



Epidemiologic Evaluation of Maxillofacial Trauma in Alzahra Hospital, Isfahan

Abbas Haghghat¹, Sobhan Pourarz², Afsaneh Zarghami^{3*}

¹Dental Implant Research Center and Department of Oral and Maxillofacial Surgery, School of Dentistry, Isfahan University of Medical Sciences, Isfahan, Iran

²Department of Oral and Maxillofacial Surgery, Guilan Dental School, Guilan University of Medical Sciences, Guilan, Iran

³Department of Orthodontics, Faculty of Dentistry, Zanjan University of Medical Sciences, Zanjan, Iran

Abstract

Background and aims: This study aimed at analyzing the epidemiological features and complications of different types of maxillofacial traumas in patients who referred to Alzahra hospital, Isfahan during 2005-2019.

Methods: This descriptive-analytical cross-sectional study included all patients with maxillofacial traumas who had been admitted to Alzahra hospital from March 1, 2005 to February 31, 2019. Several parameters were registered, consisting of patients' demographic information, and time, location and the etiology of the accident, and clinical details related to injury and treatment procedures were recorded as well. Finally, the data were analyzed using chi-square and Fisher exact tests, and $P < 0.05$ was considered statistically significant.

Results: A total of 1677 documents of traumatized patients were evaluated, including 79.66% men ($n=1336$) and 20.33% women ($n=341$). The statistical difference between the number of male and female patients was significant ($P < 0.001$) and maxillofacial traumas were more prevalent in the third decade of life (35.4%). Eventually, the highest number of referents was from Isfahan province (79.2%).

Conclusion: In general, traumatic accidents related to face and jaws are more prevalent in 21-30-year-old male patients mostly due to driving accidents, and driving accidents with vehicles was the most frequent cause of trauma.

Keywords: Maxillofacial injuries, Epidemiology, Bone fracture

*Corresponding Author:

Afsaneh Zarghami,
Tel: +989144092083;
Email: afsaneh.zarghami1989@gmail.com

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Introduction

Facial trauma is known as an inseparable part of accidents and physical damages¹ and is functionally and esthetically considerable in medical and dental services.² It is found that deformities resulting from facial traumas can inflict social and psychological pressures on affected individuals. On the other hand, functional complications such as occlusal discrepancies, limitation of jaw movements, and sensory-motional disorders due to damage to adjacent nerves might be expected as well.²⁻⁵

As mentioned in some studies, driving accidents, falling from a height, dispute, sports accidents, occupational accidents, and other daily activities are considered as the main causes of facial traumas.⁶⁻⁸ According to traffic reports in Iran, driving accidents cause approximately 28000 deaths and disabilities per year,⁹ and occupational accidents due to the lack of labor safety cause damages as well. In addition, although carrying warm and cold armaments are illegal for individuals in Iran, traumas resulting from disputes and injury with combat equipment have been reported in many studies.¹⁰ Considering the possible

influence of social factors, previous studies have indicated that the type, severity, and causes of maxillofacial traumas differ in each area and country.¹¹ Evidence suggests that the culture and political and socio-economic status of the society may significantly impose various indicators of traumas.^{4,12} Further, statistics show that sports accidents and disputes are the major factors for maxillofacial fractures in developed countries while driving accidents are considered as a more prevalent cause of these injuries in developing countries.^{3,7,13} Given that prevention is the priority, the first step could be the exploration of factors related to head and face traumas in each society in order to make appropriate preventive policies in this regard.¹¹

On the other hand, traumatic patients' management is of great importance, and various methods are known to be used for the treatment of maxillofacial traumas.

Although a number of studies have focused on the epidemiology of maxillofacial traumas in Iran and other Middle East countries, they had some negative points such as the short period of evaluation and low sample sizes.^{10,14-16} In addition, many studies in Iran have been carried out

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in northern cities such as Tehran,^{2,13} Mazandaran,^{10,16} and Hamedan,¹⁷ and no study has so far focused on the southern and central parts of the country.

Isfahan, as one of the largest and most populous cities in the central part of Iran, is considered as the most important medical center in this area. Furthermore, its geographical position is the reason for numerous patients' referrals to this city from adjacent areas. Moreover, Alzahra specialized hospital of Isfahan is one of the most important medical centers with maxillofacial surgery settings along with other medical services, and a large number of patients with maxillofacial trauma have been treated at this center during the past several years. Additionally, this medical center is equipped with an advanced electronic system in which patients' data are recorded thoroughly. Given the above-mentioned explanations, the present study sought to perform a fundamental and comprehensive evaluation of maxillofacial trauma cases recorded during a fourteen-year period in Alzahra hospital of Isfahan.

Materials and Methods

Sampling

The digital documents of patients hospitalized in the Alzahra hospital of Isfahan from March 1, 2005 to February 31, 2019 were evaluated in this descriptive-analytical study. It should be noted that documents were included if they contained at least one type of maxillofacial trauma such as naso-orbito-ethmoidal fracture types, nasal bone and zygomatic arch fractures, as well as maxillary and mandibular fractures in their history as the keyword for data search. Through detailed evaluations, documents with missing information were excluded from the study. Finally, 1677 valid documents were entered into the study. All the obtained data from the documents were anonymous, and patients were ensured of data confidentiality.

Data Collection

The information for each patient was registered in a checklist, including demographic data such as gender, age, and educational status, as well as the etiology of the trauma including driving accidents, dispute and injuries caused by weapons, sports and occupational accidents, and falling from height. Several other parameters were also recorded, consisting of the clinical signs of maxillofacial traumas such as edema, tenderness, soft tissue injuries, fracture of bony structures, malocclusion, neuronal damage, cerebrospinal fluid leakage, ocular damage, limitation of mouth opening, mandibular deviation, and injury severity score. The other accompanied complications included damage to the vertebra, head, and brain in addition to orthopedic damage to organs and damage to the abdomen and the chest. The type of surgical intervention (e.g., open reduction, closed reduction, combined intervention, and reconstruction surgery), duration of hospitalization, and complications after patient discharge were considered as

well.

Statistical Analysis

The data were analyzed using chi-square and Fisher exact tests by SPSS 18 (Microsoft, IL, USA), and $P < 0.05$ was considered statistically significant.

Results

According to the obtained results from 1677 evaluated documents (Table 1), 79.66% ($n=1336$) and 20.33% ($n=341$) of patients were men and women, respectively, and the difference between the number of the two groups was significant ($P < 0.001$).

Further, the patients' mean age was 26.55 ± 5.32 . The investigation of the age distribution of maxillofacial traumatic accidents revealed that trauma was more prevalent in the age groups of 21-30 (35.65%), 11-20 (23.55%), and 31-40 years (15.74%), respectively, and the difference among various age groups was statistically significant ($P < 0.001$). According to educational status, more than half of the injuries (58.9%) were observed in individuals without a high school certificate (Table 1).

Similarly, the majority of referents ($n=1328$, 79.2%), suffering from maxilla and face traumas, to the Alzahra hospital were from Isfahan province.

Table 1. Distribution of Maxillofacial Traumas According to Gender, Age Group, Educational Status, and the Etiology of the Trauma

		Number (%)	P Value
Gender	Male	1336 (79.66)	<0.001*
	Female	341 (20.33)	
Age group (years)	1-10	112 (6.67)	<0.001*
	11-20	395 (23.55)	
	21-30	598 (35.65)	
	31-40	264 (15.74)	
	41-50	178 (10.61)	
	51-69	72 (4.29)	
	61-70	39 (2.32)	
	71-80	12 (0.71)	
	81-90	6 (0.35)	
Educational status	Without high school certificate	987 (58.85)	<0.001*
	With high school certificate	396 (23.61)	
	Bachelor and master's degree	258 (15.38)	
	Ph.D. and higher	36 (2.14)	
Etiology of trauma	Driving accidents	1051 (62.67)	<0.001*
	Dispute	136 (8.10)	
	Sport accidents	92 (5.48)	
	Occupational accidents	65 (3.87)	
	Falling from height	327 (19.49)	
	Injuries with a warm gun	6 (0.35)	

Note. *Statistically significant (P value was obtained from the chi-square tests).

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Based on the data in Table 1, driving accidents by vehicles were the most frequent reason for maxilla and face traumas (62.67%, $P < 0.001$).

Furthermore, the hospitalization stay of injured individuals in this study was less than 2 days, 2-5 days, and more than 5 days in 58.31% ($n=978$), 33.98% ($n=570$), and 7.69% ($n=129$), respectively ($P < 0.001$), the details of which are provided in Table 2. The most prevalent observed clinical signs were tenderness (39.47%), soft tissue injury (14.78%), and malocclusion (9.06%) while no clinical sign was found in 23.13% of subjects (Table 2).

The results further demonstrated that the most frequent accompanied clinical signs were orthopedic damage to limbs (16.63%), damage to the head and brain (8.40%), and the chest (6.14%), respectively. Among the traumatized patients evaluated in this study, more than half of the cases had no accompanied signs (Table 2).

Table 2. Frequency of the Fracture Location, Duration of Hospitalization, Characteristic Signs of Maxillofacial Traumas, and Other Accompanied Signs

	Number (%)	P Value	
Location of fracture	Frontal bone	39 (2.32)	<0.001*
	Naso-orbito-ethmoidal	18 (1.07)	
	Orbital blow out fracture	77 (4.59)	
	Zygomatic arch	71 (4.23)	
	ZMC-LEFT & right	206 (12.28)	
	Maxilla**	588 (35.06)	
	Mandible***	590 (35.18)	
	Nasal bone	88 (5.24)	
Duration of Hospitalization	<2 days	978 (58.31)	<0.001*
	2-5 days	570 (33.98)	
	>5 days	129 (7.69)	
Clinical signs	Edema	59 (3.51)	<0.001*
	Tenderness	662 (39.47)	
	Soft tissue injuries	248 (14.78)	
	Malocclusion	152 (9.06)	
	Neural damages	17 (1.01)	
	Cerebrospinal fluid leakage	5 (0.29)	
	Ocular damages	39 (2.32)	
	Limitation of mouth opening	90 (5.36)	
	Maxillary deviation	17 (1.01)	
	No detectable sign	388 (23.13)	
Accompanied signs	Injury to vertebra	72 (4.29)	<0.001*
	Injury to head and brain	141 (8.40)	
	Orthopedic injury to limbs	279 (16.63)	
	Injury to abdomen	23 (1.37)	
	Injury to the chest	103 (6.14)	
	Other cases	54 (3.22)	
Without injuries to other organs	1005 (59.92)		

Note. ZMC: Zygomaticomaxillary complex fracture; *Statistically significant level (P -values were obtained from the Chi-square test); **Le Fort 1,2,3, palatal, dentoalveolar fractures; ***Symphysis, parasymphysis, body, angle, ramus, subcondyle, condyle, and coronoid, dentoalveolar fractures.

Among all patients, one-third had mandibular fractures and one-third of them suffered from maxillary fractures. Nasal bone, orbital rim, and zygomatic arch fractures were the least bone fractures that were observed in patients (Table 3).

Table 3 presents the type of surgical intervention implemented during the operation. More than half of the cases underwent open reduction surgery (e.g., reconstruction plate, suspension wiring, lag screw, plate and screw, and intraosseous). In addition, vestibular incision (51.22%) was the most applied surgical approach (Table 3).

Discussion

This study evaluated the prevalence of various types of maxillofacial traumas recorded in a fourteen-year period in the Alzahra hospital, Isfahan. A relatively long-term evaluation is one of the positive aspects of this study. A number of studies in this regard presented more than 10 years of evaluation.^{3,17} Despite the shorter period of evaluation, some other studies had more than 4000 sample sizes, which increases the validity of these studies.^{8,18} Nonetheless, the loss of data is a potential source of bias. In this study, a number of documents related to patients with maxillofacial traumas were inevitably excluded due to missing the required information, which may have influenced the final results.

In this study, the prevalence of maxillofacial traumas was significantly higher in men, which is in agreement with the findings of many similar studies.^{5,13-15,19} In a study by Gassner et al, the number of male patients was approximately twice more than female patients.³ In another study by Brasileiro et al, the number of men was four times more compared to women,¹⁹ which is in line with our findings. Another study reported that 81% of maxillofacial traumas were observed among men.²⁰ Based on the results of other studies, men were more prone to traumatic injuries probably due to dealing more with physical activities and disputes.^{5,13,21}

Regarding the reason for traumas, approximately two-third of cases were allotted to driving accidents with vehicles, and falling from a height, disputes and injuries with a warm gun, along with sports and occupational accidents, were the other causes of maxillofacial traumas in this study. In their study, Kalantar Motamedi et al¹⁸ reported a higher percentage of car accidents in comparison to our study. Literature review suggests that driving accidents are the main reason for facial traumas in both developing and high-income countries.^{21,22} Additionally, it has been claimed that the percentage of traffic accidents leading to maxillofacial traumas is 40, 24.7, 38, 45, and 55.2% in the USA, England, France, Brazil, and Jordan, respectively.^{5,14,19} However, the results of a study in Austria revealed that only 12% of 9543 maxillofacial traumatic cases were due to driving accidents. It seems that developed

Table 3. Type of the Surgical Intervention to Traumatic Areas

		Number (%)	P Value
Type of treatment intervention	Closed reduction**	88 (5.24)	
	Open reduction***	868 (51.75)	
	Combination of both	719 (42.87)	<0.001*
	Conservative observation	1 (0.05)	
	Reconstruction surgery	1 (0.05)	
Type of incision	Vestibular	859 (51.22)	
	Submandibular	165 (9.83)	
	Retromandibular	18 (1.07)	
	Preauricular	14 (0.83)	
	Subsiliary	296 (17.65)	
	Subtarsal	46 (2.74)	<0.001*
	Lateral rim of eyebrow	189 (11.27)	
	Transconjunctival	39 (2.32)	
	Bicoronal	3 (0.17)	
	Scar incision	48 (2.86)	

Note. *Statistically significant (*P* value was obtained from the Chi-square test); **Split, mandibulo-maxillary fixation, screw, IV-loop, wiring, and arch bar; ***Reconstruction plate, suspension wiring, lag screw, plate and screw, along with intra osseous.

countries are experiencing a major change in the etiology of head and face traumas. Based on the report of Gassner et al,³ daily activities (38%), sports accidents (31%), and disputes (12%) were more prevalent compared to those of our study, and data related to occupational activities (5%) were nearly in line with the results of our study. In another study, driving accidents with a motorcycle were introduced as the main reason for maxillofacial traumas.²¹ It seems that cultural considerations, driving regulations in each country, and the type of the vehicle with respect to safety equipment are some of the possible factors which play a role in altering the percentage of driving accidents in related studies.

The highest rate of mandible and face traumas belonged to the age group of 21-30 years. In this respect, a number of similar studies reported the same age distribution for maxillofacial traumas.^{19-21,23} However, in a study done in the United Arab Emirates, the second decade of life was reported as the most prevalent age group of maxillofacial traumas, which is attributed to further use of motorcycles by young people.²⁴

In the present study, nearly one-third of cases had mandibular fractures in their history. Conversely, mandibular fractures were more prevalent and involved approximately half of the cases in some related studies.^{16,19,21} On the other hand, the findings of a similar study revealed that less than one-fourth of maxillofacial fractures occurred in the mandibular region and more than 70% of these fractures were related to the midface region.³

Although the results of this study represented that tenderness was the most prevalent sign of trauma ($P < 0.001$), another study reported malocclusion and

infection after the surgical intervention as the most prevalent complications after traumatic accidents.⁵

Regarding patients' educational levels, it was found that approximately 60% of cases had no high school certificate while less than 20% of them had university degrees, which is in agreement with the finding of Esses et al.²¹ Education is among the determinants of individuals' social position that may potentially influence health conditions.²⁵ It is expected that educated individuals probably experience better quality of life including safer decisions in the family, better adaptation to traffic rules, and the like. On the other hand, it seems that low levels of education may lead to unqualified activities or unawareness of safety measures which may put individuals at the risk of injuries.^{21,26} Moreover, another reason for a higher rate of traumas among individuals without university degrees is the smaller quota of people with university degrees in comparison to the number of high school certified individuals or lower levels of education in our country.²⁷

Conclusion

According to the finding of the study, the prevalence of maxillofacial traumas was influenced by gender, age, and the educational status of individuals. Thus, it is suggested these factors be considered in policy-making and legislation, particularly for driving qualification tests. Additionally, complementary educational programs for self-protection and safety promotion during driving, occupational activities, and the like may play a key role in decreasing the number of maxillofacial traumatic accidents.

Similarly, accurate recording of patient information and digital documenting in hospitals may lead to further investigations of patients' epidemiologic data. On the other hand, maxillofacial surgeons had close cooperation mostly with orthopedic medical services since upper and lower limb fractures were the most prevalent accompanying injuries. Therefore, it is suggested that specialists expand co-educational programs in this regard.

Conflict of Interest Disclosures

The authors declared no conflict of interests.

Ethical Approval

The study protocol was approved by the Committee of Dental Implants Research Center at Isfahan University of Medical Sciences under the code 294198.

Authors' Contributions

AH: Determining the study topic and design, Arrangement of data collection, data analysis

SP: Study design, Data collection, Preparation of final report and writing manuscript

AZ: Data analysis, Preparation of final report and writing manuscript

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