

The Causes and Prevalence of Maxillofacial Fractures in Iran: A Systematic Review

Faeze Sharifi¹, Sahand Samieirad^{1*}, Ricardo Grillo^{2,3}, Maria Da Graça Naclério-Homem², Erfan Bardideh⁴, Ali Manafi⁵, Zeinab Mohammadi⁶, Majid Eshghpour¹

1. Department of Oral & Maxillofacial Surgery, Mashhad University of Medical Sciences, Mashhad, Iran.
2. Department of Oral & Maxillofacial Surgery, Traumatology and Prosthesis, University of São Paulo, São Paulo, Brazil.
3. Department of Oral & Maxillofacial Surgery, Faculdade Patos de Minas, Brasília, Brazil.
4. Dental Research Center, Mashhad University of Medical Sciences, Mashhad, Iran.
5. Department of Plastic Surgery, Iran University of Medical Sciences, Tehran, Iran.
6. Department of Medical education, Tehran university of Medical Sciences, Tehran, Iran.

*Corresponding Author:

Sahand Samieirad

Mashhad University of Medical Sciences, Mashhad, Iran. Department of Oral & Maxillofacial Surgery, Mashhad dental school, Mashhad, 91778 99191. Razavi Khorasan Province, Iran.

Tel.: +98 5138049

Email: samieerads@mums.ac.ir

Orcid: 0000-0002-3629-6814

Received: 2023/01/19

Accepted: 2023/04/05

ABSTRACT

Background: Maxillofacial fractures are a common type of injury that can result in significant morbidity and mortality. We aimed to systematically review the literature on the prevalence and causes of maxillofacial fractures in Iran to estimate the overall prevalence of maxillofacial fractures and the most common causes.

Methods: A systematic search of PubMed, Cochrane Library, Web of Science (WS) and Google Scholar (GS) electronic databases was conducted to identify relevant articles published up to January 2023. Studies reporting the prevalence and causes of maxillofacial fractures in Iran were included in the analysis. MOOSE guidelines were adopted for the current systematic review. No data or language restriction were applied. Risk of bias across the articles was assessed.

Results: A total of 32 studies comprising 35,720 patients were included in the analysis. The most common cause of maxillofacial fractures was road traffic accidents (RTAs), accounting for 68.97% of all cases, followed by falls (12.62%) and interpersonal violence (9.03%). The prevalence of maxillofacial fractures was higher in males (81.04%) and in the age group of 21-30 years (43.23%). Risk of bias across studies was considered low.

Conclusion: Maxillofacial fractures are a significant public health problem in Iran, with a high prevalence and RTAs being the leading cause. These results highlight the need for increased efforts to prevent maxillofacial fractures in Iran, especially through measures to reduce the incidence of RTAs.

KEYWORDS

Iran; Middle East; Maxillofacial Fractures; Prevalence; Systematic Review

Please cite this paper as:

Sharifi F, Samieirad S, Grillo R, Da Graça Naclério Homem M, Manafi A, Mohammadi Z, Eshghpour M. The Causes and Prevalence of Maxillofacial Fractures in Iran: A Systematic Review. *World J Plast Surg.* 2023;12(1):1-11. doi: 10.52547/wjps.12.1.3

INTRODUCTION

Maxillofacial fractures are a common form of trauma and pose significant morbidity, loss of function, and work disabilities for the afflicted individual^{1,2}. They are a major socioeconomic burden for society and can also lead to the development of psychosocial disorders³⁻⁵. The treatment goals of these injuries serve to preserve the integrity of vital structures, restore function, and improve facial esthetics. Rapid urbanization and industrial development have led



This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International license (<https://creativecommons.org/licenses/by-nc/4.0/>). Non-commercial uses of the work are permitted, provided the original work is properly cited.

to profound lifestyle changes, which continue to inflict physical injury, including people with maxillofacial trauma^{6,7}. Obtaining a competent insight into the epidemiology and etiology of maxillofacial fractures is integral to appropriate planning both on a clinical and management level. Maxillofacial fractures can occur due to a variety of causes, including motor vehicle accidents, assault, gunshot wounds, falls, and sports injuries. The incidence of maxillofacial fractures varies across different regions, and it is influenced by factors such as age, sex, cultural practices, and socioeconomic status⁸. The facial skeleton consists of multiple bones that can be affected by fractures, such as the maxilla, mandible, nasal bones, zygomatic arch, and orbital bones. Of these, the mandible is the most commonly affected bone in maxillofacial fractures⁹.

Iran has a high rate of road traffic accidents, interpersonal violence, and sport-related injuries. Every year Iranian hospital facilities manage a large caseload of physical injuries¹⁰. In Iran, maxillofacial fractures are a major public health issue, and their prevalence is a growing concern. Several studies have investigated the causes and prevalence of maxillofacial fractures in Iran¹¹⁻¹⁷. However, the findings of these studies have been inconsistent, and there is a need for a comprehensive and systematic review of the available literature. Such a review can provide valuable insights into the epidemiology and risk factors associated with maxillofacial fractures in Iran and help in the development of effective prevention and treatment strategies.

Therefore, the objective of this study was to conduct a comprehensive systematic review of the available literature on the causes and prevalence of maxillofacial fractures in Iran.

METHODS

Study design

This Systematic Review was conducted according to the recommendations by the Cochrane Group¹⁸ and the book "Systematic reviews in health care: meta-analysis in context"¹⁹. A search protocol was specified in advance and registered at PROSPERO (International Prospective Register of Systematic Reviews) nr. 400498. This review was conducted according to MOOSE Reporting Guidelines for Meta-analyses of Observational Studies.

Focused question

We intended to perform an epidemiological study on maxillofacial fractures etiology besides the quality of Iranian studies through a risk of bias assessment. In summary, the main outcome was to perform a critical review of maxillofacial fractures in Iran, assessing number of occurrences, treatment options in addition to the risk of bias and quality of studies.

Eligibility criteria

Only maxillofacial fractures studies performed in Iranian soil were added. No language restriction was applied. Records that fulfilled the following items were considered: a) maxillofacial fractures, b) studies performed in Iran; c) studies performed by at least one Iranian researcher.

Records including only results about: a) soft tissue trauma, b) studies performed outside Iran even partially, c) studies performed by Iranian foreigners, d) trauma not located on maxillofacial region were not considered, e) unpublished clinical trials, f) case reports, reviews, editorials, letters and comments, g) articles published before 2002.

Search strategy

The first hit was conducted online by two independent reviewers (SS and RG) in PubMed, Cochrane Library, WS and GS from inception until January of 2023. The following strategy was used: (Mandibular Fractures[MeSH Terms] OR Maxillary Fractures [MeSH Terms] OR Orbital Fractures[MeSH Terms] OR Zygomatic Fractures[MeSH Terms] OR Nose Fracture OR Facial Injuries[MeSH Terms] OR Maxillofacial Injuries[MeSH Terms]) AND Iran.

Because the search algorithm is different, an adaptation of the strategy was performed on GS: (mandibular maxillary orbital zygomatic nose +fractures "facial injuries" "maxillofacial injuries" +iran -"case report" -"systematic review" -meta-analysis -comments). Since it is possible to perform a bibliographic search according to the country of origin, Iran term was suppressed in WS search. A manual search was performed sought in the included articles.

Studies Selection

In the first screening procedure, titles and abstracts were screened by three independent reviewers (F.S., S.S. and R.G.). All articles that were considered

eligible at the first screening procedure underwent a full-text evaluation. If disagreements arose during the two steps evaluation process, it was resolved by consensus. Studies that met the inclusion criteria or those with doubtful information either in the title or abstract were selected for full-text assessment in this review's second round. Reasons for rejection of studies were recorded for each report. Animal studies and comparative studies but with no relation to proposed theme were excluded, as so care reports and series, comments, letters, expert opinions, and reviews. Only studies for which the full text was available were considered as eligible.

Data Extraction

In this systematic review, the data from the selected articles was extracted by one researcher and the accuracy of the data extraction was verified by another researcher. The desired information included the names of the authors of the study, the city and province in which the studies were conducted, the year of publication of the articles, the number of patients, the age range of patients with fractures, the sex of the participants in the studies, as well as the causes of the fractures (including Motor Vehicle Accident, Assault, Gunshot, Fall, Sports, and unknown causes). Additionally, data on the specific bones affected by the fractures were extracted, including the distribution of fractures in specific bones such as the mandible, Parasymphysis, Symphysis, Angle, Condyle, Body, Dentoalveolar, Coronoid Process, complex, and Ramus²⁰.

Statistical analysis

T-Student was performed with RStudio. Shapiro-Wilkes test was used to assess if data deviate from a normal distribution. Results were considered significant only with a 95% confidence interval.

Risk of bias across studies

To assess the studies' quality, risk of bias was assessed according to MOOSE Reporting Guidelines²¹. Data were added to Microsoft Excel and a heat map was created using low and high risk. The queries of the included studies are briefly explained as follows:

- Background: definition of the problem under study,
- Search: reporting of the search strategy,
- Methods: checklist section with appropriateness of quantitative summary of the data,

- Results: reporting of results (charts, tables, sensitivity tests, subgroup analysis),
- Discussion: publication bias, confounding and quality,
- Conclusion: consideration of alternative explanations for observed results and appropriate generalizations of the conclusion.

Data collection process

The reviewers RG and SS separately submitted all eligible studies to a qualitative synthesis using an extraction data table, including mainly: geographic region, age range, gender, etiology, and anatomic region injured. Subsequently, extraction data table with the results of each included study were verified together to calibrate this process's validity and reliability.

ETHICAL APPROVAL

The present study was approved by the Research Ethics Committees of School of Dentistry – Mashhad University of Medical Sciences under the number IR.MUMS.DENTISTRY.REC.1401.111.

RESULTS

Study selection

The first hit retrieved 536 records from databases. The searched records distribution and the number of studies finally selected were (Figure 1). Excluded studies and reasons for refusal are shown in Table 1. A total of 32 articles were included in the present systematic review^{10–17,22–45}.

Two articles did not evaluate the age range from 0 to 10 years, joining all patients under the age of 20 into the same age range^{24,30}. Unclear or unreported data on age range were found in 10 articles^{12,13,25,27,32,34,39,41,43,44}. One article used charts instead of tables, which made it difficult to identify some data that was not described in the text¹⁵. Few articles had crossed some data, such as the anatomical region and the type of treatment, gender or the etiology of the fracture, but a statistical comparison was not possible. Seven articles had clearly separated traffic accidents as motor vehicle and motorcycle accidents^{12,16,24,27,38,41,44}.

Results of individual studies and synthesis of results study selection

Overall, a total of 35,720 patients were added to this study. Table 2 shows the geographic distribution

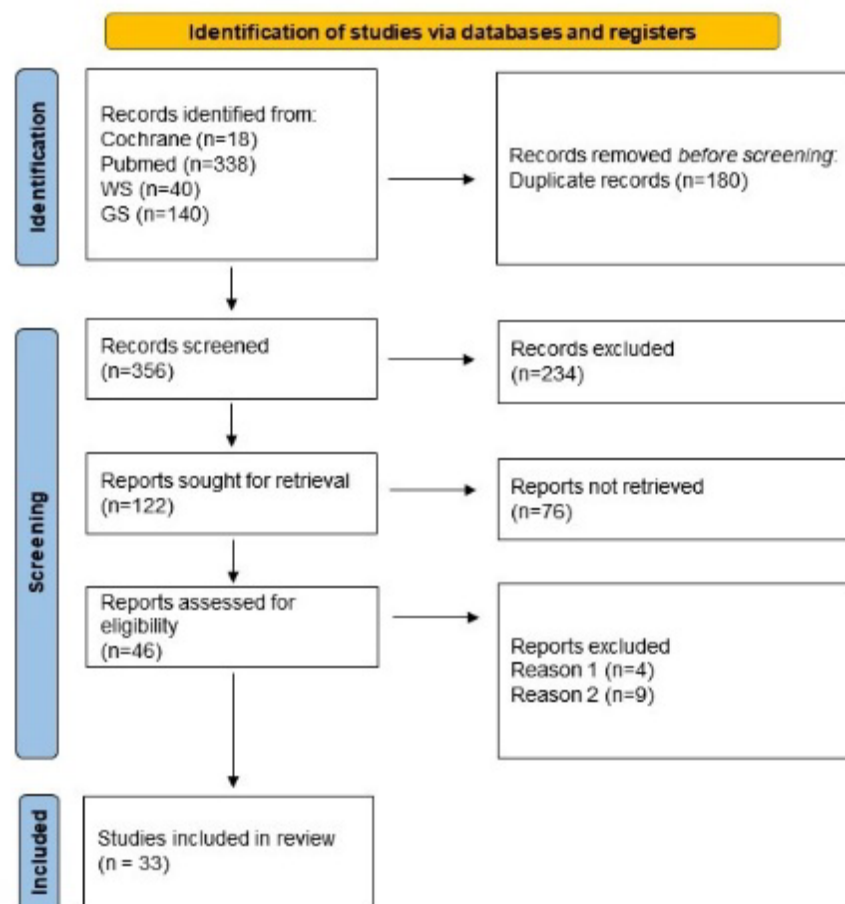


Figure 1: Flowchart of included articles

Table 1: Excluded articles and their reasons

Reason	Reference
1. Not exclusive to maxillofacial fractures	Borna et al ⁶⁶ ; Ghorashi et al ⁶⁷ ; Hajiesmaello et al ⁶⁸ ; Kashkooe et al ⁶⁹ ; Mansouri et al ⁷⁰
2. Type of study	Barach et al ⁷¹ ; Gandjalikhan-Nassab et al ⁴ ; Hennocq et al ⁷² ; Hesamirostami et al ⁷³ ; Jahromi et al ⁷⁴ ; Khaqani et al ⁷⁵ ; Khiabani et al ⁷⁶ ; Khiabani et al ⁷⁷ ; Nasser et al ⁷⁸

Table 2: Distribution of patients in the included articles all over Iranian territory in alphabetic order

Ahwaz	272
Hamedan	4718
Isfahan	1677
Kerman	221
Kermanshah	1727
Mashhad	502
multicenter	8818
Rasht	7663
Shiraz	2236
Tabriz	3567
Tehran	5713
Urmia	635
Yazd	311

of patients allover Iranian territory, not normally distributed ($w=0.81903$, $p=0.00652$). In several studies the number of fractures was higher than the number of patients. This can easily be explained as some patients had multiple fractures. The most affected patient's age range was 21-30 years in 43.23% of the patients, not normally distributed ($w=0.80479$, $p=0.03221$) (Figure 2).

In all articles whenever data was available, male

patients suffered more maxillofacial trauma than female patients ($t=2.6191$, $df=29.31$, $P=0.01382$), in complete agreement with the literature. Male suffered more trauma at a ratio of 4:1 (mean=81.04%) compared to female [68.38%-98.43%]. The vast majority of etiology was due to road traffic accidents (68.97%) while some articles has not reported etiology of maxillofacial fractures (Figure 3). When available motorcycle was the most usual vehicle

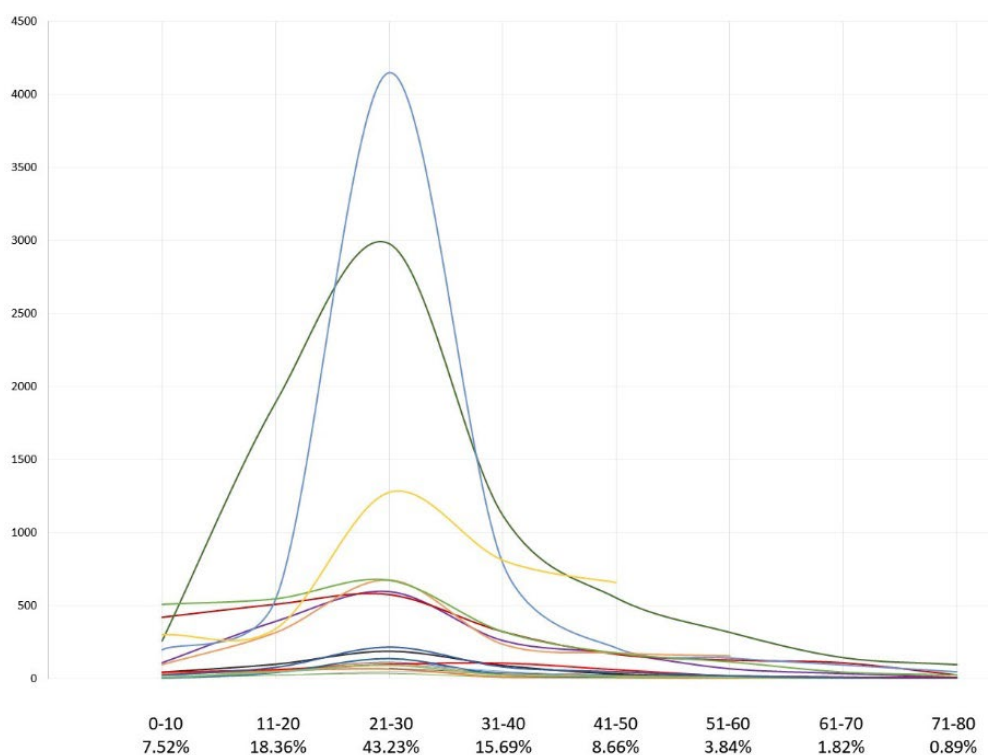


Figure 2: Age range distribution. Each colored line represents one included article

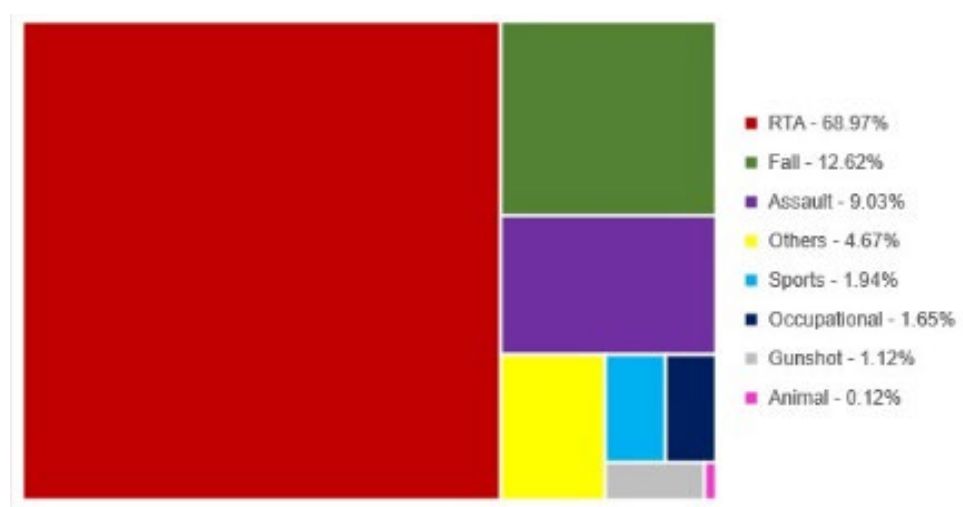


Figure 3: Comparison of more usual etiologies in order of incidence Legend: Road Traffic Accident (RTA)

in a higher proportion than cars and pedestrian accidents^{12,16,24,27,38,41,44}. Data on etiology were not normally distributed ($w=0.57892$, $P=8.996e-05$).

Mandible was the most usual are affected (54.63%). Incidence of mandible fractures was higher than facial middle third (1:1.58), exclusive orbit (1:6.12) and frontal bone (1:27.98). Mandibular body and condyle were the most affected regions in the lower jaw (Figure 4), while nose and zygomatic arch were the most affected areas in the facial middle third (Figure 5).

Surrounding tissue complications were reported in a low proportion in comparison to bone fractures ($n=531$, 2.66%). Table 3 summarizes incidence of these complications.

Other relevant data were available in few articles what makes inviable to discuss it, bringing high level evidence. Type of treatment, educational level of injured patients, Glasgow scale on admission, hospitalization stay, domestic violence as etiology and incidence among the months of the year^{12,13,22,23,26-28,44} are amongst these data.

Risk of bias

The risk of bias across studies is expressed in Figure 6. No additional analyses were pre-specified and

made. According to prespecified protocol, included studies could be considered in low risk of bias ($p=0.7875$). The biggest flaws related to some risks of bias were found in the quality of the data and the lack of additional information. Half of the articles needed to present clearer data, especially regarding age groups. Ideally, the same age group standards (0-10, 11-20, 21-30, etc.) should be used routinely in order to allow for comparison. The use of additional data and comparisons between different groups are also relevant in preventing some types of traumas such as age or sex and etiology.

DISCUSSION

Maxillofacial fractures are a significant public health concern worldwide, and their causes and prevalence have been the subject of numerous studies. This comprehensive systematic review aimed to explore the causes and prevalence of maxillofacial fractures in Iran, based on data from 32 articles.

We found that the most affected age group was between 21-30 years. This is consistent with other studies reported a higher incidence of maxillofacial fractures in young adults^{2,9,12}. One of the main reasons for this could be the higher use of motor

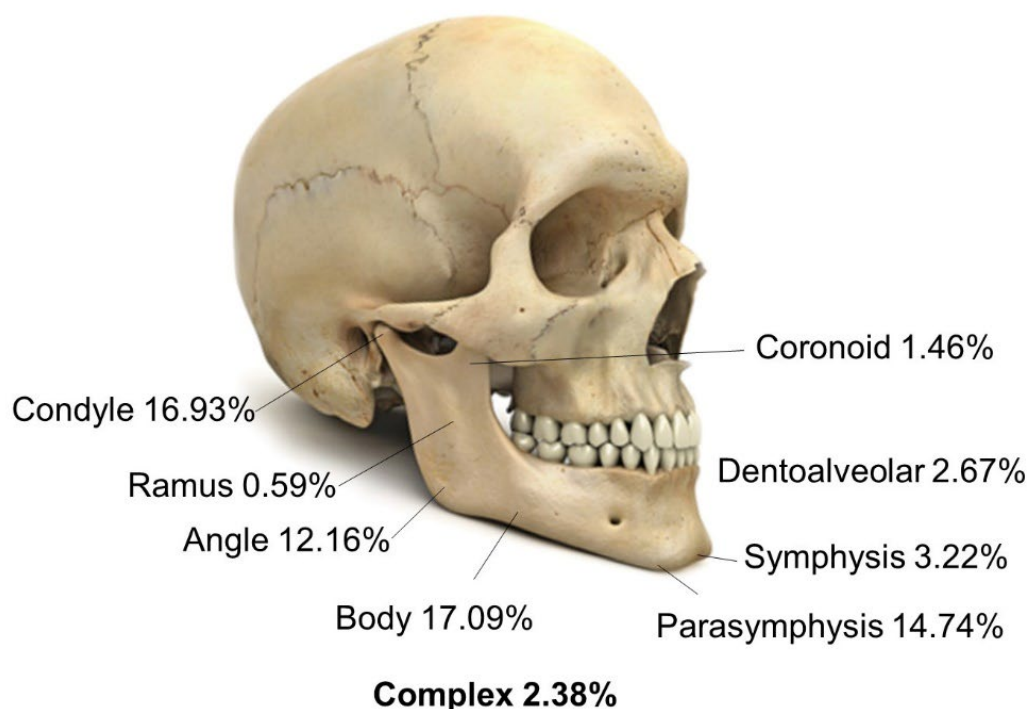


Figure 4: Affected regions of the mandible

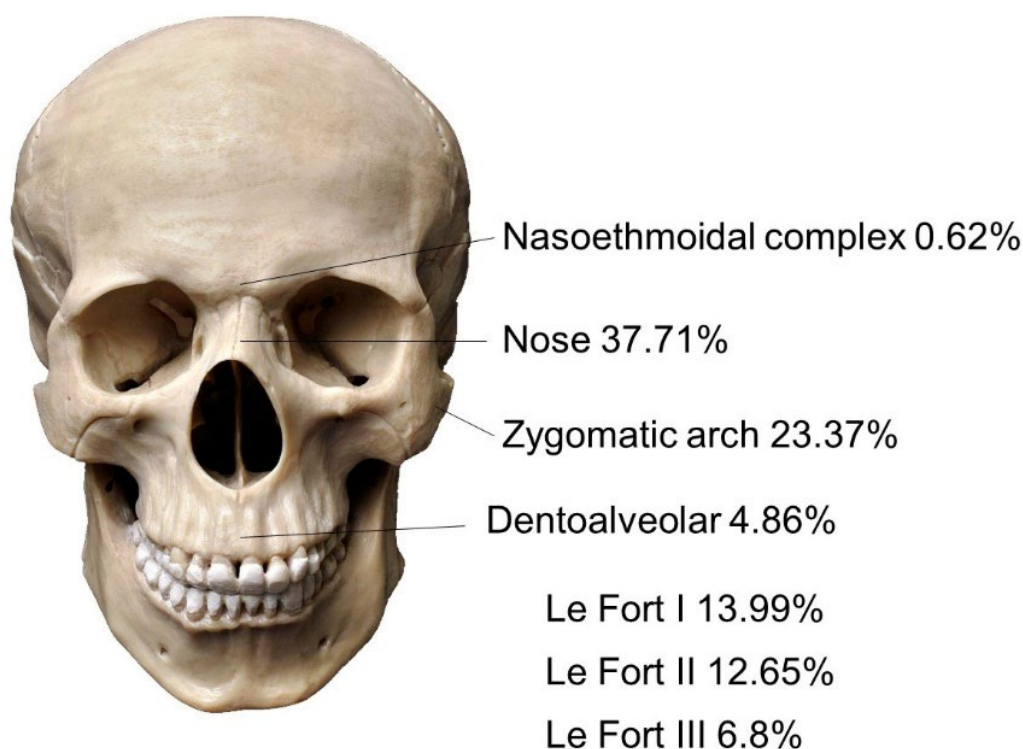


Figure 5: Affected regions of the midface

Table 3: Surrounding tissues complications related to bone maxillofacial fractures.

Tissue	Incidence (%)
Orbital soft tissue	33.90
Palpebral injuries	3.20
Nasal soft tissue	54.61
Lip injuries	1.32
Ears injuries	3.58
Lacrimal system injuries	0.38
Facial nerve	2.26
Trigeminal nerve	0.75

vehicles by this age group. Several studies have shown that motor vehicle accidents are the leading cause of maxillofacial fractures in young adults^{46,47}. This age group is also more likely to engage in physical altercations, which can result in maxillofacial trauma⁴⁸.

In Iran, this age group is particularly prone to maxillofacial fractures due to the low age of retirement. Older people in Iran tend to be less active and involved in fewer physical activities than their younger counterparts⁴⁹. This difference is more pronounced in Iran compared to other countries, where older people may still participate in physical

activities such as sports and exercise⁵⁰⁻⁵³.

In all the articles we reviewed, male patients suffered more maxillofacial trauma than female patients, with a margin of four to one. This finding is consistent with other studies that have reported a higher incidence of maxillofacial fractures in males². In Iran, cultural factors may contribute to this difference. Men in Iran are often the primary breadwinners and perform the main activities of the household, including driving and manual labor. These activities put them at a higher risk of accidents and trauma.

Comparing our findings to other studies conducted

in different countries, cultural factors also seem to play a role in the differences between fractures of men and women. For example, in the United States, men are more likely to be involved in high-risk activities such as extreme sports or physical altercations, which may result in maxillofacial trauma^{54,55}. In India, cultural factors such as gender-based violence and road safety issues have also been reported as significant contributors to maxillofacial fractures in both men and women⁵⁶.

Also, in our review the mandible was the most common bone affected by maxillofacial fractures in Iran, with an incidence of 54.63%. This is consistent with other studies that have reported a higher incidence of mandibular fractures compared to other facial bones⁵⁷. One of the main reasons for this may be the high incidence of motor vehicle accidents (MVA) in Iran, which are a leading cause of maxillofacial fractures. In MVAs, the mandible is the main affected bone due to the position of the mandible in relation to the rest of the facial bones⁵⁸. The mandible is also a relatively thin bone compared to the other facial bones, making it more vulnerable to fractures in high-impact accidents⁵⁹.

Additionally, our review found that the mandibular body and condyle were the most commonly affected regions in mandibular fractures. This again supports the argument that MVAs are the primary cause of mandibular fractures in Iran, as these accidents typically result in high-impact forces that affect the mandibular body and condyle⁶⁰. In contrast, physical assaults typically result in fractures of the zygomatic arch or orbital bones, as these areas are more exposed and vulnerable to direct impact⁴⁸.

Comparing our findings to studies conducted in other countries, the incidence of mandibular fractures in Iran appears to be higher than in some other countries. For example, a study in India found that the mandible was affected in only 34% of maxillofacial fractures, while the zygomatic bone was the most affected⁶¹. In the United States, the mandible was the most affected bone in pediatric maxillofacial fractures, with a lower incidence in adult patients⁵. These differences may be attributed to variations in the prevalence of risk factors, such as MVA, in different countries.

Another potential explanation for the differences between our study and studies conducted in other countries regarding the incidence of maxillofacial fractures could be related to cultural and social

factors. For example, in Iran, alcohol consumption is strictly prohibited in public and private, while in many other countries, alcohol is more widely available and consumed. Alcohol consumption is a well-established risk factor for traumatic injury, including maxillofacial fractures^{62,63}.

Therefore, the differences in incidence of maxillofacial fractures in Iran compared to other countries may be partially attributed to the lack of public alcohol consumption. A study from Australia, for example, found that alcohol was involved in 18% of maxillofacial fractures⁶². Similarly, a study from South Africa reported that alcohol was involved in a significant amount of maxillofacial fractures and was a significant risk factor for injury severity⁶⁴.

However, it is worth noting that while public alcohol consumption is prohibited in Iran, it is still possible for individuals to consume alcohol privately, which may still contribute to the incidence of maxillofacial fractures⁶⁵. Additionally, there may be other cultural and social factors that contribute to the differences between our study and studies from other countries. For example, differences in the prevalence of high-risk activities such as sports or occupational hazards may also play a role.

While the incidence of maxillofacial fractures in Iran may be different compared to other countries, the reasons for this are likely multifactorial and include a combination of cultural, social, and environmental factors. The lack of public alcohol consumption may be one contributing factor, although it is important to consider other potential explanations as well. Further research is needed to better understand the underlying reasons for the differences in the incidence of maxillofacial fractures between Iran and other countries, and to develop targeted interventions aimed at reducing the incidence of these injuries.

This systematic review provides valuable insights into the causes and prevalence of maxillofacial fractures in Iran. The data suggest that young adults, particularly males, are at a higher risk of maxillofacial trauma due to their engagement in high-risk activities such as motor vehicle use and physical altercations. Cultural factors also appear to play a role in the differences between maxillofacial fractures in men and women. These findings can inform targeted public health interventions aimed at reducing the incidence of maxillofacial fractures in Iran and other countries with similar cultural

backgrounds, such as improving road safety measures and promoting safe driving practices.

CONCLUSION

This comprehensive systematic review of 32 articles provides valuable insights into the patterns and trends of maxillofacial fractures in Iran. Motor vehicle accidents and physical altercations are the most common causes of these injuries in Iran, with the mandible being the most affected bone. The high incidence of maxillofacial fractures in the 21-30-year-old age group highlights the need for targeted interventions, such as public education campaigns and improvements in road infrastructure and enforcement of traffic laws. Our study underscores the importance of further research into the cultural and social factors that contribute to the incidence of maxillofacial fractures in Iran. Overall, our study provides a valuable resource for healthcare providers, policy makers, and researchers working to address the burden of maxillofacial fractures in Iran.

ACKNOWLEDGMENTS

The authors would like to appreciate Reza Shakiba for his cooperation in this article. The authors would like to thank the continued support of the Research Counselor of Mashhad University of Medical Sciences. This study was not supported by any grant.

COMPETING INTERESTS

Authors declare that they have no conflicts of interest to disclose.

REFERENCES

- Romeo I, Sobrero F, Roccia F, Dolan S, Laverick S, Carlaw K, et al. A multicentric, prospective study on oral and maxillofacial trauma in the female population around the world. *Dent Traumatol* 2022;**38**:196–205.
- Roccia F, Iocca O, Sobrero F, Rae E, Laverick S, Carlaw K, et al. World Oral and Maxillofacial Trauma (WORMAT) project: A multicenter prospective analysis of epidemiology and patterns of maxillofacial trauma around the world. *J Stomatol Oral Maxillofac Surg* 2022;**123**:e849–57.
- Salzano G, Orabona GDA, Audino G, Vaira LA, Trevisiol L, D'Agostino A, et al. Have There Been any Changes in the Epidemiology and Etiology of Maxillofacial Trauma During the COVID-19 Pandemic? An Italian Multicenter Study. *J Craniofac Surg* 2021;**32**:1445–7.
- Gandjalikhan-Nassab S, Samieirad S, Vakil-Zadeh M, Habib-Aghahi R, Alsadat-Hashemipour M. Depression and anxiety disorders in a sample of facial trauma: A study from Iran. *Med Oral Patol Oral Cir Bucal* 2016;**21**:e477–82.
- Segura-Palleres I, Sobrero F, Roccia F, de Oliveira Gorla LF, Pereira-Filho VA, Gallafassi D, et al. Characteristics and age-related injury patterns of maxillofacial fractures in children and adolescents: A multicentric and prospective study. *Dent Traumatol* 2022;**38**:213–22.
- Chukwulebe S, Hogrefe C. The Diagnosis and Management of Facial Bone Fractures. *Emerg Med Clin North Am* 2019;**37**:137–51.
- Chrcanovic BR. Factors influencing the incidence of maxillofacial fractures. *Oral Maxillofac Surg* 2012;**16**:3–17.
- Alharbi FA, Makrami AM, Ali FM, Maghdi AA. Patterns and Etiology of Maxillofacial Fractures: A 5-year Retrospective Study. *J Contemp Dent Pr* 2020;**21**:445–52.
- Khan TU, Rahat S, Khan ZA, Shahid L, Banouri SS, Muhammad N. Etiology and pattern of maxillofacial trauma. *PLoS One* 2022;**17**:e0275515.
- Samieirad S, Tohidi E, Shahidi-Payam A, Hashemipour MA, Abedini A. Retrospective study maxillofacial fractures epidemiology and treatment plans in Southeast of Iran. *Med Oral Patol Oral Cir Bucal* 2015;**20**:e729–36.
- Ansari MH. Maxillofacial fractures in Hamedan province, Iran: A retrospective study (1987-2001). *J Craniomaxillofacial Surg* 2004;**32**:28–34.
- Farzan R, Farzan A, Karimpour M, Tolouie M. A 6-Year Epidemiological Study of Mandibular Fractures in Traumatic Patients in North of Iran: Review of 463 Patients. *World J Plast Surg* 2021;**10**:71–7.
- Hashemi HM, Beshkar M. The prevalence of maxillofacial fractures due to domestic violence - a retrospective study in a hospital in Tehran, Iran. *Dent Traumatol* 2011;**27**:385–8.
- Kadkhodaie MH. Three-year review of facial fractures at a teaching hospital in northern Iran. *Br J Oral Maxillofac Surg* 2006;**44**:229–31.
- Mesgarzadeh AH, Shahamfar M, Azar SF, Shahamfar J. Analysis of the pattern of maxillofacial fractures in north western of Iran: A retrospective study. *Journal Emergences, Shock Trauma* 2011;**4**:48–52.
- Mohajerani SH, Asghari S. Pattern of mid-facial fractures in Tehran, Iran. *Dent Traumatol* 2011;**27**:131–4.
- Mosaddad SA, Gheisari R, Erfani M. Oral and maxillofacial trauma in motorcyclists in an Iranian subpopulation. *Dent Traumatol* 2018;**34**:347–52.
- Higgins JPT, Altman DG, Gøtzsche PC, Jüni P, Moher D, Oxman AD, et al. The Cochrane Collaboration's tool for assessing risk of bias in randomised trials. *BMJ* 2011;**343**:d5928.
- Egger M, Smith GD, Altman DG. Systematic Reviews in Health Care: Meta-Analysis in Context: Second Edition. Systematic Reviews in Health Care: Meta-Analysis in Context: Second Edition. 2008. 1–487 p.
- Ackley BJ, Ladwig GB, Swan BA, Tucker SJ. Evidence-Based Nursing Care Guidelines. Mosby, editor. 2007.

21. Stroup DF, Berlin JA, Morton SC, Olkin I, Williamson GD, Rennie D, et al. Meta-analysis of observational studies in epidemiology: a proposal for reporting. Meta-analysis Of Observational Studies in Epidemiology (MOOSE) group. *JAMA* 2000;**283**:2008–12.
22. Ebrahimi A, Behzadi BA, Motamedi MHK, Rasouli HR. Epidemiologic patterns of maxillofacial fractures: A 5-year study in one of the referral hospitals of Iran. *Trauma Mon* 2021;**26**:258–64.
23. Haghighat A, Pourarz S, Zarghami A. Epidemiologic Evaluation of Maxillofacial Trauma in Alzahra Hospital, Isfahan. *Int J Epidemiol Res* 2020;**7**:152–6.
24. Ghorbani F, Khalili M, Ahmadi H. The evaluation of alveolar fractures of trauma patients in Iran. *BMC Oral Health* 2021;**21**:499.
25. Sarkarat F, Motamedi MHK, Aghdam HM, Rastegarmoghadamshalduzi H. Evaluation of Oral and Maxillofacial Trauma in Tehran from 2008 to 2016. *Trauma Mon* 2019;**24**:e67802.
26. Arabion H, Tabrizi R, Aliabadi E, Gholami M, Zarei K. A retrospective analysis of maxillofacial trauma in shiraz, iran: a 6-year- study of 768 patients (2004-2010). *J Dent (Shiraz, Iran)* 2014;**15**:15–21.
27. Latifi H. Prevalence of different kinds of maxillofacial fractures and their associated factors are surveyed in patients. *Glob J Health Sci* 2014;**6**:66–73.
28. Momeni H, Shahnaseri S, Hamzeheil Z. Distribution assessment of maxillofacial fractures in trauma admitted patients in Yazd hospitals: An epidemiologic study. *Dent Res J (Isfahan)* 2011;**8**:80–3.
29. Vahedi HS, Vahidi E, Basirian R, Saeedi M. Assessment of Maxillofacial Trauma in the Emergency Department. *Trauma Mon* 2017;**22**:e58204.
30. Khojastepour L, Moannaei M, Eftekharian HR, Khaghaninejad MS, Mahjoori-Ghasrodashti M, Tavanafar S. Prevalence and severity of orbital blowout fractures. *Br J Oral Maxillofac Surg* 2020;**58**:e93–7.
31. Motamedi MHK. An assessment of maxillofacial fractures: A 5-year study of 237 patients. *J Oral Maxillofac Surg* 2003;**61**:61–4.
32. Motamedi MHK. Primary Management of Maxillofacial Hard and Soft Tissue Gunshot and Shrapnel Injuries. *J Oral Maxillofac Surg* 2003;**61**:1390–8.
33. Motamedi MHK, Dadgar E, Ebrahimi A, Shirani G, Haghighat A, Jamalpour MR. Pattern of maxillofacial fractures: A 5-year analysis of 8,818 patients. *J Trauma Acute Care Surg* 2014;**77**:630–4.
34. Ramezani M, Mahmoud-Hashemi H, Vaezi T, Beshkar M, Hasheminasab M. The pattern of maxillofacial fractures: a study of 302 patients and a discussion of fracture classification. *J Craniomaxillofacial Res* 2015;**2**:95–102.
35. Rezaei M, Jamshidi S, Jalilian T, Falahi N. Epidemiology of maxillofacial trauma in a university hospital of Kermanshah, Iran. *J Oral Maxillofac Surgery Med Pathol* 2017;**29**:110–5.
36. Yadollahi M, Sahmeddini S. An overview of the prevalence and pattern of maxillofacial trauma in the south of Iran. *J Emerg Pract Trauma* 2021;**7**:118–22.
37. Zandi M, Khayati A, Lamei A, Zarei H. Maxillofacial injuries in western Iran: A prospective study. *Oral Maxillofac Surg* 2011;**15**:201–9.
38. Zargar M, Khaji A, Karbakhsh M, Zarei MR. Epidemiology study of facial injuries during a 13 month of trauma registry in Tehran. *Indian J Med Sci* 2004;**58**:109–14.
39. Mehravaran R, Akbarian G, Nezhad CM, Gheisari R, Ziaei M, Zadeh FG. Evaluation of the relationship between the pattern of midfacial fractures and amaurosis in patients with facial trauma. *J Oral Maxillofac Surg* 2013;**71**:1059–62.
40. Ghaffari-Fam S, Sarbazi E, Daemi A, Sarbazi M, Riyazi L, Sadeghi-Bazargani H, et al. Epidemiological and Clinical Characteristics of Fall Injuries in East Azerbaijan, Iran; A Cross-Sectional Study. *Bull Emerg Trauma* 2015;**3**:104–10.
41. Mohammadi S, Mohebbi S. Occurrence of mandibulofacial injuries presenting to the Otorhinolaryngology and Head & Neck Surgery Department. *J Craniofac Surg* 2007;**18**:833–7.
42. Samieirad S, Aboutorabzade MR, Tohidi E, Shaban B, Khalife H, Hashemipour MA, et al. Maxillofacial fracture epidemiology and treatment plans in the Northeast of Iran: A retrospective study. *Med Oral Patol Oral Cir Bucal* 2017;**22**:e616–24.
43. Sarafraz Z, Mirshamsi MH, Musavi SA, Azaraein MH. Assessing the Ignored Associated Injuries of the Ear, Nose and Throat in Patients with Multiple Trauma in Shahid Rahnamun Hospital of Yazd in 2012 and 2013. *Electron Physician* 2015;**7**:1121–5.
44. Akhlaghi F, Mafi N, Bastami F. Prevalence of Maxillofacial Fractures and Related Factors: A Five-Year Retrospective Study. *Trauma Mon* 2019;**24**:1–4.
45. Dibaie A, Raissian S, Ghafarzadeh S. Evaluation of maxillofacial traumatic injuries of forensic medical center of ahwaz, Iran, in 2005. *Pakistan J Med Sci* 2009;**25**:79–82.
46. Lima Júnior SM, Santos SE, Kluppel LE, Asprino L, Moreira RWF, de Moraes M. A comparison of motorcycle and bicycle accidents in oral and maxillofacial trauma. *J Oral Maxillofac Surg* 2012;**70**:577–83.
47. Chuang KT, Hsieh F, Liao HT. The Correlation of Age and Patterns of Maxillofacial Bone Fractures and Severity of Associated Injuries Caused by Motorcycle Accidents. *Ann Plast Surg* 2019;**83**:e28–34.
48. Arpalhti A, Haapanen A, Puolakkainen T, Abio A, Thorén H, Snäll J. Assault-related facial fractures: does the injury mechanism matter? *Int J Oral Maxillofac Surg* 2022;**51**:91–7.
49. Wusiman P, Maimaitiuerxun B, Guli, Saimaiti A, Moming A. Epidemiology and Pattern of Oral and Maxillofacial Trauma. *J Craniofac Surg* 2020;**31**:e517–20.
50. Aytac I, Yazici A, Tunç O. Maxillofacial Trauma in Geriatric Population. *J Craniofac Surg* 2020;**31**:e695–8.
51. Lee DH, Han SS, Kim DH, Kim EC, Lee EH, Park JO, et al. Clinical Characteristics Associated with Physical Violence in the Elderly: A Retrospective Multicenter Analysis. *Iran J Public Health* 2022;**51**:79–87.
52. Godfrey A, Lord S, Mathers JC, Burn DJ, Rochester L. The association between retirement and age on physical activity in older adults. *Age Ageing* 2014;**43**:386–93.
53. Grillo R, Slusarenko da Silva Y, Tavares MG, Borba AM,

- Naclério-Homem M da G. Which sports have a higher risk of maxillofacial injuries? *J Stomatol Oral Maxillofac Surg* 2022;**S2468-7855**:00354–8.
54. Yang SC, Johnson DG, Keefe SH, Bast BT. Aquatic Activity-Related Craniofacial Injuries Presenting to United States Emergency Departments, 2010 to 2019. *J Oral Maxillofac Surg* 2021;**79**:2538.e1–2538.e6.
 55. Povolotskiy R, Youssef P, Kaye R, Paskhover B. Facial Fractures in Young Adults: A National Retrospective Study. *Ann Otol Rhinol Laryngol* 2019;**128**:516–23.
 56. Othman S, Cohn JE, Toscano M, Shokri T, Zwillenberg S. Substance Use and Maxillofacial Trauma: A Comprehensive Patient Profile. *J Oral Maxillofac Surg* 2020;**78**:235–40.
 57. Boffano P, Kommers SC, Karagozoglu KH, Forouzanfar T. Aetiology of maxillofacial fractures: A review of published studies during the last 30 years. *Br J Oral Maxillofac Surg* 2014;**52**:901–6.
 58. Nogami S, Yamauchi K, Yamashita T, Kataoka Y, Hirayama B, Tanaka K, et al. Elderly patients with maxillofacial trauma: study of mandibular condyle fractures. *Dent Traumatol* 2015;**31**:73–6.
 59. Gualtieri M, Pisapia F, Fadda MT, Priore P, Valentini V. Mandibular Fractures Epidemiology and Treatment Plans in the Center of Italy: A Retrospective Study. *J Craniofac Surg* 2021;**32**:E346–9.
 60. Patel N, Kim B, Zaid W. A Detailed Analysis of Mandibular Angle Fractures: Epidemiology, Patterns, Treatments, and Outcomes. *J Oral Maxillofac Surg* 2016;**74**:1792–9.
 61. Agarwal P, Mehrotra D, Agarwal R, Kumar S, Pandey R. Patterns of Maxillofacial Fractures in Uttar Pradesh, India. *Craniofacial Trauma Reconstr* 2017;**10**:48–55.
 62. Lee K, Olsen J, Sun J, Chandu A. Alcohol-involved maxillofacial fractures. *Aust Dent J* 2017;**62**:180–5.
 63. Goulart DR, Durante L, De Moraes M, Asprino L. Characteristics of Maxillofacial Trauma Among Alcohol and Drug Users. *J Craniofac Surg* 2015;**26**:e783–6.
 64. Desai J, Lownie J, Cleaton-Jones P. Prospective audit of mandibular fractures at the Charlotte Maxeke Johannesburg Academic Hospital. *S Afr J Surg* 2010;**48**:122–6.
 65. Chegeni M, Kamel Khodabandeh A, Karamouzian M, Shokoohi M, Abedi L, Khalili M, et al. Alcohol consumption in Iran: A systematic review and meta-analysis of the literature. *Drug Alcohol Rev* 2020;**39**:525–38.
 66. Borna H, Rad SMBA, Borna S, Mohseni SM. Incidence of and risk factors for birth trauma in Iran. *Taiwan J Obstet Gynecol* 2010;**49**:170–3.
 67. Ghorashi Z, Ahari HS, Okhchi RA. Birth injuries of neonates in Alzahra hospital of Tabriz, Iran. *Pakistan J Med Sci* 2005;**21**:289–91.
 68. Hajiesmaello M, Hajian S, Riazhi H, Majd HA, Yavarian R. Secondary traumatic stress in Iranian midwives: stimuli factors, outcomes and risk management. *BMC Psychiatry* 2022;**22**:56.
 69. Kashkooe A, Yadollahi M, Pazhuheian F. What factors affect length of hospital stay among trauma patients? A single-center study, Southwestern Iran. *Chinese J Traumatol* 2020;**23**:176–80.
 70. Mansouri M, Faghihi H, Hajizadeh F, Rasoulinejad SA, Rajabi MT, Tabatabaey A, et al. Epidemiology of open-globe injuries in Iran: Analysis of 2,340 cases in 5 years (report no. 1). *Retina* 2009;**29**:1141–9.
 71. Barach P, Rivkind A, Israeli A, Berdugo M, Richter ED. Emergency preparedness and response in Israel during the Gulf War. *Ann Emerg Med* 1998;**32**:224–33.
 72. Hennocq Q, Bennedjaï A, Simon F, Testelin S, Devauchelle B, Tulasne JF, et al. Maxillofacial surgery in wartime Middle-East: Paul Tessier's missions to Iran. *J Craniofacial Surg* 2019;**47**:1449–55.
 73. Hesamirostami M, Sarparast L, Radfar A, Hesamirostami S, Hosseinzadeh AZ, Yousefnezhad O. Choosing Appropriate Technique for Nasal Reconstruction in Challenging Cases of Panfacial Burn: Treatment Algorithm. *J Burn Care Res* 2021;**42**:1215–26.
 74. Jahromi HE, Gholami M, Rezaei F. A randomized double-blinded placebo controlled study of four interventions for the prevention of postoperative nausea and vomiting in maxillofacial trauma surgery. *J Craniofac Surg* 2013;**24**:e623–7.
 75. Khaqani MS, Tavosi F, Gholami M, Eftekharian HR, Khojastepour L. Analysis of Facial Symmetry After Zygomatic Bone Fracture Management. *J Oral Maxillofac Surg* 2018;**76**:595–604.
 76. Khiabani K, Zinhaghayegh B, Amirzade-Irani MH. Does Dynamic Intermaxillary Fixation With Elastics Improve Outcomes Following Unilateral Condylar Fracture? *J Oral Maxillofac Surg* 2021;**79**:192–9.
 77. Khiabani K, Ahmadfar M, Labafchi A, Gosheh MR, Samieirad S. Is Preoperative Administration of Tranexamic Acid Effective on Blood Loss Reduction in Mandibular Fracture Surgeries? A Triple-Blind Randomized Clinical Trial. *J Oral Maxillofac Surg* 2021;**79**:429.e1–429.e7.
 78. Nasser M, Fedorowicz Z, Ebadifar A. Management of the fractured edentulous atrophic mandible. *Cochrane Database Syst Rev* 2007;**1**:CD006087.