 26 | 13% |
| Both Early and Delayed Procedures | 4 | 2% |

with polytrauma, and 8 (4%) patients required mechanical ventilation support. The most common fracture was of zygomatic bone 64 (53.8%) followed by mandible fractures 37 (31.1%), (Table 2). In mandible, most common site of fracture was angle of the mandible and symphysis region (n=13 each) followed by condyles (n=10). Among total mandible fractures, 21 (56.8%) presented with fracture at single place and 16 (43.2%) were from multiple sites. There were 3 (1.5%) patients who lost vision because of facial trauma. The management of both soft tissue injuries and bone fractures along with type of anaesthesia administered with timing of the treatment are summarised in Table 3.

## Discussion

The trends of maxillofacial injuries during the initial phase of Covid-19 showed similar patterns that have been reported elsewhere. The patients in our study belonged to the age ranging from 2 to 88 years, that are comparable to the other studies where minimum to maximum age was 5-75 years.[9] More than half 106 (52.5%) of victims belonged to age group of 16-35 years.[6,10] Our population was little younger, the mean age was 28.0 ± 16.3 years as compared to other studies where it was reported to be (32.6 ± 11.2),[6] (29.1 ± 8.6)[10] and (35.0 ± 11.8) years[9] respectively. The male to female ratio was 4:1 that matched to many other studies.[9, 11] Most of the patients who suffered from maxillofacial injuries were victims of RTAs, 133 (65.8%) and the results of our study correspond to other studies where RTAs found to be the most common cause accounting 73.8% of injuries. [5, 9, 11] The data suggests that young males adults were more prone to have such injuries compared to females of the same age group as a result of RTA and this segment of the population is more exposed to such incidences while commuting to their workplace. [5, 9, 11] These preventable RTAs results in economic loss of approximately 1.3 billion USD to Pakistan annually.[5] The most common victims (53%) of RTAs in our study were motorcycle riders. Many of them reported that they had an accident in the evening, suggesting poor visibility due to reduced amount of light and fog in winters that might have contributed to the sequence of events leading to the accident. A study from Karachi stated 45% of RTA sufferers were motorcycles and most of them were not wearing helmets or protection gears and mornings in summers were when more accidents happened as a result of overspeeding.[5] In other studies two wheelers were responsible for 67-91% of facial injuries.[6,9,10] Motorcycle being responsible for large number of injuries can be assessed from the fact that in Pakistan there were 21.9 million registered motorcycles in 2019, that makes nearly 75.5% of all motorized vehicles.[5]

After RTAs the second common cause 38 (18.8%) was facial trauma because of falling, slipping or tripping Figure-1. The results were similar to others where fall accounted for 18-23%.[6, 9, 11] Violence was the third most common cause 24 (11.9%) resulted in patients with maxillofacial injuries Figure-2. Studies suggests that RTAs were responsible for most of the maxillofacial injuries in the developing countries, while interpersonal violence was the common cause in the developed world.[10,11] Also Covid-19 resulted in increased cases of domestic violence and assault in western countries.[3] They also suggest that women suffer more from maxillofacial injuries as a result of domestic violence with prevalence ranging from 34-73%.[9] All the others modes of injuries 7 (3.5%) were similar to other studies.[9] Soft tissue injuries were present in 125 (61.9%) of all cases. Among the total 58.9% patients were presented with bone fractures and 41.1% with soft tissue injuries without fractures. The most common bone fracture was zygomatic bone, isolated or zygomaticomaxillary complex fractures (ZMC) accounted for 53.8%. Other studies also reported it to be the most common fracture with prevalence ranges between 36-63%.[9,11] The second most common fracture was of mandible 37 (31.1%) that was also reported elsewhere.[9] However, some studies have reported mandible to be the most common bone fractured (44.9%).[6,11] Wearing helmets could prevent motorcycle riders from more severe facial injuries particularly in developing countries where road traffic crashes adversely impact health care system and economy. The angle of the mandible and the symphysis region were fractured more commonly, followed by the condyles. This was contrary to some studies that suggested body of the mandible to be the

most common site from where the mandible gets fractured followed by symphysis/parasymphysis and angle of the mandible.[10] The nasal bone isolated or in combination of naso-orbitoethmoid (NOE) fractures had a high prevalence 22.7% in our study Figure 3, while others reported a low prevalence of 6.4%.[9] Study from Iran reports that nasal bone was the most common site of fracture in maxillofacial region.[11]Approximately 58 (48.7%) fractures were managed by conservative or closed treatment method using Erich Arch bar, Eyelets and IMF screws and our estimates are approximate to other study reports ranging from 27-46% were such cases were managed with closed or conservative approach.[9,10] Maxillomandibular fixation (MMF) using IMF screws reduces the working time or direct contact with the patient.[2, 7] Fractures where open reduction and internal fixation was indicated, it was done using miniplate osteosynthesis.[9] More than half of the patients 61 (51.3%) were managed with open reduction at our institute while around one third 34.5% of such cases managed by open reduction in one study.[9]

Most of the patients were managed under the local anaesthesia to avoid aerosol generation during the intubation procedure under GA, however fractures or injuries requiring GA for the proper management were given with precautions.

After declaration of Covid-19 as health emergency by WHO 1, uncertainty coupled with lack of proper information regarding SARS-CoV-2 virus, fuelled by misinformation spread through social media like a wildfire, much faster than the pandemic itself brought the entire globe at a halt.[1] With restricted physical and economic activities, the entire planet was transformed with the new norms of social distancing, staying at home, frequent hand washing along with fear and panic.[1] Being in direct contact with the virus health care workers suffered more from the stress than the general masses.[3,7] Various governments responded differently according to their own circumstances from partial to complete lockdowns.[1]

It was advised to ensure at least the minimal protection i.e., N95 mask and an eye goggle.[7,8] Doctors and staff were trained regularly on how to use and dispose PPE and protect themselves from the infection and contamination of the facilities.[2,7,8] Vaccination was done as soon as it was available to the health care workers. Duration of patient's hospital stay was reduced.[7] For the indoor admissions and emergency/elective surgeries, vitals were checked, Covid-19 RT-PCR test and a standard chest radiograph was made necessary unless it requires immediate intervention as in case of life threatening injuries.[7] The contact of admitted patients with others were restricted.[7] Frequent chlorhexidine oral rinses were prescribed.[12] Observation of any sign and symptom of Covid-19 were immediately reported and the patient was isolated to rule out the suspicion.[2,7,8]

The evolving information regarding the prevention, nature of the disease, diagnosis, protection and its management lead to different guidelines at various institutes.[2,7] When the pandemic was on its peak, initially the patient were managed with minimal but necessary and brief contact delaying the definitive treatment of non-life threatening injuries.[7] But the increasing magnitude of trauma and maxillofacial injuries continued adding into the plight and misery of the patients with disfigurement, functional, psychological, social implications and problems with long term consequences including the financial burden on the family and country. So, delaying the definitive treatment of these non-life-threatening injuries was not a practical option in the long run. Covid-19 pandemic was not just a simple respiratory disease but also an economic challenge for the entire world.[1,3] Pakistan was already facing many economic challenges even before Covid-19 pandemic and the economic dilemma soldered with poor financial and resource management escalated it.[1]

There were some limitations in our study as it was conducted at a single center for a very short duration by only Maxillofacial Surgery Department. The time when it was conducted was in winters, with no data on other seasonal influence or season-based behaviours of the motor vehicle riders and the impact it had on the number of accidents and the patterns of injuries. The data on nasal fractures managed by ENT department was not included in our results due to its unavailability. Also, the patients presented in outpatient were excluded. To better understand we need a longer duration study involving multiple centers and specialties directly or indirectly involved in managing facial trauma. With this study, our fellow colleagues may be encouraged to come up with their own local data to help us all to understand the real magnitude of the maxillofacial injuries in the region and country to properly plan and manage our facilities. To identify the causes of maxillofacial trauma specifically and injuries in general and to help authorities to modify or bring changes to the existing laws to reduce the number of road traffic accidents which will ultimately reduce the financial burden on an already struggling country with economic problems which skyrocketted more due to Covid-19 pandemic.[12] The authorities should develop austerity in issuance of driving licenses after developing and implementation of advance testing structures and

procedures like the way implemented in the developed countries.[5] Formulation of better laws or revision of the existing ones and development of mechanism for the repairs of pitted and poor quality roads.[5] Availability of functional street lights in all areas should be ensured along with more active and provocative awareness campaigns should be launched to reduce the number of accidents and the magnitude of maxillofacial trauma. It will also reduce the financial burden and help in the reallocation of resources to improve healthcare facilities and services.[1]

## Conclusion

The most of the maxillofacial trauma injuries reported during the beginning of Covid-19 pandemic were RTAs and the younger male population of productive age group was the most vulnerable sub-set of population. Soft tissue injuries were the most common, succeeded by bone fractures. The Covid -19 pandemic was a serious situation, and it is not the first or the last respiratory disease outbreak. Its infectivity is low currently, but the virus is still present and will stay for some time with its variants and sub-variants continuously mutating. The world is evolving and so hence the diseases. The importance of learning and training is crucial and relevant. But sometimes unexpected or bad things must happen before the good things can, like the recent development of vaccines and public awareness of good health, hygiene and infection control. This viral infection acted as a catalyst and as a result, a massive amount of work is being done not only in the field of medical sciences but also in other subjects springing new technological advancements and achievements we were once decades away.

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**Author's Contributions**

**OP:** Study concept, supervision and finalized.
**ZS:** Interpretation and data analysis.
**FB:** Data collection, compilation and writing.