

Maxillofacial Fractures in Makka City in Saudi Arabia; an 8-year Review of Practice

Mazen Almasri^{1*}, Dina Amin², Anas F AboOla², Jamil Shargawi²

¹Umm Alqura University, Oral Maxillofacial Surgery Department, Saudi Arabia / Consultant at Alnoor Specialist Hospital

²Oral Maxillofacial Surgery Department, Alnoor Specialist Hospital

*Corresponding author: mazen_ajm@yahoo.com

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Abstract Objective: to review the practice of maxillofacial trauma surgery in Makka city, Saudi Arabia, as road traffic accidents is considered a major cause of morbidity and mortality in the kingdom. Materials and methods: a chart review of all the maxillofacial trauma cases that visited the major hospital in the city, Alnoor specialist hospital (NSH), from October 2005 to October 2013 was collected. A total of 1132 patients' records were retrieved. Amongst, 965 maxillofacial injuries were included in the study as completed information was found. Charts of incomplete records, soft tissue injuries only, or solitary dental injury were excluded. Then, pertinent information such as age, gender, residence status, and fracture pattern were extracted, tabulated, and correlated. Results: it was presented that males were affected four times more than females (ratio of 4.4:1), of an age ranged from 3 years old to 97 with a mean of 51 years old, and patients of 1 to 16 years old counting 135 cases (11.9%), while the age between 17 – 45 years counting 856 (75.7%), and the age 46 – 97 counting 139 (12.3%). The majority of injuries was involving the lower facial third (mandible) by 523 cases (54.19%), then the middle third that include Zygomatic maxillary complex (ZMC) by 399 cases (41.3%; $p=0.006$), orbital floor by 25 cases (2.5%), and upper third (nasal, ethmoid, orbital, and frontal bar) fractures of 18 cases (1.8%). The ratio of Saudi patients to non Saudi was found to be 1.89:1. Conclusion: The maxillofacial injuries in Makka city are mainly affecting male patients aged between 17-45 years old with the mandible and middle face fractures being most commonly injured respectively.

Keywords: maxillofacial, facial trauma, fracture, Saudi Arabia, mandible, zygoma

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1. Introduction

General trauma including Maxillofacial trauma is one of the most serious healthcare burden in Saudi Arabia [1,2,3]. Beside the cost effectiveness, hospital service occupancy, and delaying other major surgeries (elective or urgent), it causes a lot of social sorrow to the patients and their families [1,2].

Road traffic accidents (RTA) in Saudi scored to be among the highest worldwide and the causes are mainly not properly following the rules and regulation and hence high percentage of these accidents are actually preventable [2,3]. The magnitude and severity may vary among different regions worldwide and in Saudi as well. Thus, a lot of factors do contribute to the problem such as the social-education level, age, occupation, city geography and climate [1,4]. Although the severity can be categorized based on the injury location at the face, as lower facial third fractures are less severe compared to the middle third and the upper third respectively, it might not necessary to be the case (Figure 1). As mandible single fracture line usually accompanied by other fracture lines, other jaw injuries, or cervical spine injuries in more than

20% of the cases, which make such categorization more complicated [5].

The degree of involvement between male and female partners in the community does explain a lot about the nature of the injuries as well as the community culture; however, male citizens are usually affected more than females [1,6].

In this study, the maxillofacial injuries are being investigated in Makka city, a very unique place compared to others in the kingdom. Being the major holy city that visitors from all over the world approach, the multicultural and multi lingual nature of the society, the high traffic nature, and the very fast economic real estate expansion rate are among the major factors. Moreover, those extremely mixed factors might have visitors to be confused when it comes to comprehending the rules and regulations of the Kingdom. Driving, biking, working, studying and communicating with others might cause an issue of conflict and hence motor vehicle accidents, altercations, falls or industrial injuries (Figure 1).

To our knowledge, this is the first study that investigates the issue of maxillofacial trauma injuries in the city during an eight-year period (between 2005 and 2013) including 965 cases of multinational sources.



Figure 1. An axial CT scan showing a foreign body (electrical cutting saw) penetrating the orbital cavity into the cerebrum as an example to industrial trauma in the region

2. Materials and Methods

After getting the study ethical approval at Alnoor specialist Hospital (NSH) / research committee, all the operated cases under the oral maxillofacial surgery department during the last 8 years were retrieved (from 2003 to 2013). Cases with incomplete records, soft tissue injuries only, or dentoalveolar injuries were excluded from the study. A total of 965 cases were included and tabulated to correlate the age, gender, residency status, and the injury recorded.

3. Results

It was found that mandible fractures was the most common fracture type seen in the area scoring 54.19%, while the ZMCs scored 41%, the solitary orbital floor as 2.5%, and the nasal ethmoid orbital frontal bar fractures scoring 1.8% (Table 1) (Figure 2).

Table 1. The anatomical distribution of maxillofacial fractures, ZMC: zygomatic maxillary complex, NOE: naso-ethmoid-orbital

Fractures	Mandible	Orbital floor	ZMC	NOE / Frontal
Number	523	25	399	18
Percentile	54.19	2.5	41.3	1.8

Table 2. The maxillofacial injury pattern in relation to the age groups

Age group	Percent %	Count
1 to 16 Years	11.9	135
17 to 45 Years	75.7	856
46 to 97 Years	12.3	139

It was presented that males were affected 4 times more than females (ratio of 4.4:1; $p=0.70$, not significant), while Saudi patients scored 1.89 times more than non Saudis, and the age group between 17- 45 years old scored 75.7% of the injuries compared to other age groups (Table 2) (Figure 3).

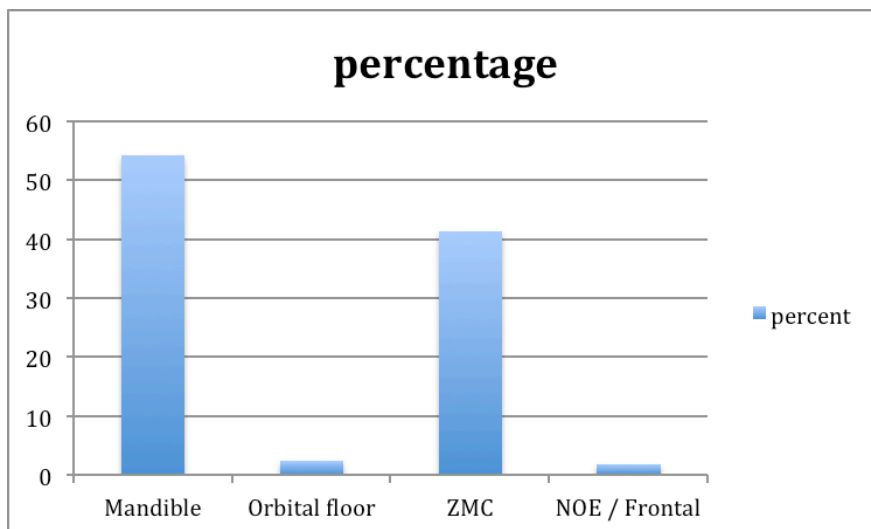


Figure 2. The maxillofacial injury pattern as per the anatomical site distribution

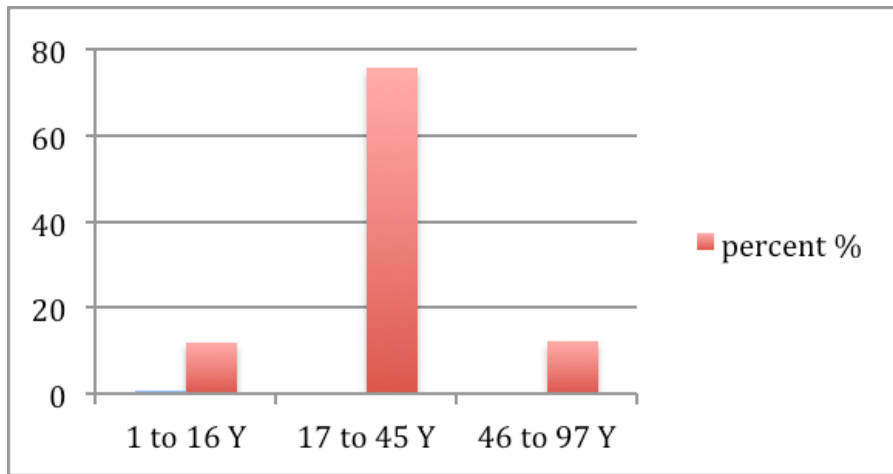


Figure 3. The maxillofacial injury distribution as per the age factor

4. Discussion

Road traffic accident is a major threat to the health care sector in Saudi. Although, the government is working actively to enforce lots of rules, regulations, and penalties pertaining to traffic regulation, RTA is still occupying a major part in the tertiary health care service [1,2,3]. The objective of the study is to review the oral maxillofacial trauma injuries that took place in NSH in Makka city, one of the busiest areas in the kingdom of Saudi Arabia that is blessed with Hajj and Omrah (Muslim religious rituals) seasons and therefore active visitors from the entire world all year long. To our knowledge this is the first study conducted in the city and aimed to review the maxillofacial injuries in the region.

It was found that most of the maxillofacial trauma injuries in Makka are mandible fractures (54%) and ZMC fractures (41%) respectively, while fractures involving the upper third of the face and orbital floor are minimal. That

can be attributed to the mechanism of injuries, which mainly directed to lower energy RTAs at the city area compared to a higher energy injury in some mountain areas as the southern Aseer region, which can produce more fatal results (1) (Table 3, Figure 4). However, the sequel of such injuries are still critical, as losing school days, working days, family tragedies, and being a huge obstacle to the health care system in the area due to the high bed occupancy rate. Such, lead to delay in operating other maxillofacial cases, such as orthognathic surgery, oncology, temporomandibular joint, major dentoalveolar, and medically compromised surgical case management.

Table 3. A comparison of the maxillofacial injuries in three cities in Saudi

Area	Aseer	Riyadh	Makka
Duration	2011-2012	2007-2011	2003-2013
Mandible fracture	50.68%	56.40%	54.19%
ZMOC	27.39%	43.60%	43.80%
NOE/Frontal	21.91%	12.80%	1.80%

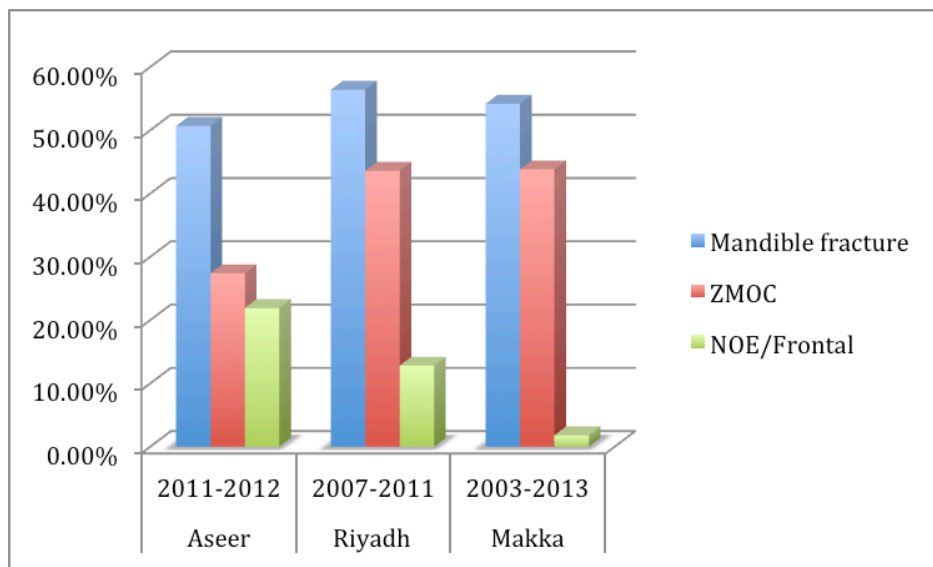


Figure 4. A bar graph showing the distribution of maxillofacial injuries in three cities in Saudi. ZMOC: zygomatic maxillary orbital complex, NOE: naso othmoid orbital

In Makka, the male to female ratio is comparable to other cities in Saudi such Jeddah and Almadina which might explain a comparable traffic and transportation

theme while it was lower than Riyadh (6:1) and the Southern Aseer region (10:1) [1,2,3].

A significant incidence of injuries was identified among patients' age between 17- 45 years (75%), which coincide to the incidence in other Saudi cities and around the gulf region [1,6,7]. Therefore, a strict message should be delivered to this age group whom mainly are controlling motor vehicles in the community and probably can make a significant change to the injury patterns and bed occupancy.

The presence of a relatively high injury among non-Saudis does raise a concern as well. The ratio of Saudi to non-Saudi is 1.89:1, which indicated the need to direct an attention to the etiology behind having this high incidence rate. Factors such as language barrier, multi cultural background, negligence of industrial safety measures, and possibly not comprehending and following the country's traffic regulation can formulate few reasons that may require further investigation (Figure 1).

In order to overcome the challenges of trauma bed occupancy and creating more time for other maxillofacial cases the following points might need to be considered:

A. Patients' role: It is the citizens' prime responsibility to follow the traffic regulations, speed limits and the general ethics and driving manners. Those include fastening seat belts, strictly following the vehicle-passenger capacity, and traffic regulations. As using motorcycles is increasing in the kingdom, careful helmets and body protection vests are a must for those riders [8,9].

B. Hospitals' role: In order to manage such challenges, regional trauma network and bed occupancy plan might support the trauma service [10]. However, surgical team departmental plan is mandatory to support the regional plan in the first place, thus, the following points might be of benefit to pertinent maxillofacial surgical services:

1. Carefully design the admission criteria vs an outpatient care.
2. Reducing the operating time as possible.
3. Assure properly functioning hard-wears and drilling system with clear maintenance plan.
4. Assure properly trained practitioners and residents with planned supervision and training.
5. Careful planning to teeth at fracture sites, as compromised teeth may be a source of further failure and hence increase the chances of further surgical time consumption
6. Applying same day admission and operating instead of admitting patients few days before the surgical date.
7. Patients' surgical preparation and antibiotics intake can be organized through an out patient clinic coordinator.
8. Assuring faster turnover rate through providing the earliest cutting time, recovery, and case turnover.
9. Careful utilization of perioperative pain medications to assure convenient patient course through the hospitalization period.
10. Utilizing qualified oral maxillofacial surgeons in the region to supervise patient care in variable hospitals.
11. Time and cost efficiency toward paper work and documentation, and hence, quality criteria should be carefully designed not to compromise the patient care.

5. Government Role

Implementation of surveillance cameras, helicopter traffic control, strict enforcement of the regulations, and applying penalties may help the general traffic control in addition to planning motor vehicles rush hour plan [1,10,11]. Not to mention the necessity of assuring the vehicles' safety which sounds to be below the expectations especially with the increase use of cell phones, texting while driving and applying the WiFi system in some new vehicles. Thus, upgraded designs to car safety, seat belts, torso, and head protection might be necessary.

Conflict of Interest

The authors have no conflict of interest to declare.

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