RESEARCH ARTICLE

# REVISED Epidemiology of maxillofacial injuries during monsoon and non-monsoon season in India: a data-based retrospective study from a tertiary care dental teaching hospital [version 2; peer review: 2 approved]

Anand Deep Shukla[1], Srikanth G[1], Kalyan Chakravarthy[2], Ayusha Kaushal[1], Hariti M Udeshi[1]

[1]Department of Oral and Maxillofacial Surgery, Manipal College of Dental Sciences, Manipal , Manipal Academy of Higher Education, Manipal, Karnataka, 576104, India
[2]Department of Public Health Dentistry, Manipal College of Dental Sciences, Manipal, Manipal Academy of Higher Education, Manipal, Karnataka, 576104, India

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## Abstract

### Background

Maxillofacial Injury (MFI) is a major public health concern that is multifactorial in etiology-road traffic accidents (RTAs), falls and violence. RTAs are the major cause of maxillofacial injuries (MFIs) in countries like India. Recent studies have shown that maxillofacial fractures (MFF) constitute a significant proportion of facial injuries seen in hospitals (56.5%). The incidence of maxillofacial fractures can vary depending on several factors, including age, gender, and environmental factors. Of particular concern is the impact of seasonal variations, such as the monsoon season, which lead to high incidence of maxillofacial fractures due to hazardous conditions.

### Methods

A retrospective review of medical records was done in a tertiary-care dental teaching hospital was done.

### Results

Data of 200 subjects including 154 males (77%) and 46 females (23%) with a mean age of 35.38 ± 16.541 years; age range: 1 – 80 years was

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1. **Amit Sethi**, Boston University, Boston, USA

2. **Rui Santos**, School of Technology and Management, Polytechnic Institute of Leiria, Leiria, Portugal
Integrated Researcher at the Statistics and Applications Center of the University of Lisbon, Lisboa, Portugal

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analyzed. A total of 200 MFI's were recorded between 2021 and 2022. Soft tissue injuries were reported in 37.5% of the cases in non-monsoon season and 42.3% of the cases during the monsoon season. Dentoalveolar fractures were reported in 6.2% of the cases during the non-monsoon seasons and 7.7% during the monsoon season. In this study, mandible was the most fractured bone (n=104,52%) followed by zygomatic complex (n=50, 25%). The frequently observed pattern among mandibular fracture was condyle 8.3% during the non-monsoon season and 2.9% during the monsoon season).

**Conclusions**

The results of the study indicate that mandibular fractures are most commonly seen in maxillofacial fractures, followed by fractures of the zygomatic complex. The study also reveals a higher incidence of soft tissue injuries and dentoalveolar fractures during the monsoon season. Further research is warranted to explore the factors that contribute to the seasonal variation in maxillofacial fractures for effective interventions to reduce their occurrence.

**Keywords**
Maxillofacial injuries, Road Traffic Accidents

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**Corresponding author:** Srikanth G (srikanth.mds@manipal.edu)

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**REVISED** **Amendments from Version 1**

Tables and figures have been edited and renumbered as per the reviewers suggestion – Figure 1 was removed. Additional table has been added for sex distribution and maxillofacial injuries. Statistical tests used have been edited. Interpretation of the results have been added to improve the clarity. Discussion was edited as per the reviewer suggestion.

**Any further responses from the reviewers can be found at the end of the article**

## Introduction

Maxillofacial injury (MFI) is a broad term used to describe any form of damage or trauma to the structures of the face, including the jaw, teeth, and facial bones and associated soft tissues.[1] Maxillofacial fractures (MFF), on the other hand, specifically refer to fractures or breaks in one or more of the facial bones, such as the mandible or zygomatic complex. It is important to note that while MFFs are a type of MFI, not all MFIs involve fractures.

MFIs are a significant public health concern, with a wide spectrum of severity that can range from minor injuries to life-threatening conditions.[2] The incidence of maxillofacial fractures can vary depending on several factors, including age, gender, and environmental factors.

Recent studies have demonstrated that maxillofacial fractures are among the most frequent types of facial injuries seen in hospitals 56.5%.[3,4] These fractures can involve different components of the facial skeleton, including the mandible, maxilla, zygoma, and orbital bones.[3,4]

Additionally, it is important to consider how environmental factors may affect the number of maxillofacial fractures in hospital settings. The monsoon season, for example, may result in an increase in maxillofacial fractures owing to slippery roads and pavements, reduced visibility, and fallen trees and electrical wires.

Healthcare providers must be aware of these trends and take steps to predict and manage maxillofacial injuries. Therefore, this research paper aims to compare the incidence and pattern of maxillofacial trauma in a hospital-based setting with a focus on environmental factors.

## Methods

### Study design

The present study was conducted in the Department of Oral and Maxillofacial Surgery, Manipal College of Dental Sciences Manipal, Udupi, Karnataka, India. This study was based on a systematic computer-assisted database search that allowed extraction of retrospective data of the patients who reported to our outpatient unit with injuries from RTA from December 2021 to December 2022.

Data collection was initiated only after requisite approvals were obtained from the Scientific Committee and the Institutional Ethics Committee of Hospital (IEC:57/2022).

The requirement for informed consent was waived in view of the retrospective nature of the study and there being no direct contact with the study subjects. This study did not involve any intervention or therapy, and the research involved no risks to the subjects. Subjects' names and identity were not disclosed in any way during or after this database review study. Subjects were identified by subject ID numbers only, and hence, patient data confidentiality has been maintained.

### Subject screening, inclusion and exclusion criteria

Patients of both sexes and all age groups with clinically and radiographically diagnosed maxillofacial fractures (with or without contiguous bodily fractures/injuries) were included in this study. Patients with incomplete records were excluded from the study. Patients with isolated skull fractures and only minor superficial soft tissue injuries were excluded from our study.

No formal sample size was calculated and all 200 patients who met the inclusion criteria during the study period were included.

### Data collection

The hospital records were assessed and data on age, sex and season during which injury occurred was collected. Data was also recorded for anatomic location of facial fractures, associated soft tissue and dentoalveolar injury. In records fractures

had been classified as fractures of the mandible, zygomatic-maxillary complex (ZMC), orbital floor, nose, Lefort 1, 2, 3 and naso-orbital-ethmoid (NOE) fracture. Mandibular fractures included fractures of the symphysis, Para symphysis, body, angle, ramus, coronoid, and condyle (Table 1).

**Table 1. Distribution of soft tissue injuries and various types of facial bone fractures between Monsoon and Non-monsoon seasons.**

| | | Season | | | | P-value |
|---|---|---|---|---|---|---|
| | | Non-Monsoon | | Monsoon | | |
| | | N | % | N | % | |
| Soft tissue injury | Absent | 60 | 62.5% | 60 | 57.7% | 0.488 |
| | Present | 36 | 37.5% | 44 | 42.3% | |
| Dentoalveolar | Absent | 90 | 93.8% | 96 | 92.3% | 0.69 |
| | Present | 6 | 6.2% | 8 | 7.7% | |
| Lefort 1 | Absent | 95 | 99.0% | 100 | 96.2% | 0.371 |
| | Present | 1 | 1.0% | 4 | 3.8% | |
| Lefort 2 | Absent | 96 | 100.0% | 103 | 99.0% | >0.99 |
| | Present | 0 | 0.0% | 1 | 1.0% | |
| Lefort 3 | Absent | 92 | 95.8% | 99 | 95.2% | >0.99 |
| | Present | 4 | 4.2% | 5 | 4.8% | |
| Frontal bone | Absent | 87 | 90.6% | 101 | 97.1% | 0.053; Sig |
| | Present | 9 | 9.4% | 3 | 2.9% | |
| Palatal bone | Absent | 93 | 96.9% | 103 | 99.0% | 0.352 |
| | Present | 3 | 3.1% | 1 | 1.0% | |
| Temporal bone | Absent | 92 | 95.8% | 103 | 99.0% | 0.147 |
| | Present | 4 | 4.2% | 1 | 1.0% | |
| Zygomatic arch | Absent | 72 | 75.0% | 98 | 94.2% | <0.001; Sig |
| | Present | 24 | 25.0% | 6 | 5.8% | |
| Naso orbito ethmoid bone | Absent | 95 | 99.0% | 102 | 98.1% | >0.99 |
| | Present | 1 | 1.0% | 2 | 1.9% | |
| Fronto-zygomatic suture area | Absent | 93 | 96.9% | 104 | 100.0% | 0.109 |
| | Present | 3 | 3.1% | 0 | 0.0% | |
| Pyriform rim | Absent | 94 | 97.9% | 102 | 98.1% | >0.99 |
| | Present | 2 | 2.1% | 2 | 1.9% | |
| Zygomaticomaxillary complex (ZMC) | Absent | 61 | 63.5% | 87 | 83.7% | 0.001; Sig |
| | Present | 35 | 36.5% | 17 | 16.3% | |
| Orbital rim | Absent | 89 | 92.7% | 104 | 100.0% | 0.005; Sig |
| | Present | 7 | 7.3% | 0 | 0.0% | |
| Orbital floor | Absent | 73 | 76.0% | 92 | 88.5% | 0.021; Sig |
| | Present | 23 | 24.0% | 12 | 11.5% | |
| Orbital wall | Absent | 94 | 97.9% | 103 | 99.0% | 0.609 |
| | Present | 2 | 2.1% | 1 | 1.0% | |
| Sphenoid bone | Absent | 96 | 100.0% | 103 | 99.0% | >0.99 |
| | Present | 0 | 0.0% | 1 | 1.0% | |
| Tympanic plate | Absent | 95 | 99.0% | 103 | 99.0% | >0.99 |
| | Present | 1 | 1.0% | 1 | 1.0% | |

**Table 1.** *Continued*

| | | Season | | | | P-value |
|---|---|---|---|---|---|---|
| | | Non-Monsoon | | Monsoon | | |
| | | N | % | N | % | |
| Nasal bone | Absent | 85 | 88.5% | 98 | 94.2% | 0.149 |
| | Present | 11 | 11.5% | 6 | 5.8% | |
| Sinus wall | Absent | 93 | 96.9% | 104 | 100.0% | 0.109 |
| | Present | 3 | 3.1% | 0 | 0.0% | |
| Pterygoid plate | Absent | 95 | 99.0% | 104 | 100.0% | 0.48 |
| | Present | 1 | 1.0% | 0 | 0.0% | |
| Symphysis | Absent | 96 | 100.0% | 101 | 97.1% | 0.247 |
| | Present | 0 | 0.0% | 3 | 2.9% | |
| Parasymphysis | Absent | 94 | 97.9% | 100 | 96.2% | 0.684 |
| | Present | 2 | 2.1% | 4 | 3.8% | |
| Angle | Absent | 94 | 97.9% | 101 | 97.1% | >0.99 |
| | Present | 2 | 2.1% | 3 | 2.9% | |
| Body | Absent | 91 | 94.8% | 99 | 95.2% | >0.99 |
| | Present | 5 | 5.2% | 5 | 4.8% | |
| Ramus | Absent | 95 | 99.0% | 103 | 99.0% | >0.99 |
| | Present | 1 | 1.0% | 1 | 1.0% | |
| Condyle | Absent | 88 | 91.7% | 101 | 97.1% | 0.091 |
| | Present | 8 | 8.3% | 3 | 2.9% | |
| Coronoid | Absent | 94 | 97.9% | 104 | 100.0% | 0.139 |
| | Present | 2 | 2.1% | 0 | 0.0% | |

### Statistical analysis

Statistical analysis was performed using SPSS-20.0 for the Windows Statistical Package (IBM Corporation, Armonk, NY, USA) and a p value of ≤0.05 was considered statistically significant.

Descriptive data were presented as mean ± SD or number (%), unless specified. Data for incidence of soft tissue injuries, dentoalveolar Injuries and various facial fractures were compared between the two seasons i.e., monsoon and non-monsoon using Chi-square or Fishers exact test.

## Results

In one year, period between December 2021 to December 2022, data of a total of 200 subjects were recorded and analyzed. Out of these, 154 (77%) were males while only 47 (23%) were females. Male to female ratio was 3.28:1 (rounded to two decimal places). The mean age of study population was 35.38 ± 16.541 years (age range: 1-80 years). There was no significant difference in the distribution of soft tissue injuries and dentolalveolar fractures between non-monsoon and monsoon seasons (P=0.488 and 0.69) respectively. Fractures in Frontal bone (P=0.053), Zygomatic arch (P<0.001), Zygomaticomaxillary complex (ZMC) (P=0.001), and Orbital rim (P=0.005) and Orbital floor (P=0.021) were significantly higher in non-monsoon season than monsoon season. Among males, the fractures of zygomatic arch (P<0.001), zygomaticomaxillary complex (P<0.001) and Orbital floor (P=0.007) were significantly higher in non-monsoon than monsoon season. In females, orbital floor fractures were significantly higher in non-monsoon than monsoon season (P=0.054) (Table 2).

**Table 2. Distribution of soft tissue injuries and various types of facial bone fractures between Monsoon and Non-monsoon seasons as per the sex.**

| | | Female | | | | P-value | Male | | | | P-value |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Non-Monsoon | | Monsoon | | | Non-Monsoon | | Monsoon | | |
| | | N | % | N | % | | N | % | N | % | |
| Soft tissue injury | Absent | 13 | 52.0% | 10 | 47.6% | 0.767 | 47 | 66.2% | 50 | 60.2% | 0.545 |
| | Present | 12 | 48.0% | 11 | 52.4% | | 24 | 33.8% | 33 | 39.8% | |
| Dentoalveolar | Absent | 22 | 88.0% | 20 | 95.2% | 0.614 | 68 | 95.8% | 76 | 91.6% | 0.343 |
| | Present | 3 | 12.0% | 1 | 4.8% | | 3 | 4.2% | 7 | 8.4% | |
| Lefort 1 | Absent | 25 | 100.0% | 21 | 100.0% | - | 70 | 98.6% | 79 | 95.2% | 0.375 |
| | Present | 0 | 0.0% | 0 | 0.0% | | 1 | 1.4% | 4 | 4.8% | |
| Lefort 2 | Absent | 25 | 100.0% | 21 | 100.0% | - | 71 | 100.0% | 82 | 98.8% | >0.99 |
| | Present | 0 | 0.0% | 0 | 0.0% | | 0 | 0.0% | 1 | 1.2% | |
| Lefort 3 | Absent | 25 | 100.0% | 21 | 100.0% | - | 67 | 94.4% | 78 | 94.0% | >0.99 |
| | Present | 0 | 0.0% | 0 | 0.0% | | 4 | 5.6% | 5 | 6.0% | |
| Frontal bone | Absent | 24 | 96.0% | 21 | 100.0% | >0.99 | 63 | 88.7% | 80 | 96.4% | 0.066 |
| | Present | 1 | 4.0% | 0 | 0.0% | | 8 | 11.3% | 3 | 3.6% | |
| Palatal bone | Absent | 25 | 100.0% | 21 | 100.0% | - | 68 | 95.8% | 82 | 98.8% | 0.335 |
| | Present | 0 | 0.0% | 0 | 0.0% | | 3 | 4.2% | 1 | 1.2% | |
| Temporal bone | Absent | 24 | 96.0% | 21 | 100.0% | >0.99 | 68 | 95.8% | 82 | 98.8% | 0.335 |
| | Present | 1 | 4.0% | 0 | 0.0% | | 3 | 4.2% | 1 | 1.2% | |
| Zygomatic arch | Absent | 22 | 88.0% | 21 | 100.0% | 0.239 | 50 | 70.4% | 77 | 92.8% | <0.001; Sig |
| | Present | 3 | 12.0% | 0 | 0.0% | | 21 | 29.6% | 6 | 7.2% | |
| Naso orbito ethmoid bone | Absent | 25 | 100.0% | 20 | 95.2% | 0.457 | 70 | 98.6% | 82 | 98.8% | >0.99 |
| | Present | 0 | 0.0% | 1 | 4.8% | | 1 | 1.4% | 1 | 1.2% | |
| Fronto-zygomatic suture area | Absent | 25 | 100.0% | 21 | 100.0% | - | 68 | 95.8% | 83 | 100.0% | 0.096 |
| | Present | 0 | 0.0% | 0 | 0.0% | | 3 | 4.2% | 0 | 0.0% | |
| Pyriform rim | Absent | 24 | 96.0% | 20 | 95.2% | >0.99 | 70 | 98.6% | 82 | 98.8% | >0.99 |
| | Present | 1 | 4.0% | 1 | 4.8% | | 1 | 1.4% | 1 | 1.2% | |



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**Table 2.** *Continued*

| | | Female | | | | P-value | Male | | | | P-value |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Non-Monsoon | | Monsoon | | | Non-Monsoon | | Monsoon | | |
| | | N | % | N | % | | N | % | N | % | |
| Zygomaticomaxillary complex (ZMC) | Absent | 22 | 88.0% | 17 | 81.0% | 0.686 | 39 | 54.9% | 70 | 84.3% | <0.001; Sig |
| | Present | 3 | 12.0% | 4 | 19.0% | | 32 | 45.1% | 13 | 15.7% | |
| Orbital rim | Absent | 20 | 80.0% | 21 | 100.0% | 0.054; Sig | 69 | 97.2% | 83 | 100.0% | 0.211 |
| | Present | 5 | 20.0% | 0 | 0.0% | | 2 | 2.8% | 0 | 0.0% | |
| Orbital floor | Absent | 23 | 92.0% | 19 | 90.5% | >0.99 | 50 | 70.4% | 73 | 88.0% | 0.007; Sig |
| | Present | 2 | 8.0% | 2 | 9.5% | | 21 | 29.6% | 10 | 12.0% | |
| Orbital wall | Absent | 24 | 96.0% | 21 | 100.0% | >0.99 | 70 | 98.6% | 82 | 98.8% | >0.99 |
| | Present | 1 | 4.0% | 0 | 0.0% | | 1 | 1.4% | 1 | 1.2% | |
| Sphenoid bone | Absent | 25 | 100.0% | 20 | 95.2% | 0.457 | 71 | 100.0% | 83 | 100.0% | - |
| | Present | 0 | 0.0% | 1 | 4.8% | | 0 | 0.0% | 0 | 0.0% | |
| Tympanic plate | Absent | 25 | 100.0% | 20 | 95.2% | 0.457 | 70 | 98.6% | 83 | 100.0% | 0.461 |
| | Present | 0 | 0.0% | 1 | 4.8% | | 1 | 1.4% | 0 | 0.0% | |
| Nasal bone | Absent | 23 | 92.0% | 21 | 100.0% | 0.493 | 62 | 87.3% | 77 | 92.8% | 0.256 |
| | Present | 2 | 8.0% | 0 | 0.0% | | 9 | 12.7% | 6 | 7.2% | |
| Sinus wall | Absent | 24 | 96.0% | 21 | 100.0% | >0.99 | 69 | 97.2% | 83 | 100.0% | 0.211 |
| | Present | 1 | 4.0% | 0 | 0.0% | | 2 | 2.8% | 0 | 0.0% | |
| Pterygoid plate | Absent | 25 | 100.0% | 21 | 100.0% | - | 70 | 98.6% | 83 | 100.0% | 0.461 |
| | Present | 0 | 0.0% | 0 | 0.0% | | 1 | 1.4% | 0 | 0.0% | |
| Symphysis | Absent | 25 | 100.0% | 21 | 100.0% | - | 71 | 100.0% | 80 | 96.4% | 0.25 |
| | Present | 0 | 0.0% | 0 | 0.0% | | 0 | 0.0% | 3 | 3.6% | |
| Parasymphysis | Absent | 25 | 100.0% | 21 | 100.0% | - | 69 | 97.2% | 79 | 95.2% | 0.687 |
| | Present | 0 | 0.0% | 0 | 0.0% | | 2 | 2.8% | 4 | 4.8% | |
| Angle | Absent | 25 | 100.0% | 21 | 100.0% | - | 69 | 97.2% | 80 | 96.4% | >0.99 |
| | Present | 0 | 0.0% | 0 | 0.0% | | 2 | 2.8% | 3 | 3.6% | |



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**Table 2.** *Continued*

| | | Female | | | | P-value | Male | | | | P-value |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Non-Monsoon | | Monsoon | | | Non-Monsoon | | Monsoon | | |
| | | N | % | N | % | | N | % | N | % | |
| Body | Absent | 24 | 96.0% | 20 | 95.2% | >0.99 | 67 | 94.4% | 79 | 95.2% | >0.99 |
| | Present | 1 | 4.0% | 1 | 4.8% | | 4 | 5.6% | 4 | 4.8% | |
| Ramus | Absent | 25 | 100.0% | 21 | 100.0% | - | 70 | 98.6% | 82 | 98.8% | >0.99 |
| | Present | 0 | 0.0% | 0 | 0.0% | | 1 | 1.4% | 1 | 1.2% | |
| Condyle | Absent | 25 | 100.0% | 21 | 100.0% | - | 63 | 88.7% | 80 | 96.4% | 0.066 |
| | Present | 0 | 0.0% | 0 | 0.0% | | 8 | 11.3% | 3 | 3.6% | |
| Coronoid | Absent | 25 | 100.0% | 21 | 100.0% | - | 69 | 97.2% | 83 | 100.0% | 0.211 |
| | Present | 0 | 0.0% | 0 | 0.0% | | 2 | 2.8% | 0 | 0.0% | |

## Discussion

Maxillofacial trauma can be caused by various factors including falls, assaults, sporting injuries and road traffic accidents. Of these, road traffic accidents and monsoon weather conditions have been identified as significant contributors to the incidence of maxillofacial injuries. Given the increasing prevalence of road traffic accidents and unpredictable weather patterns, it is important to understand the epidemiology of maxillofacial injuries and identify any underlying patterns or trends that may exist to help reduce their incidence.

Some regions show a correlation between monsoon season and an increase in facial fractures, possibly due to broken and slippery roads/pavements,[5,6] falling objects, electrical wires, poor visibility and increased traffic congestion. This can lead to an increase in road traffic accidents and facial injuries. However, there is evidence to suggest that monsoon periods may have fewer cases of facial fractures as people may prefer to stay indoors in anticipation of rain.[7]

Understanding these trends and patterns can help develop preventive measures to improve public safety, especially in areas where monsoons are severe.

The incidence of maxillofacial fractures is higher in developing countries than in developed ones due to several factors such as the lack of adequate safety measures, poor road infrastructure and social factors.[5,8]

The increase in both the frequency and severity of maxillofacial injuries can be linked to the high dependence on road transportation and the growth of socio-economic activities in developing countries. Contributing to these injuries are poor road safety awareness, unsuitable road conditions, underdeveloped motorways, speeding, outdated vehicles without safety features, and a lack of helmets and seat belts, as well as violations of traffic laws.[5,9] All these factors come together to create a high number of road traffic accidents in developing countries.

Men show higher incidence for MFI's due to their greater involvement in high-risk activities, outdoor activities, anatomical differences, and behavioral differences such as risk-taking in comparison to women as only few of them drive a vehicle. This has resulted in an increase in the male: female ratio this is found to be consistent with the findings reported in other research papers.[4,5,8]

On analyzing the data, we found that soft tissue injury and dentoalveolar injury were not significantly associated with monsoon season, while zygomatic arch, zygomaticomaxillary complex, frontal, orbital floor and orbital rim fractures were significantly more common during non-monsoon season.

Our study was conducted in an environment with better road infrastructure, mandatory wearing of helmet and seatbelt rules and easy access to immediate medical care, which may have contributed to a lower incidence of maxillofacial trauma. This contrasts with previous studies that have reported a higher incidence of maxillofacial trauma in low-income countries with poor infrastructure and limited access to healthcare services.

Future studies that are planned shall have a database which includes patients over a longer period of time so that the database is much wider.

## Data availability

### Underlying data

Figshare: Data for the study on epidemiology of maxillofacial trauma, https://doi.org/10.6084/m9.figshare.23558628.v2.[10]

- Data updated.xlsx
- data legend.docx

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# Open Peer Review

## Current Peer Review Status: ✔ ✔

**Version 2**

Reviewer Report 05 April 2024

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✔ **Rui Santos**
[1] School of Technology and Management, Polytechnic Institute of Leiria, Leiria, Portugal
[2] Integrated Researcher at the Statistics and Applications Center of the University of Lisbon, Lisboa, Portugal

The authors considered the majority of my comments during the manuscript review, leading to enhancements in its quality.

***Competing Interests:*** No competing interests were disclosed.

***Reviewer Expertise:*** Statistical inference, data science, meta-analysis and epidemiology, mainly applied to the areas of Medicine and Forensic Science.

**I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.**

**Version 1**

Reviewer Report 20 February 2024

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? **Rui Santos**
[1] School of Technology and Management, Polytechnic Institute of Leiria, Leiria, Portugal

[2] Integrated Researcher at the Statistics and Applications Center of the University of Lisbon, Lisboa, Portugal
[3] School of Technology and Management, Polytechnic Institute of Leiria, Leiria, Portugal
[4] Integrated Researcher at the Statistics and Applications Center of the University of Lisbon, Lisboa, Portugal

The authors present a retrospective study of the etiology and the type of maxillofacial injuries depending on factors such as sex, age and monsoon season in India.

In this study, 200 maxillofacial injuries are analyzed from the medical records of a tertiary-care dental teaching hospital. The critical analysis of the results is interesting, but there are some aspects that should be clarified and/or improved, namely:

- The authors state "Univariate analysis was done by Student's t-test". What was the t-test used for?

- Tables should be presented (and numbered) in the order in which they are referred to (table 2 is referred to before table 1).

- Figure 1 and Table 2 have the same information (and neither adds information in relation to what is in the text). I think they can be both removed.

- All information in Table 1 is referred to in the text (this table can also be removed).

- All information from Table 3 is included in the first lines of Table 4, so this table must be removed.

- In Table 4, the column headings are clearer if are used in the same way as those in Table 3 (i.e., "Non-monsoon season" and "Monsoon season" instead of 0 and 1). The same occurs in the line designations, where "Absent" and "Present" are clearer than 0 and 1 (even with the explanation in a footnote to the table).

- The results section should be developed in order to clarify the results presented, in particular which p-value is presented in Table 4 (i.e., which test was carried out, as it appears to be a comparison test of the proportions observed between the two seasons, but the only test referred in the text is the univariate t-test which is not suitable for this purpose). Moreover, in Table 4, why is "Sig" (significant) the p-value "0.053" on the "FRONTAL BONE", but the p-value "0.021" is not significant in the "ORBITAL FLOOR"?

- Some discussion and references are related to the etiology of maxillofacial injuries, such as road traffic accidents, falls, assaults, sports injuries, and violence. Moreover, it is stated that "In this study the incidence of maxillofacial trauma due to RTA during the monsoon season was found to be lesser but the severity of trauma was found to be greater". Can the authors provide the data (for example in a table) on which they based this statement? In fact, in the Results section nothing is presented about the etiology of the maxillofacial injuries. If the analyzed data contains information about the etiology, it would be relevant to include this information in summary form in the Results section. Please note that the provided data does not contain any information about

the etiology.

- In the discussion, differences in terms of sex are also mentioned ("Men show higher incidence"...). Since the analyzed data contains information about the sex of the patients, what can be concluded from the analysed data? Is it possible to add results (in the Results section) that highlight the differences between the sexes in the maxillofacial injuries?

**Is the work clearly and accurately presented and does it cite the current literature?**
Yes

**Is the study design appropriate and is the work technically sound?**
Partly

**Are sufficient details of methods and analysis provided to allow replication by others?**
Partly

**If applicable, is the statistical analysis and its interpretation appropriate?**
Partly

**Are all the source data underlying the results available to ensure full reproducibility?**
Partly

**Are the conclusions drawn adequately supported by the results?**
Partly

***Competing Interests:*** No competing interests were disclosed.

***Reviewer Expertise:*** Statistical inference, data science, meta-analysis and epidemiology, mainly applied to the areas of Medicine and Forensic Science.

**I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.**

Author Response 22 Feb 2024

**anand deep shukla**

Thank you for reviewing the manuscript.
Below are the comments raised by the 2nd reviewer along with the replies

Query: The authors state "Univariate analysis was done by Student's t-test". What was the t-test used for?
Reply : Apologies for the confusion. We have corrected the same. "Data for incidence of soft tissue injuries, dentoalveolar Injuries and various facial fractures were compared between the two seasons i.e., monsoon and non-monsoon using Chi-square or Fishers exact test."

Query: Tables should be presented (and numbered) in the order in which they are referred to (table 2 is referred to before table 1).
Reply: Tables have been numbered accordingly.

Query: Figure 1 and Table 2 have the same information (and neither adds information in relation to what is in the text). I think they can be both removed.
Reply: Both Figure 1 and Table 2 have been removed.

Query: All information in Table 1 is referred to in the text (this table can also be removed).
Reply: The table has been removed

Query: All information from Table 3 is included in the first lines of Table 4, so this table must be removed.
Reply: The table has been removed

Query: In Table 4, the column headings are clearer if are used in the same way as those in Table 3 (i.e., "Non-monsoon season" and "Monsoon season" instead of 0 and 1). The same occurs in the line designations, where "Absent" and "Present" are clearer than 0 and 1 (even with the explanation in a footnote to the table).
Reply: The column headings are changes to Non monsoon and monsoon season as instructed.

Query: The results section should be developed in order to clarify the results presented, in particular which p-value is presented in Table 4 (i.e., which test was carried out, as it appears to be a comparison test of the proportions observed between the two seasons, but the only test referred in the text is the univariate t-test which is not suitable for this purpose). Moreover, in Table 4, why is "Sig" (significant) the p-value "0.053" on the "FRONTAL BONE", but the p-value "0.021" is not significant in the "ORBITAL FLOOR"?
Reply: The statistical analysis that was carried out was Chi-square or Fishers exact test, the same has been corrected in the manuscript. The p value of 0.021 for orbital floor has been changed to significant as pointed out.

Query: Some discussion and references are related to the etiology of maxillofacial injuries, such as road traffic accidents, falls, assaults, sports injuries, and violence. Moreover, it is stated that "In this study the incidence of maxillofacial trauma due to RTA during the monsoon season was found to be lesser but the severity of trauma was found to be greater". Can the authors provide the data (for example in a table) on which they based this statement? In fact, in the Results section nothing is presented about the etiology of the maxillofacial injuries. If the analyzed data contains information about the etiology, it would be relevant to include this information in summary form in the Results section. Please note that the provided data does not contain any information about the etiology.
Reply: We have omitted the line as per the suggestion.
The included cases were only due to RTA as etiology.

Query: In the discussion, differences in terms of sex are also mentioned ("Men show higher incidence"...). Since the analyzed data contains information about the sex of the patients, what can be concluded from the analyzed data? Is it possible to add results (in the Results

section) that highlight the differences between the sexes in the maxillofacial injuries?
Reply: The data highlighting the sex distribution in maxillofacial injuries has been added.

***Competing Interests:*** Nil

Reviewer Report 31 October 2023

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**Amit Sethi**
[1] Department of Oral and Maxillofacial Surgery, Henry M. Goldman School of Dental Medicine, Boston University, Boston, Massachusetts, USA
[2] Department of Oral and Maxillofacial Surgery, Henry M. Goldman School of Dental Medicine, Boston University, Boston, Massachusetts, USA

The authors have done well to highlight the influence weather and environmental conditions can play on the number and type of maxillofacial injuries seen.

The authors have brought up a very unique factor which could influence the number of patients presenting with maxillofacial trauma. The authors have also done well to classify patients based on age, sex and type of injury. Sex of patients may be important and evolve in coming years as more women take up driving.

The authors mention that the effect of rains may be mitigated by the fact that some people choose to stay home because of impending rain. This study is a good pilot study for a more elaborate study to be done in which a) duration can be longer b) the years with "good" or "bad" monsoon can be studied and data analyzed c) comparison can be done across different hospitals situated in places with light / moderate / heavy rain and then compare the variability in type and number of patients coming to emergency rooms with maxillofacial trauma

Overall the article is a good read and discusses an important topic in an objective manner.

**Is the work clearly and accurately presented and does it cite the current literature?**
Yes

**Is the study design appropriate and is the work technically sound?**
Yes

**Are sufficient details of methods and analysis provided to allow replication by others?**
Yes

**If applicable, is the statistical analysis and its interpretation appropriate?**
Yes

**Are all the source data underlying the results available to ensure full reproducibility?**
Yes

**Are the conclusions drawn adequately supported by the results?**
Yes

***Competing Interests:*** No competing interests were disclosed.

***Reviewer Expertise:*** Dentoalveolar surgery, Anesthesia, Medicine, Trauma

**I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.**