Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/0emrxk17

# CHANGING PATTERNS OF FACIAL FRACTURES OVER THE LAST DECADE: A RETROSPECTIVE ANALYSIS

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## ABSTRACT

Facial fractures, caused by accidents, falls, sports injuries, and assaults, are a global health concern. Social, environmental, and technological changes have influenced their frequency and patterns. Rising road traffic and socioeconomic activities increase the complexity of these injuries, causing aesthetic, functional, and financial burdens.

**Methodology:** A retrospective analysis of 3,878 patient records from 2014 to 2024 from multiple Punjab hospitals revealed facial fractures diagnosed through imaging (OPG, PA face, PNS, CT with 3D). The fractures were categorized by bone type and injury mechanism, and demographic data was recorded. The study aimed to compare trends over time.

**Results:** It revealed a male predominance (90.1%), with the majority of patients aged 21–30 years (35.5%). RTAs were the leading cause of injury (62% in 2023), followed by assaults and sports-related incidents. Mandibular fractures were the most common (63%), followed by zygomatic (15.3%) and maxillary fractures (8.9%). The study highlights a rising trend in facial trauma until 2023, with a slight decline in 2024, potentially influenced by COVID-19 lockdowns. These findings underscore the need for targeted preventive measures, particularly for RTAs and violence-related injuries, and emphasize the importance of age- and gender-specific interventions.

**Conclusion:** The study reveals social developments and trauma care advancements have impacted facial fracture patterns over the past decade, highlighting the need for targeted preventative measures by government officials.

**Keywords**: Facial fractures, trauma epidemiology, retrospective study, maxillofacial injury, injury prevention, aging population

## INTRODUCTION

Facial fractures are common in trauma patients and are typically caused by a variety of mechanisms, including vehicle accidents, falls, sports injuries, and assaults.[1] Over the past decade, social, environmental, and technological changes have likely influenced the frequency and types of facial

injuries encountered in clinical practice.[2]Numerous factors, such as traffic accidents, falls, attacks, workplace accidents, sports injuries, and gunshot injuries, can result in maxillofacial trauma.[3,4] The location, size, and direction of the force all affect its pattern and severity. Trauma is the primary cause of maxillofacial injuries, which impact the soft tissues, teeth, and bones of the face.[5] Due in major part to rising road traffic and expanding socioeconomic activities, these injuries are becoming more common and more severe.[5] Over the last three decades, the causes of maxillofacial trauma have changed and are still changing, differing by age group, gender, region, and socioeconomic position.[6, 7, 8]

A comprehensive care strategy is required since injuries today range from superficial cuts and fractures to systemic involvement (e.g., head, spine, chest, or abdomen), whereas prior trauma patterns were simpler.[10]maxilllofacial trauma is one of the most important medical injuries encountered globally. Particularly due to majority and various types of bones involved. Maxillofacial fractures are also associated with esthetic and functional morbidity, alongwith financial and psychological burden to the patient.[11, 12] A patient's self-esteem, attractiveness, and oral function can all be impacted by facial injuries.[13] Age, facial bone growth, fracture type, involvement of surrounding tissues, and other injuries are all important considerations during treatment.[14]

Trends in face fractures over the past years have been influenced by increased knowledge of preventative measures, breakthroughs in technology for diagnosis and treatment, and improvements in safety protocols.[15, 16, 17] To increase public awareness about avoiding and treating these injuries, trauma teams and maxillofacial surgeons should collaborate.[18] This study aims to analyze how these factors have impacted the incidence, distribution, and mechanisms of facial fractures. The results of this study highlight the necessity of focused preventative measures, especially in the domains of violence and sports-related injuries, and indicate that more investigation is required to comprehend the root causes of these

## METHODS

A retrospective analysis was conducted on patient records from January 2014 to December 2024 across database of multiple hospitals in Punjab i.e Multan medical and dental college, Nishtar institute of dentistry and Armed Forces Institute of Dentistry. Inclusion criteria consisted of patients diagnosed with facial fractures confirmed through imaging (OPG, PA face, PNS, CT with 3D). The fractures were categorized by type of bone involved (e.g., nasal, mandibular, orbital, zygomatic, maxillary) and mechanism of injury (e.g., motor vehicle accidents, falls, assaults, sports injuries and miscellaneous). Demographic data, including age and gender were also recorded. Study population were divide into seven age groups Statistical methods were employed to compare trends over time, with particular attention to changes in the prevalence of specific fracture types and their causes.

## RESULTS

There were 3878 patients with age range of 1 t0 70 years, with mean age of 28.03 ± 13.83 indicating relatively young age presentation. The study has male predominance 90.1% (3494) of the cases being male and 9.9% (384), respectively, being female shown in figure 1. Annual injury data show erratic patterns, with 408 injuries at their highest in 2023 and 205 at their lowest in 2014. Road traffic accidents continue to be the most common cause, making for 62% (252 injuries) of all injuries in 2023. Injuries somewhat decreased in 2024, however they increased dramatically between 2014 and 2023. Total number of injuries reported and there percentage with respect to different etiology in every year is elaborated in graph 01.

Age-specific trauma pattern shows that the age group of 21–30 years old has the largest burden, with an average of 1,378 cases per year (35.5%), followed by those aged 31–40 years (850 cases, 21.9%) and 11–20 years (582 cases, 15%). 51-60 (163 cases, 4.2%), Older persons especially those aged 61-70 (1.8%) instances, and have the lowest averages, whereas children aged 1-10 account for 426 cases yearly (11%). Details of age related trauma burden is discussed in table 2.

With a diagnostic rate of 63% (2443 cases), mandible-related trauma was the most prevalent diagnosis. Zygoma injuries came in second at 15.3% (593 cases). Injury to the maxilla accounted for 8.9% (345 cases), whereas polytrauma accounted for 3.4% (132 cases). Less common were combined injuries such maxilla + zygoma (3.8%, 147 instances) and maxilla + mandible (5.5%, 213 cases) as described in table 3.

**Table 1: Distribution of Injuries Based on Specific Etiology (Annual Data) (n=3878)**

| Year | RTA | Sports | Assaults | Others | Total injuries (3878) | Percentage (100%) |
|---|---|---|---|---|---|---|
| 2014 | 76 | 32 | 91 | 32 | 205 | 5.28% |
| 2015 | 86 | 41 | 92 | 33 | 327 | 8.43% |
| 2016 | 98 | 41 | 106 | 41 | 422 | 10.88% |
| 2017 | 88 | 61 | 76 | 51 | 305 | 7.86% |
| 2018 | 179 | 43 | 67 | 47 | 338 | 8.71% |
| 2019 | 177 | 47 | 82 | 69 | 376 | 9.6% |
| 2020 | 195 | 60 | 141 | 47 | 420 | 10.83% |
| 2021 | 206 | 41 | 95 | 87 | 388 | 10% |
| 2022 | 213 | 32 | 95 | 38 | 390 | 10.05% |
| 2023 | 252 | 43 | 87 | 45 | 408 | 10.52% |
| 2024 | 190 | 27 | 36 | 46 | 299 | 7.71% |

**Table 2: Age related pattern of trauma in study population (n=3878)**

| **Age in years** | **Average per year** | **Percent per year** |
|---|---|---|
| 1-10 | 426 | 11.0 |
| 11-20 | 580 | 15 |
| 21-30 | 1378 | 35.5 |
| 31-40 | 850 | 21.9 |
| 41-50 | 396 | 10.2 |
| 51-60 | 178 | 4.6 |
| 61-70 | 70 | 1.8 |

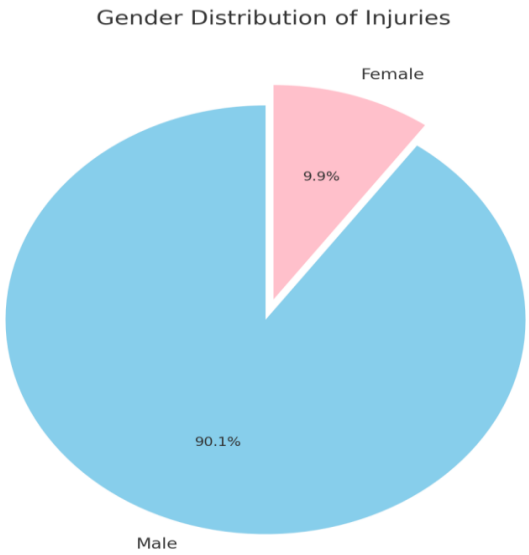


**Figure 01: Pie chart indicates gender distribution and its percentage of total patients.**

**Table 03: Summarize the frequency and percentage distribution of various diagnoses. (n=3878)**

| Diagnosis | Frequency | Percent |
|---|---|---|
| Mandibular fractures | 2443 | 63.0 |
| Maxillary fractures | 345 | 8.9 |
| Solitary Zygoma fractures | 593 | 15.3 |
| Panfacial fractures | 132 | 3.4 |
| Combined Mandibullar and maxillary fractures | 213 | 5.5 |
| Zygomatic compex fractures | 147 | 3.8 |

## DISCUSSION

The facial trauma reported in literature is as high as 20–60% along with that of all the road traffic accidents having some type of facial injuries.[18] This seems because of face directly exposed with external. Our analysis of pattern of maxillofacial injuries over an 11-year period (2014–2024) shows that majority of trauma patient were male (90.1%) and more than percent of cases were in between 20-40 years of age. Cause of male preponderance be that,men have more pastime out door as compared to females . There is a noticeable upward trend, peaking in 2022 in RTA (Road Traffic Accidents), followed by a decline in 2024. Sports Injuries fluctuate without a clear pattern, generally remaining lower than other categories. There was a peak in assaults in 2020, followed by a steady decline up to 2024. This peek may represent the era of covid 19 and lockdown over the world resulting in more indoor activities than driving or sports outdoor.[19] Miscellaneous Injuries remain relatively consistent, with slight variations year to year. When we analyzed total injuries reported there is a significant increases between 2014 and 2023, with a decline in 2024, but this decline may show false representation because of data collection up-to October 2024 (table 1).

Our study results aligned with the study conducted by Adekunle Adeleke et al. They found road traffic incident is major cause of facial trauma followed by assault.[20] Similarly Mohammed Al-Bokhamseen et al. conducted a retrospective study on Saudi Arabia population and found the most common cause of facial trauma as road traffic accidents.[21] They also found that majority of facial injury patient were 20 to 40 years of age, particularly male predominance was seen. Contrary to our research Boffano P, et al. conducted research in 2015 on European population and elaborated the most frequent cause of injury, with 1,309 occurrences was violence related assault.[22] The primary etiological variables in various sites fluctuated between attacks and falls. This variation in cause of trauma can be social, behavioral and cultural differences as well as legislation and road safety and infrastructure difference with sub continental country.

According to our research data, high-risk behaviors including participation in RTAs, sports, and social events are associated with the highest trauma incidence in the 21–30 age range (Table 2). This is consistent with previous research Al-Hassani et al.'s (2022), which focused on a cohort of 1,187 patients, determined trends in the occurrence and patterns of maxillofacial trauma.[23] Young males were disproportionately impacted by maxillofacial injuries, which accounted for 18.5% of all trauma hospitalizations. Age-related decreases in injury frequency, especially among those aged 51 to 70, are probably caused by a decrease in caution and physical activity. Based on Brucoli M, et al. analysis of 1,334 elderly patients, the study found that falls were the main cause of injuries, with zygomatic fractures being the most common in elderly patients.[24] Falls were linked to a decreased prevalence of concurrent injuries (27.3%) and lower FISS ratings (P <.005). This shows older people have fewer injuries because of lower risk exposure, while young adults particularly men are more likely to sustain catastrophic injuries.

Falls and accidents at home are the main causes of trauma in children aged 1 to 10 years. In a retrospective investigation on maxillofacial trauma in pediatric patients, Patidar DC, and Malhotra A, assessed 466 children with 750 damaged teeth, the incidence was twice as high in males as in females, with 93.1% of all injuries, falls were shown to be the most common cause.[25] These trends demonstrate the value of age-appropriate preventative measures in lowering injuries at various

phases of life.[8]In late twenties or thirties people are having more recreational and outdoor hobbies and this is the most prone age range to have facial traumas.[26]Our study results showing 21-30 years age people percentage is 35 % comparable to studies of Nigeria, Pakistan and UAE.[18, 27]

The mandible is the most often fractured facial bone (63%), according to our study data, followed by zygomatic fractures (15.3%) and maxillary fractures (8.9%). Combination fractures of the maxilla and mandible (5.5%) and maxilla and zygoma (3.8%) were less common than polytrauma (3.4%). Previous studies have similiarities with our research results as Khan TU, described in there study conducted in Khyber Pakhtunkhwa province of Pakistan, that mandibular fractures are most common among facial skeletal fractures (22.9%) followed by zygoma (7.1%).[28]This is probably because of its prominence and susceptibility in high-impact situations like attacks and auto accidents.[29] The significance of focused preventive and treatment approaches to address the most prevalent patterns of maxillofacial trauma, especially in high-risk populations, is shown by this distribution.[29, 30]

The retrospective nature of this study is one of its few shortcomings, which might cause biases. Despite being gathered from several locations, the data only came from one province, which limited its generalizability. However, concentrating just on hospitalized cases leaves out less severe injuries, minimizing the total trauma load. There was no evaluation of long-term effects, such as psychological and functional effects. We advise that these constraints be addressed in future research to improve the results' comprehensiveness, generalizability, and the reliability.

## CONCLUSION

Our study shows impact of social developments and advances in trauma care have led to notable changes in facial fracture patterns over the last ten years. Even though safety precautions awareness programs have decreased some injuries, injuries from road traffic accidents and violence continue to be problems. Targeted preventative measures should be given top priority by government officials, and further study is required to fully comprehend and address these tendencies.

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