Frontiers in Health Informatics www.healthinformaticsjournal.com
ISSN-Online: 2676-7104
2024; Vol: 13 Issue 8 Open Access

Evaluation of Factors Affecting Mortality in Patients with Severe Maxillofacial Injuries in Sulaimaniyah City/KRG

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Cite this paper as: Jamal FS, Mahmood BJ. (2024) Evaluation of factors affecting mortality in patients with severe maxillofacial injuries in Sulaimaniyah City/KRG. *Frontiers in Health Informatics*, *13(8) 6572- 6578*

ABSTRACT

Background and objectives: *Traumatic injuries continue to be a major contributor to mortality, and long-term disability all over the world. Facial injuries impact one-third of severely injured patients. Occasionally, standalone maxillofacial trauma is linked with fatality, however in patients with concurrent injuries, the death rate increases. This research focused on analyzing and evaluating facial injuries and factors affecting mortality among patients admitted to the emergency unit due to traumatic injuries.*

Methods: *A Prospective Cross-sectional methodology was used in this research; consisting of a total of 105 patients of both sexes including 81 males and 24 females with maxillofacial injuries were observed until carrying out the hospital or dying upon arrival or during their hospital stay between January 2024 and January 2025 at the emergency department of shar teaching hospital in Sulaimanyah city, Kurdistan region, Iraq. Measurements of Injury Severity Score and Glasgow Coma Scale were statistically analyzed to determine the factors associated with mortality. Injury Severity Score is evaluated by the process of converting injury codes in the International Classification System of Diseases, tenth edition (ICD-10).*

Result: *During a one-year observation period, 105 patients were evaluated. The average age (mean) of individuals with maxillofacial injuries was 28.1 ± 14.9 years, and 77% of them were male. Road traffic accidents including (car accidents and motorcycle collisions) were the most prevalent etiological cause of facial injuries regardless of gender. The research findings reveal a significant correlation between mortality and AIS-ISS scores and GCS.*

Keywords: *Maxillofacial injury, Mortality, Glasgow Coma Scale, Injury Severity Score*

INTRODUCTION

Traumatic injuries continue to be a major contributor to mortality, and long-term disability all over the world. Facial injuries impact one-third of severely injured patients [1, 2]. Traumatic injuries have been established as one of the significant population health problems in developed nations in addition to nations with low yearly income [3].A considerable proportion of trauma patients (40- 60%) pass away caused by injuries before arriving at the hospital [4]. The incidence of traumatic injuries is more widespread among young individuals, predominantly men (70%-80%) which leads to a substantial economic burden for society because life expectancy is reduced as a result of fatality and disability [5]. Given that the facial bones are anatomically positioned in distinctbalance and their close and strong relation to the brain, traumatic facial traumas are of critical significance [6]. Globally, the predominant factors of maxillofacial trauma are vehicle collisions, then falls, assault, and other causes [7].

Studies in the existing literature have established that maxillofacial injuries is mainly found in men within the age range

of 21 to 30. The ratio of male to female has been established between 2:1 and 8:1 in the research literature [7, 8]. Facial injuries are typically responsible for nonreversible consequences or fatality in individuals,particularly while they are correlated with other concurrent injuries. Head injuries and thoracic injuries are usually linked with maxillofacial bone fractures in patients with extensive traumatic injuries [9]. Head injury, chest injury, and Abbreviated Injury Scale (AIS), Injury Severity Score(ISS) are recognized as stable and unconventional markers in increasing the rates of mortality among patients with polytraumatic injuries[10].According to existing research, isolated facial injuries are.occasionally associated with death, At the same time patients with concomitant traumatic injuries, the rates of mortality are significantly elevated [11]. Based on the published studies, the prevalence rate of head injuries in patients with maxillofacial injuries was up to 20–70% contingent upon the socioeconomicand environmental situation [12]. Most often, head injuries correspond withsevere maxillofacial injuries such as midface fractures and/or naso-orbito-ethmoid(NOE) fractures frontal bone fractures, or sinus entanglement; head injuries are less uncommonly correlated with isolated fractures of the mandible.

Besides the head participating, other concomitant injuries can be incorporated such as chest, abdomen, and extremities [13]. The scores of the Abbreviated Injury Scale (AIS), which is anatomically derived, were suggested in 1971 and have continued brought up numeroustimes. In 1974, Baker et al. established the Injury Severity Score (ISS) derived fromthe supposition that the degree of intensity of the injuries and probability of death could be exhibited by the cumulative sum of the squaring of the triple highest AIS points for three separate body parts. The AIS-ISS approach has been established as the most broadly adopted survival indicator guide in medicaloutcomes [14, 15].

Materials and Methods

A Prospective Cross-sectional methodology was used in this research; consisting of a total of 105 patients of both sexes including 81 males and 24 females with maxillofacial injuries were observeduntil carried out to the hospital or dying on arrival or during their hospital stayingbetween January 2024 and January 2025 at the emergency department of shar teaching hospital in Sulaimanyah city, Kurdistan region, Iraq.The scientific studyprotocol is authorized by the Ethical Committee of the Kurdistan Higher Council of Medical Specialities (KHCMS)Ethical Committees.

Injuries to the maxillofacial regioninvolve damage to the soft and/or hard tissue of the face and jaws. Each patient record is evaluated individually. The following parameters were gathered and analyzed: patient demography, etiology and mechanism of trauma, anatomical body region and intensity of the injury, concomitant injuries, and clinical outcome. Maxillofacial fractures and head injuries were evaluated by X-ray and/or computed tomography (CT) scan of the face and head.CT/X-ray investigations were carried on further to the thorax, abdomen, spine, and extremities when multiple injuries were recognized.

The severity and intensity of the injury of regional anatomy were analyzed by the following commonly used grading methods: (AIS) The Abbreviated Injury Severity Score, (ISS). The Injury Severity Score,and (GCS)Glasgow Coma Score.AIS isa global scoring evaluation system that categorizes any injury by anatomical region on the 6-point ordinal scale for grading injuries1=minor, 2=moderate, 3=serious, 4=severe, 5=critical,6=maximal. The Values of the InjurySeverity Score (ISS) are evaluated by the process of converting injury codes in the International Classification System of Diseases, tenth edition (ICD-10). The injury severity score (ISS) minor=1-8, moderate=9-15, severe=16- 24, critical=25-75) was established according to the records. The AIS-ISS score was evaluated for any individual dependent on diagnoses.

Patients with concomitant injuries were graded by the cumulative sum of the squares of the three greatest AIS grades for three separate body parts. Information regarding the state of consciousness and awareness based on the GCS was obtained from the data notesgiven by the first neurosurgeon who evaluated the patient's neurological states. The difference between groups concerning parameters such as AIS, ISS,and GCS were estimated. Further analysis was conducted to recognize the variables that were significantly correlated with death rates. The data were gathered and

arranged viaExcel spreadsheet software (Microsoft). Before the numericaldata analysis, the data werecheckedto ensure the required dataquality.

StatisticalAnalysis

The recorded data was transferred into the GraphPad Prism 9.0 Statitical program. The numerical data process was conducted by GraphPad Prism 9.0.2 programand was used for the visualization of the results. Quantitative continuous variables were revealed as mean, and standard deviation. Median range categorical ordinal variables and categorical nominal data were introduced in the form of percentages (%). The variation between categorical data was evaluated with the unpaired t-test, the Mann-Whitney U test. Several logistic regression evaluation was used to analyze the correlation between variables including (gender, age etiological factor of injury AIS-ISS), and death rate in individuals with multiple traumas, and the Odds ratio (OR) was determined with a 95% (CI) confidence interval for the variables. A p-value of <0.05 was regarded to be statistically significant.

RESULTS

During the 12-month observation period, 105 patients were collected and evaluated. The patient's mean age included in this study was (28.2, SD ± 14.9 years), ranging from 3 to 80 years. There were 81 males (77%) and 24 females (23%) with a gender proportion of 3, 3:1.The majority of trauma occurred amongst the 21-30 year (young) age group. Road traffic accidents including (car accidents, motorcycle accidents, and pedestrian accidents) were the most prevalent etiological cause (74%) with statistical significance in comparison to the other groups ($p < 0.001$).The second most common cause of injuries was fall from height (11%). The other factors (15%) include assault, work-related injuries, blast injuries, sport-related injuries, and unknown causes. The evaluation of data revealed that there was no relevant statistical variation in the population among patients who died and those whosurvived involving gender,age, etiological factors of injuries (Table 1 and Figure 1).

Table 1.The demographic of maxillofacial injured patients,gender, and mechanism of the trauma of patients those who survived, and those who nonsurvived.

Parameters		Maxillofacial Injured patients	The rate in percentage (%)
Age (yr) (Mean±SD)		28.1±14.9	
Gender	**Male**	81	77.2
	Female	24	22.8
Mechanism of injuries	**Road traffic accident**	78	74.3
	Falling accident	11	10.5
	Others	16	15.3
Death		5	4.8

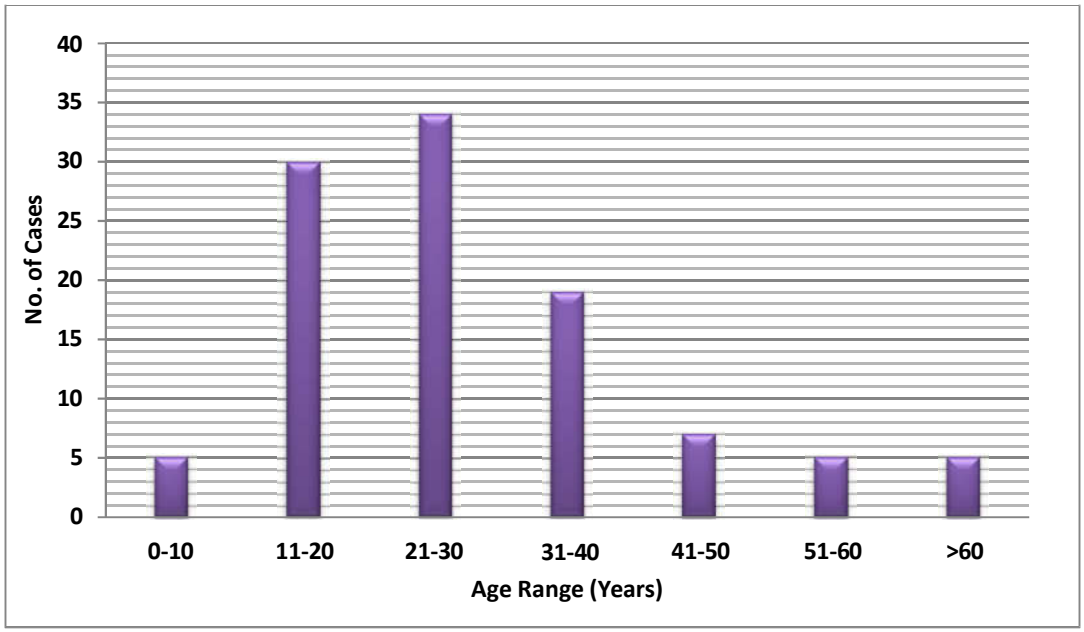

Figure 1. The chart illustrates the age demographics range of patients

In this study, among all patients only (32.7%) patients suffered isolatedmaxillofacial injuries, while (67.3%) patients had concomitant injuries in another body region. In polytraumatic patients, the most frequently injured body anatomical regions associatedwith facial fractures were the head injuries (49.6%), followed by the chest injuries (27.7%), then the extremities (17.2%). The face-AIS score corresponded to minor in 59 % of patients, moderate in 21 %, serious in 12%, severe in 5%, critical 2%, and maximal in the remaining 1%. The median range (AIS-ISS) was 5 (1-75) about 80 %of patients had an ISS between 1 and 8. The mean GCS measurement of the patients upon admission to the emergency unit was observed to be 12.7 ± 2.9. A GCS score ≤ 9 was recognized in (12.4%) of the individuals. The lowest possible score was 3.Multiple predictor regression modeling reveals that facial-AIS (Odd ratio: 2.14(95% CL: 1.119—3.166)) and GCS (Odd ratio: 12.17(95% CL: 12.13—13.26)). The overall mortality rate for the patients in this study was (4.8%) although there was a male predominance in the patients with maxillofacial injuries, there was no gender-based variationregarding survival.Table 2 shows thedetails of differentiating the intensity indicators among the survived and nonsurvived patients and reveals that patients who died had considerably lower GCS and substantially higher ISS.

Table 2. Two sample-based data analyses (median values) of comparing and evaluating intensity indicators of facial injured patients who survived with those who did not survived.

Variable		Total (N=105)		Survivors (N=100)		Non Survivors (N=5)	
		Median	Range	Median	Range	Median	Range
Location of injury	Face AIS	1	(1-6)	1	(1-3)	4	(2-6)
	Head AIS	2	(1-5)	2	(1-5)	4	(2-5)
	Chest AIS	1	(1-4)	1	(1-4)	2	(1-4)
Injury Severity Score (ISS)		5	(1-75)	5	(1-75)	19.5	(5-75)
Glasgow Coma Scale (GCS)		14	(3-15)	14	(3-15)	4	(3-15)

DISCUSSION

Traumatic injuries rank as one of the key public health concerns across the world and are a substantial contributor to death and disability, particularly among the young demographic [16].Maxillofacial trauma results in serious healthcare, economic, and societal outcomes that are influenced by considerable appearance and efficiencydisabilities, as well as psychological disturbances, social impairments, and high financial burden associated with medical care and recovery. Maxillofacial injuries differ in form, intensity, and signs and symptoms. They can also be related to concurrent injuries in the other body regions. The occurrence of numerous critical injuries in the facial region is correlated with a greater risk of complications,clinical outcomes, and even fatality[17]. Polytrauma is typically more critical, and the possibility of death is higher in the case of head injuries, with 70.77% of mortality caused by polytrauma who suffered head injuries [18, 19].

The result of the present study is similar to other previous studies revealing that facial injuriesoccurredin age related curve with the highest incidence seen between ages 21 to 30 years. In addition,children under 11 are included in 4% to 10% of all facial injuries [20]. At the same time in this research the ratio of males to femalessignificantly higher were males 3 times more than females 77% and 23% of male and female that in sequence, these findings were nearly compatible with most of the research on this topic, This is characteristic to the reason that male furthermoreengaged in external occupationmoreover contact to assault and aggression interaction. In addition, the higher proportion of male car drivers or motorcycle drivers than female. This ratio seems to be less prominent in developed nations due to greater involved outdoor activity of female [21, 22]. In our patient groups, the highly frequent etiologic factor of facialinjuries was traffic collision74% as reported in other studies from other countries of the world [23-25].

In addition, in the current research, the next most frequent cause of injuries was falls from height11% which was attributed to inadequate safety protocols in the workplace. The other factors in 15% include assault, blast injuries, sport-related injuries, and unknown causes [26]. Concomitant injuries are common in maxillofacial injured patients, they occurred in 67.3% ofall clinical cases, and there is a significant interrelation between the occurrence of accompanying injuries and the mechanism of traumatization [27]. In all instances, the primary cause of death was correlated with concomitant injuries and not directly caused by facial injuries, head injuries, and thoracic injuries are prevalent in the current study where head injuries occur in (49.6%), followed by chest injuries (27.7%), then other concomitant injuries [28-30]. Consequently, the close positioning of the head and chest correlativeto thefacial region enhances their chance of injury. This basic clinical observation is confirmed by the evidence of our study.

The overall mortality rate for the patients in this study was 4.8%which is near to other studies [27, 29]. Data analysis revealed that high AIS-ISS, reduced GCS, and associated chest injuries were considerably high in individuals who died identical to previous studies [27, 30]. We observed a significant connection between the maxillofacial injuries severity and head injuries. Furthermore, we identified that a combination of multiple facial bone fractures correlated with more critical head injuries, as determined by the GCS and AIS-ISS. Interestingly the current study and other literature found a strong and linear correlation between AIS-ISS and survival rate, but generally, maxillofacial trauma presents a lowerAIS-ISS score than head and neck injuries [17, 31].

CONCLUSION

In conclusion, facial traumatic injuries are a frequent form of which leads to moderate to serious injuries. The majority of maxillofacial injured patients are young males that injured by road traffic accidents or falls from height. Furthermore, the rate of mortality among patients with facial injuries was 4.8% overall. In addition, the most important factors affecting survival rate are associated with injuries to another part of the body such as head injuries, chest injuries, and others that are determined by GCS, and AIS-ISS scores. Moreover, the rate of mortality is greater in patients with severe facial injuries such as maxillary lefort III fracture, and pan-facial fracture than in those with mandibular fracture.

Interest conflict

All authors have no conflict of interest related to the release or publication of article.

Consent for publications

The author checked and confirmed the final version of the manuscript for publication.

Ethics approval and consent to participate

The Research protocol approved by the Ethical Committee of the Kurdistan Higher Council of Medical Specialities (KHCMS) Ethical Committees

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