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**THE PATTERN OF ORAL AND MAXILLOFACIAL
INJURIES AMONG PATIENTS ATTENDING
FUJAIRAH HOSPITAL, FUJAIRAH, UAE**

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ABSTRACT

Title: The pattern of oral and maxillofacial injuries among patients attending Fujairah Hospital, Fujairah, UAE.

Principal investigator: ASMAA ALHMOUDI

Supervisor: Professor Mohamed Jaber

Objective: To determine the pattern of oral and maxillofacial injuries among patients attended Fujairah Hospital, Fujairah, UAE.

Study design: Descriptive retrospective hospital based study.

Study population: All patients who attended the Oral and Maxillofacial Surgery Department- Fujairah Hospital for the treatment of oral and maxillofacial injuries during the period of the study.

Methodology: This is a retrospective study of patients who had attended Fujairah Hospital between 2003 till 2015, with oral and maxillofacial injuries using a structured form to obtain the relevant information. Socio-demographic information (age, gender, education level), type of injury, place where the injury took place, and the causes of injury were recorded. Clinical findings were recorded such as: type of injury, site of injury, single or multiple, soft tissue or hard tissue injury. The hard tissue injury was categorized as a fracture of nasal bone, maxilla, mandible, zygoma, frontal, palatal and orbital bones. Radiological investigations, including plain skull radiography, orthopantomograph and where necessary a computed tomography (CT) were reviewed. The treatment offered and treatment outcomes were also recorded. The data were entered

into a computer data base (SPSS) version 20 for statistical analysis. An association of maxillofacial injury parameters and type of injuries was evaluated using Chi –square test. A significant level $p<0.05$ was used to draw out conclusions.

Results

Road traffic accidents (RTA) were the most (34.8%) common causes of oral and maxillofacial injuries. The introduction of the compulsory seatbelt law has dramatically reduced the incidence of the maxillary facial injuries from 62.6% prior to the introduction of the law to 24.0% after the law introduction. Five hundred and forty-eight patients (76.4%) had sustained fractures of either the mandible, mid face or both and 335 (46.8%) patients sustained fracture mandible and 122 (17%) sustained fractured zygomatic complex including zygomatic arch, while 91 patients (12.7%) diagnosed with maxillary fracture.

Surgical wound debridement and wound suturing were the most common method of treatment for soft tissue injuries, while mandibulomaxillary fixation was the most (45.3%) widely used method of treatment of bony injuries prior to 2008. Likewise, open reduction and internal fixation (ORIF) has been widely used method after 2008.

Conclusion

This study showed that maxillofacial injuries in Fujairah are similar to national, regional characteristics. These findings should alert the authorities, particularly the government and the Road Safety Authority on the need for the enforcement of existing traffic laws and to raise the awareness among the public about the magnitude of the problem.

DEDICATION

I would like to dedicate this dissertation to:

My parents, who taught me to trust in ALLAH, believe in hard work and who had consistently ingrained in my subconscious being that so much could be done with less.

My humble dedication also goes to my small family for supporting and encouraging me.

To my sisters and brothers for taking care of my kids during my educational pursuit.

DECLARATION

I, **ASMAA ALHMOUDI**, declare that this dissertation is my own original work and that it has not been presented and will not be presented to any other University for a similar or any other degree award.

Signature..... Date

ACKNOWLEDGEMENT

I wish to thank the Almighty ALLAH for granting me good health during the period of this study. I also wish to express my sincere gratitude and appreciation to Prof Mohamed Jaber for his supervision, constructive criticisms, and encouragement during the preparation of the study proposed and this dissertation.

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I wish to acknowledge the support extended to me by my fellow residents who were a big source of support during the period of this study.

I would like to extend my deepest thanks to my family for their encouragement, understanding, sacrifices, and acceptance of my absence during the period of preparation of this dissertation.

In summing things up, I would like to thank the Ministry of Health and the Fujairah Medical Zone for sponsoring my study and giving me the access to the patient files and records to complete my study.

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LIST OF ABBREVIATIONS

CT	Computed Tomography
ORIF	Open Reduction & Rigid Internal Fixation
IMF	Inter Maxillary Fixation
OM	Occipitomenital
TT	Tetanus Toxoid
RTA	Road Traffic Accident
MV	Motor Vehicle
SPSS	Statistical Package for Social Sciences

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INTRODUCTION

Oral and maxillofacial injuries occur in a significant number of trauma patients. They represent one of the greatest challenges to the public health services worldwide because of their high incidence, health, and financial implications. Often they are associated with varying degrees of physical, functional and aesthetic damage (Perry 2009). These injuries have been reported to be one of the principal causes of mortality especially among young adults (Ardekian et al., 1998). Trauma to the facial area ranges from simple and limited to the soft tissues to complex injuries involving the underlying skeletal structures (Kruger 1984). Soft-tissue injuries have been reported to be the most common presentation following maxillofacial trauma (Hussain et al., 2007). The types of these injuries vary considerably. It may be a clean, sharp laceration, a laceration with a contusion, an abraded wound, a contused wound, an avulsed wound, a puncture wound, or a burn wound (Timothy & Mitchener 2010). Fractures of the facial bones may involve, among other things the mandible, maxilla, zygomatic arch, nasal bones, and the orbit. Prompt attention and care to a victim are, therefore, necessary to prevent serious complications that sometimes may result in death (Mosby et al., 1996). There are several causes of maxillofacial fractures, however, it has been reported that so far road traffic accidents remain the major etiologic factor of maxillofacial injuries (Phullipo et al., 2011).

The epidemiology of facial fractures varies in type, severity, and causes depending on the population studied. The results of epidemiological studies vary depending on the demographics of the particular population under study. Factors such as geographic

region, socioeconomic status and temporal factors, including the period of the year, can influence both the type and the frequency of injuries reported for a given population. The differences in the causes of maxillofacial fractures between populations may be the result of differences in the presence of risk factors and cultural differences between countries (Yoffe et al., 2008; Kun & Sun 2010). Epidemiological assessments are essential to reaffirm patterns, identify new trends and develop clinical and research priorities for effective treatment and prevention of these injuries (Olasoji et al., 2002 ; Popakosta et al., 2008).

1.1 Literature review

Oral and Maxillofacial injuries remain a serious clinical problem because of the sensitivity of this anatomical region. The occurrences of facial injuries tend to be high compared to injuries in the rest of body because the face is not shielded by other structures. Maxillofacial injuries resulting from trauma are usually challenging to the maxillofacial surgeon. Causes of these injuries include automobile accidents, physical altercations, gunshot, home accidents, sports, occupational hazards and other less common causes (Yoffe et al., 2008; Popakosta et al., 2008). In most developing countries road traffic accidents are the leading cause of maxillofacial injuries (Akama et al., 2007). In a recent study from Saudi Arabia reported that RTAs are a major cause of MFI in the southern region (Almasri, 2013). Maxillofacial Injuries occurred more commonly in 20 – 40 age range with road traffic accident being the major etiological factor (Bali et al., 2013). In facial trauma, older persons are prone to bone fractures (an increase of 4.4%/year of age) and soft tissue injuries (an increase of 2%/year of age) while younger

persons are more susceptible to dentoalveolar trauma (decrease of 4.5%/year of age) (Robert et al., 2003).

Studies worldwide show that in recent years there has been a high incidence of oral and maxillofacial injuries (Gassner et al., 1999). A significantly higher prevalence has been found in serious accidents or traumatic events in which most of the injured suffered multiple injuries (Zahoor et al., 2010). The knowledge of the etiologic factors and mechanisms of injuries can be helpful for a satisfactory trauma prevention program (Malara et al., 2006). Maxillofacial terror casualties present a unique epidemiology, with more severe injuries and higher prevalence of both soft and hard tissue injuries (Ringler et al., 2007). Gunshot injuries to the face in civilian life are rarely reported and when occurring they are accompanied by potential complications and can have catastrophic consequences (Glapa et al., 2007). In serious accidents or traumatic events, soft-tissue injuries (cuts, lacerations or bruises) may occur along with other injuries such as fractures (Zahoor et al., 2010).

Other previous studies have indicated that the facial region was the most common site of injury following violent episodes mostly in married couples (Saddki et al., 2010). A study to review the epidemiology of patients aged 1-18 years treated for oral and maxillofacial injuries during a 3-year period at a tertiary care center in Wales UK showed that 65.5% were aged 1-10 years. Seventy-three percent of injuries occurred to the soft tissues and 15% were fractures. Falls were by far, the commonest cause of injury, but with increasing age, assaults became more common (Shaikh, 2002). In the United Arab Emirates (UAE),

road traffic accidents have been found to be the most common causes of maxillofacial trauma (Al-Ahmad et al., 2004).

Nevertheless, the etiology and incidences of maxillofacial injuries vary from one country to another and in different places within the same country depending on the prevailing socio-economic, cultural and environmental factors (Anwar, 1998). In Sub-Saharan Africa, males sustained more facial fractures than females; the ratios were reported to be 5.4:1, 4.5:1 and 5:1 in Nigeria, Senegal and Zimbabwe respectively (Odusanya, 1985; Larroque, 1986; Khan, 1988). The male predominance is not only related to violence and falls but also partly to the traditional role of males in society whereby they are more exposed to occupational and environmental hazards than the women. Literature from the developed countries show that facial bone fractures are caused by accidents from automobiles and motorcycles, sports, occupational and social altercations (Rowe & Kelly, 1962; Van Hoof et al., 1977; Kartz et al., 1979; Fortunato et al., 1982; Ramba, 1985). Periodic verification of the etiology of maxillofacial injuries help to recommend ways in which maxillofacial injuries can be averted (Odusanya, 1985). Even though numerous reports on maxillofacial trauma exist, only a few gave detailed information about work-related maxillofacial injuries (Hachl, et al., 2002).

In victims of domestic violence who sustained maxillofacial injuries, mid face injuries predominated (Leb et al., 2001). Although falls and road traffic accidents are the most frequent causes of orofacial soft tissue injuries, less common causes, like burns are more likely to result in death (Ogonni et al., 2002).

In sport, the most reported injuries were soft tissue and only a few required professional attentions. The reported incidence of orofacial injury related to sport was generally very low, suggesting that at the age and skill levels represented by these soccer appears to be relatively safe to the maxillofacial complex (McFadyen & Shulman 1999; Akama et al., 2007). The presence of injuries in the maxillofacial complex in children and adolescents, victims of physical violence in the school environment has been reported (Rath, 2001). In most of these cases, the perpetrators were friends from school. Injuries around the head and face were all situated in soft tissues, mainly in the lips. (Rahman et al., 2007) have reported that children exhibit a different pattern of clinical features depending on the etiology and stage of their bone maturation.

Management of maxillofacial trauma has developed in an evolutionary manner. Evaluation of injuries of soft tissue and bone must be precise through instrumental diagnostic examinations (Magennis et al., 1998). Careful inspection, palpation, and examination of function assure accurate diagnosis of the injuries (White, 1989). New principles evolved, which are definitive soft and hard tissue management, allowing for better return of patients to their pre-traumatic appearance or at least as close as possible (Baig, 2002). Treatment priorities have been divided into three different stages according to the need: acute urgent, urgent and necessary intervention. It is recommended that urgent therapy should be given within 8 hours after the trauma, and also it has been shown that the most serious immediate life-threatening complication following maxillofacial trauma is airway obstruction. The onset can be sudden, as with foreign body aspiration, or following soft-tissue damage that can lead, at a later stage, to airway-

compromising edema (Ardekian et al., 1998). The management of the paediatric patient with maxillofacial injury should take into consideration the differences in anatomy and physiology between children and adults, the presence of concomitant injury and the particular stage in growth and development (Haug, 2000).

The face and neck take on a particular significance when one considers the complexity of function and significant aesthetic value of the structures of the face and neck (White, 1989). Aggressive surgery for complicated oral and maxillofacial injuries, including reconstruction using fibular flap combined with a lateral coronal flap to achieve good reconstruction results has been documented and could be selected as the first line treatment (Han et al., 2008). The free flaps transfer is reliable and can reconstruct the oral-maxillofacial traumatic soft and hard tissue defects. Fibula and radial forearm free flap are the most commonly used flaps. Early aggressive surgery with free flaps transfer for traumatic defects can prevent scar contracture and tissue displacement, which can shorten the treatment period and improve the final outcome (Peng et al., 2007).

Application of local tissue transfer procedures in a series of facial warfare injuries yielded acceptable tissue form, texture, and colour match, especially when these procedures were used in combination, and tailored to surgically fit the individual case. Moreover, application of these procedures is relatively easy and postoperative morbidity is limited, provided the general condition of the patient is stable, and the surgical techniques used have good indications and flap principles (Motamedi & Behnia, 1998). The nasal skeleton and soft tissues are frequently involved and may require surgical

repair of the injuries. The primary reconstruction often requires the use of autogenous grafts and secondary revision surgery. The treatment may require a multidisciplinary surgical team or a single surgeon who knows how to manage the injury. Optimally, the reconstruction of nasal bone avulsions is performed, primarily using autogenous graft materials (Sambajon et al., 1998). As with any injury, priorities are given to life threatening conditions, according to advanced trauma life support resuscitation (Fleisher, 1999). Initial wound management consisting of irrigation and debridement is at least equally important with antibiotics for prevention of infection. The need for prophylaxis against complicated systemic infections, particularly tetanus, should be provided. Facial burns are frequently associated with other morbidities. An initial evaluation and treatment should follow the same systematic approach as for all trauma patients: a primary survey, a secondary survey, followed by definitive treatment. For head and neck burns, the airway is a major concern because of potential inhalation injuries e.g. laryngeal edema and is much more likely to require intubation. Despite the rather high number of oral and maxillofacial injuries seen in our setting, very few studies have been done to evaluate these injuries and none of them is comprehensive enough.

1.2 Maxillofacial injuries in the UAE

Trauma is a major health problem in the United Arab Emirates (UAE). It is the second cause of death in the UAE, which translates to 18% of mortality. It is the leading cause of death under 45 years of age and accounts for 60% of yearly potential life loss (Hefny et al., 2013). Trauma research has a central role in identifying key local health problems related to trauma and ways to solve them. Nevertheless, a good trauma audit process and

a good injury quality management system are essential and complementary to trauma research. Without proper knowledge on the causes and other associated factors, it becomes difficult to plan evidence-based programs for community education on preventive measures.

Road traffic collision is the most common cause of serious trauma in UAE followed by falls (Hefny et al., 2013). In the recent past, the government of the UAE has introduced seat belt law and other traffic regulation to organize transportation sector. This has resulted in reduction in the severity of injury, hospital stay, and number of operations in injured patients (AbuZidan et al., 2012).

The seriousness of the problem of maxillofacial injuries resulting from MV a motorcycle accident is therefore not clearly known.

An increase in maxillofacial injuries has out weighted available human resource and equipment currently available, resulting in an increase of pressure on the government to increase personnel and provide adequate supplies in hospitals to meet this new demand. This means a demand to deploy manpower in the maxillofacial specialty in referral centres and regional hospitals. This cannot be done appropriately without the availability of adequate data showing the epidemiology, etiology, management and complications of maxillofacial injuries in Al-Fujairah.

To this date, there are limited numbers of studies conducted in the United Arab Emirates to assess the epidemiology of facial injuries (Al-Ahmad et al., 2004; El-Khateeb & Abdullah, 2007), these studies reported that maxillofacial injuries among UAE patients were somewhat similar to those reported in other countries. Differences from other countries are probably related to factors peculiar to the UAE, such as climate, social trends, and the cosmopolitan population.

1.3 Statement of the problem

It has been observed that oral and maxillofacial injuries constitute a significant number of both outpatient and inpatients' attendance. They are often associated with morbidity due to varying degrees of functional and aesthetic disruption. However, only limited information has been documented at our setting on the pattern, treatment modalities, and complications.

Information on the major causes of maxillofacial trauma in Al-Fujairah and in the UAE, in general is limited. Without proper knowledge on the causes and other associated factors, it becomes difficult to plan evidence-based programs for community education on preventive measures.

In the recent past the UAE has gone tremendous economic expansion and improvement in the standard of living, in addition to the modernization of the transportation sector, as a result, many vehicles have been bought and used on the roads in both the urban and rural areas. Like every good thing, which comes with some bitter pill, the rapid expansion of

the transportation sector has brought about passengers being often exposed to unnecessary accidents resulting in injuries to the riders and their passengers. To my knowledge, no in-depth study has so far been carried out after these changes in the UAE society. The seriousness of the problem of maxillofacial injuries resulting from RTA is therefore not clearly known.

1.4 Rationale

Carrying out this study shall provide results with useful information and knowledge regarding etiology, demographic pattern, type of oral and maxillofacial injuries and its associated complications. It will further provide information on the treatment modalities in place and the outcome of such treatment. Knowledge accrued on the oral and maxillofacial injuries, is necessary for early intervention, in the form of proper management and implementation of prevention measures. This will also reduce significantly the morbidity and mortality associated with these injuries through providing a valuable source of information for clinicians and researchers regarding oral and maxillofacial injuries in Fujairah.

The findings will provide the hospital and the authorities with evidence-based information that can form a basis for decision making in planning community-based preventive strategies, equipping the oral and maxillofacial sector with the manpower, equipment and educational programs. Such information shall also form the basis for planning the provision of manpower, materials, and equipment nationwide. Finally, the study is a part of the fulfillment of the requirement of Masters of Science in Oral surgery

degree program.

Therefore, the aim of this study was to determine the pattern of occurrence and management of oral and maxillofacial injuries among patients attending Al-Fujairah Hospital, UAE.

1.5 Objectives

1.5.1 Broad Objective

To determine the pattern of oral and maxillofacial injuries among patients attending Fujairah Hospital, Emirate of Fujairah, UAE.

1.5.2 Specific Objectives

1. To determine the demographic patterns of patients presenting with oral and maxillofacial injuries attending Fujairah Hospital.
2. To determine the etiology of oral and maxillofacial injuries among patients attending Fujairah Hospital. [L]
[SEP]
3. To determine the types of oral and maxillofacial injuries among patients attending Fujairah Hospital [L]
[SEP]
4. To determine the treatment modalities of different types of oral and maxillofacial injuries among patients attending Fujairah Hospital [L]
[SEP]

MATERIAL AND METHODS

2.1 Study Settings

This study was conducted at the Oral and Maxillofacial section of Fujairah Hospital. This is the largest referral hospital in Al-Fujairah. It is also the only referral centre for all complicated cases of oral and maxillofacial injuries. This study was carried out in two departments: The Oral and Maxillofacial Surgery and Emergency Medicine Department.

2.2. Study Design

Descriptive retrospective cross-sectional hospital based study.

2.3 Study Duration

The study was carried out from January 2003 to February 2015.

2.4 Study Population

Participants for this study comprised of all patients who attended the Oral and Maxillofacial Surgery and the Emergency Medicine Department for the treatment of oral and maxillofacial injuries during the period of the study.

2.5 Inclusion and Exclusion Criteria

Inclusion criteria: - All patients presenting to the Oral and Maxillofacial Surgery and Emergency Medicine Department with oral and maxillofacial injuries.

Exclusion criteria: - Exclusion criteria were patients who: (1) refused to be treated (2)

were treated in other hospitals due to polytrauma; and (3) whose records contained incomplete data.

2.6 Sample Size Estimation

The sample size for this study was estimated based on a previous study (Al-Ahmed, 2004) a total of 135 patients were expected to participate.

2.7 Sampling Procedure

All patients presenting at the Oral and Maxillofacial Surgery and Emergency Medicine Department with oral and maxillofacial injuries and who had adequate information in their medical records were enrolled for the study.

2.8 Methods

A structured form was used to obtain relevant information (Appendix I) on the patient's social-demographic information. (Age, sex, address, education level and marital status), patient's main complaint, the place where the injury took place, cause of injury and general condition of the patient immediately after injury and afterward, the time interval from injury to reporting to the hospital. Special forms were prepared for recording clinical findings as follows: type of injury, site of injury, single or multiple, soft tissue or hard tissue injury. Soft tissue injuries were categorized as bruises, abrasions, cut wound, contusion, lacerations, avulsions, and burns. The hard tissue injury was categorized as a fracture of facial bones, such as nasal bone, maxilla, mandible, zygoma, frontal palatal and orbital bones. Radiological investigations included plain radiography (Skull lateral

and posterior-anterior view, occipitontal (OM) or Waters view, sub mental vertex view, Towne view, orthopantomography and computed tomography (CT) where necessary. A maxillofacial surgeon did the interpretation of the radiological investigations.

All patients received basic primary assessment procedures, Securing the airway by whatever means were necessary, including endotracheal intubation or surgical airway, was to be performed immediately whenever there was any doubt about the future stability of the patient. The breathing was also monitored before identifying the injury. Bleeding was controlled and volume expansion accomplished to maintain perfusion of the vital organs by blood transfusion, blood substitutes or I.V. fluids as it was indicated. Medication such as tetanus toxoid (TT), analgesics and antibiotics were also given when necessary. Surgical procedures such as bleeding control, tracheostomy, surgical wound toilet, wound suturing and teeth extraction were also recorded. Orthopedic procedures such as alveolar bone splinting, inter maxillary fixation (IMF), open reduction and internal fixation (ORIF) and open reduction with cranial facial suspension were done where appropriate.

For the admitted patients, the number of days spent in hospital was recorded against the type of injury and treatment done. They were checked for completeness and clarity and then entered into the computer for analysis.

2.8.1 Analysis

The analysis was done using Statistical Package for Social Sciences program (SPSS) Version 20. An association of maxillofacial injury parameters (demographic factors, etiology, treatment, and complications) and type of injuries were evaluated using Chi – square test (X^2). Significant level $p < 0.05$ was used to draw out conclusions. Formula.

2.8.2 Ethical Clearance

This study was channeled through the Research Ethics committees of the ministry of health in UAE for clearance. It was accepted and the study was done.

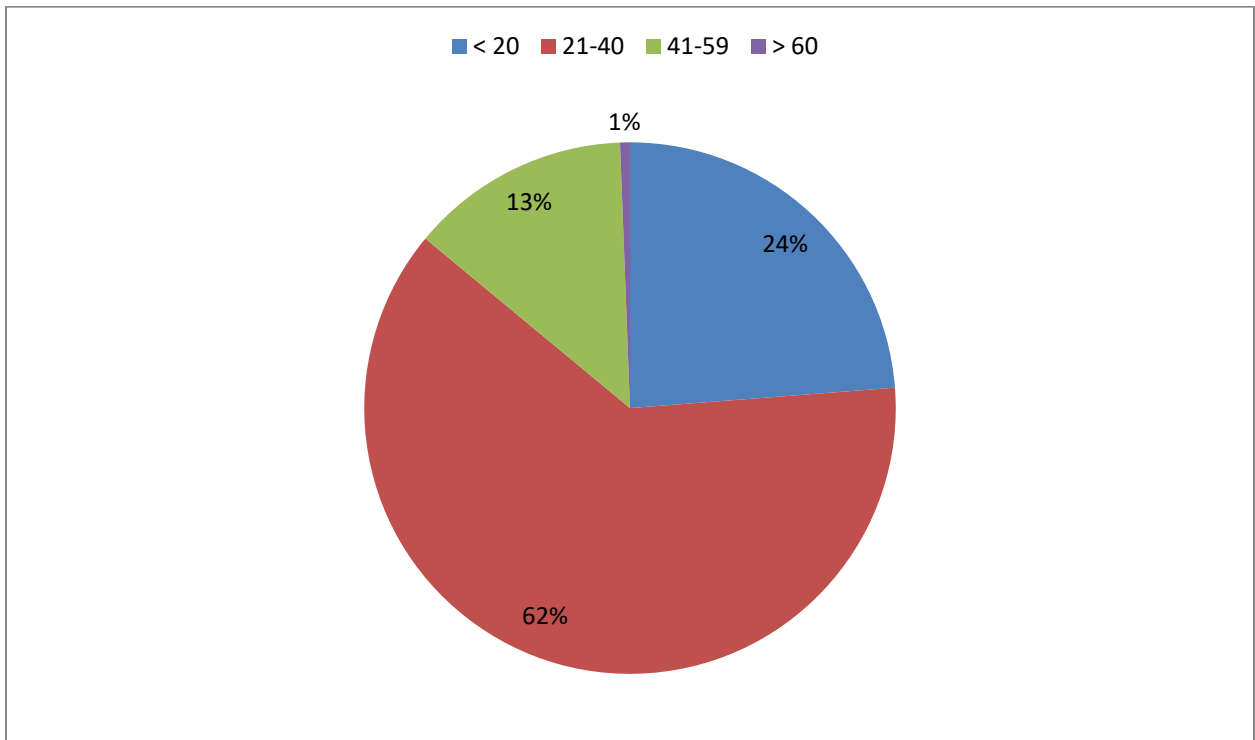
RESULTS

3.1 Distribution of participants per class of age

The study comprised a total of 716 patients with oral and maxillofacial injuries. Five hundred and ninety-seven (83.5%) were males while 118 (16.5%) were females with M:F ratio of 5:1.

The age range was 3 to 64 yrs. with a mean age of 27.0(S.D 13.34) years and the median age was 29 years. The age group 21-40 and >20years were the most affected age groups. The age group >60 were the least affected (Fig.1).

Fig 1. Distribution of participants per class of age

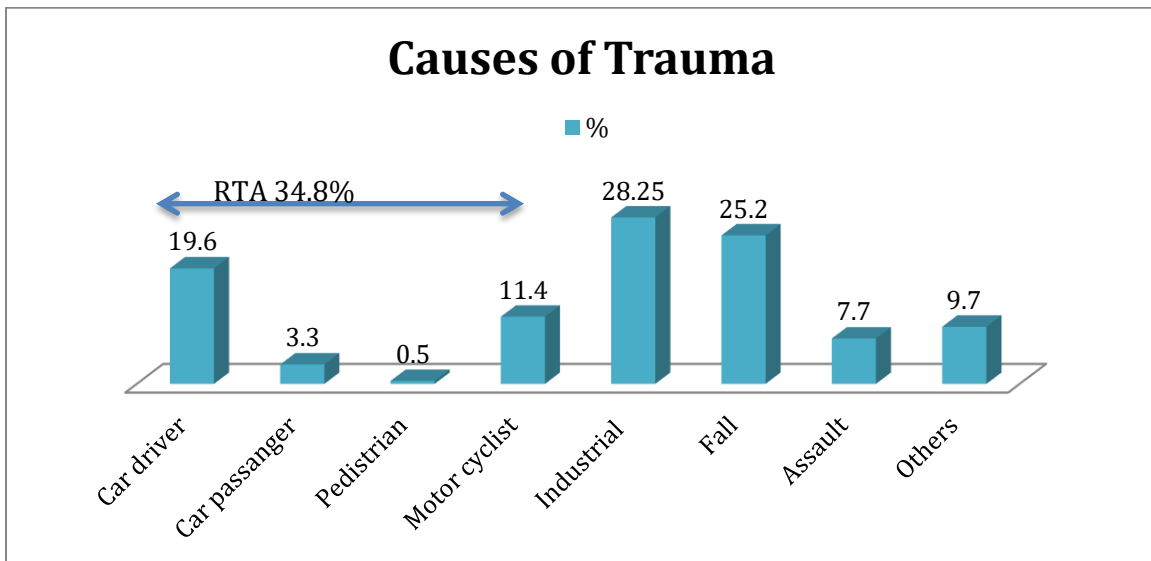


3.2 Causes of maxillofacial injuries:

- **Frequency:**

Road traffic accidents (RTA) were the most common cause of oral and maxillofacial injuries 34.8%. The other significant cause was industrial (work related injuries) (28.3%), and falls (25.2%) while assaults represent only 7.7% (Fig 2).

Fig. 2 Causes of maxillofacial Injuries



- **Relationship between car driver & nationality.**

UAE car driver has a high risk of injuries than expatriate car driver with a significant difference between the two groups p value <0.001(Table 1).

- **Relationship between motor -cyclist & nationality.**

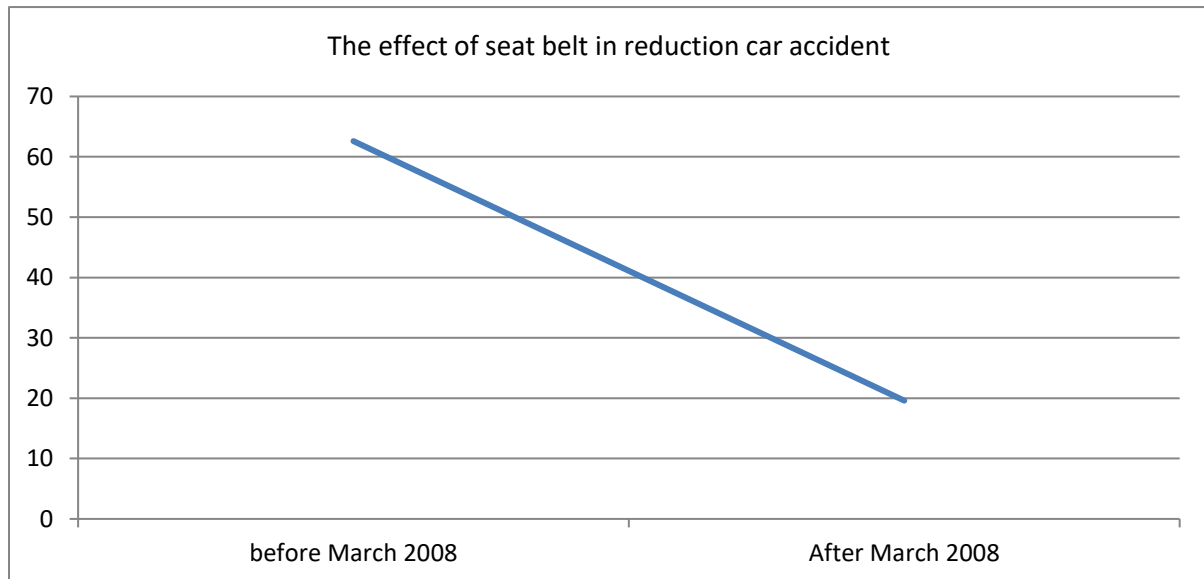
UAE motor- cyclist has a high risk of injuries than expatriate motor- cyclist with a statistically significant difference between the two groups p value = 0.006 (Table 1).

Table 1. Maxillofacial Injuries between UAE and non-UAE Nationals

Cause of Trauma	Origin	No	Yes	P-value
Car driver	UAE	77 (71.3)	31 (28.7)	<0.001
	Expatriate	69 (93.2)	5 (6.8)	
Car passenger	UAE	105 (97.2)	3 (2.8)	0.673
	Expatriate	72 (97.3)	2 (2.7)	
Pedestrian	UAE	108 (59.7)	0	0.407
	Expatriate	73 (98.6)	1 (1.4)	
Motor Cyclist	UAE	89 (82.4)	19 (17.6)	0.006
	Expatriate	72 (97.3)	2 (2.7)	

3.3 Timing of applying seat belt rule in March 2008 & incident of injuries before & after it:

Fig 3. The effect of seat belt in reduction of car accident

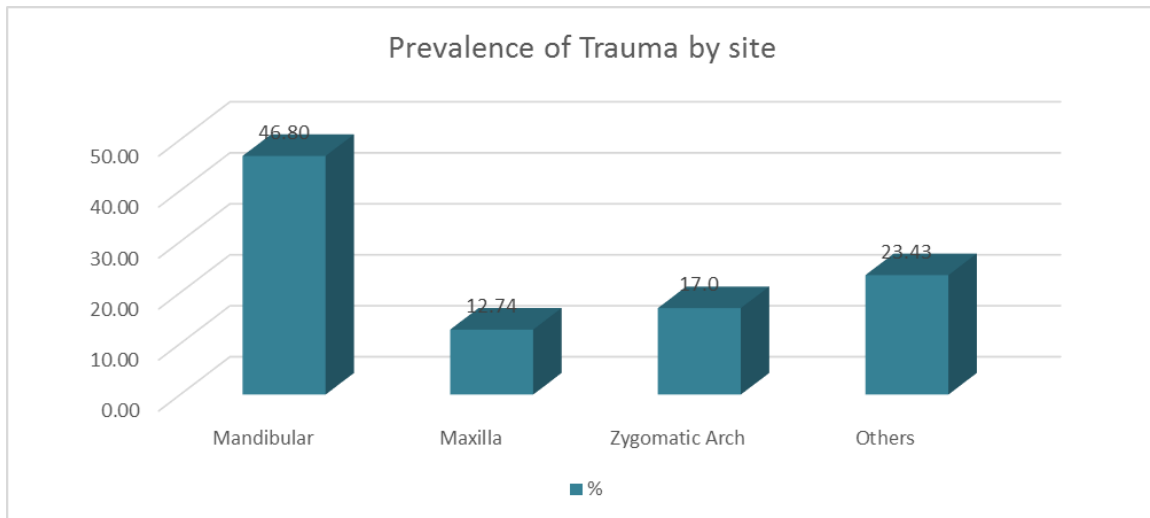


In the comparison of accidents between the two groups before March 2008 and after that date, it is evident that there was a significantly high incidence of injuries before March 2008, 62.6% compared to 24% after that date p-value <0.001.

3.4 Sites of Maxillofacial Injuries

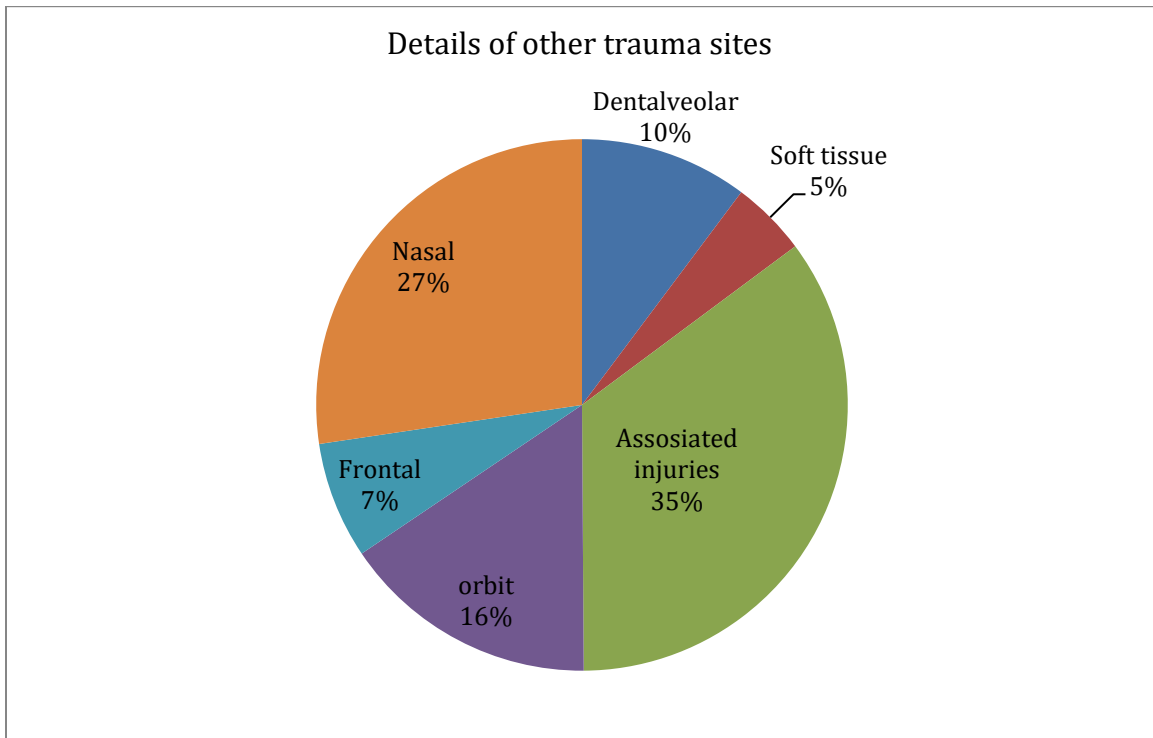
The distribution of trauma per site among 716 patients treated for oral and maxillofacial fractures in Fujairah Hospital 2003-2015 is shown in (Fig.4). Of 715 patients with oral and maxillofacial injuries, 548 (76.4%) patients had sustained a fracture of either the mandible, mid face or both. Of those, most had mandibular fracture 335 (46.8%), followed by zygomatic complex 122(17.0%) and the rest 19 (12.7%) had mid facial fractures (Fig. 4).

Fig. 4: Prevalence of Trauma by Site



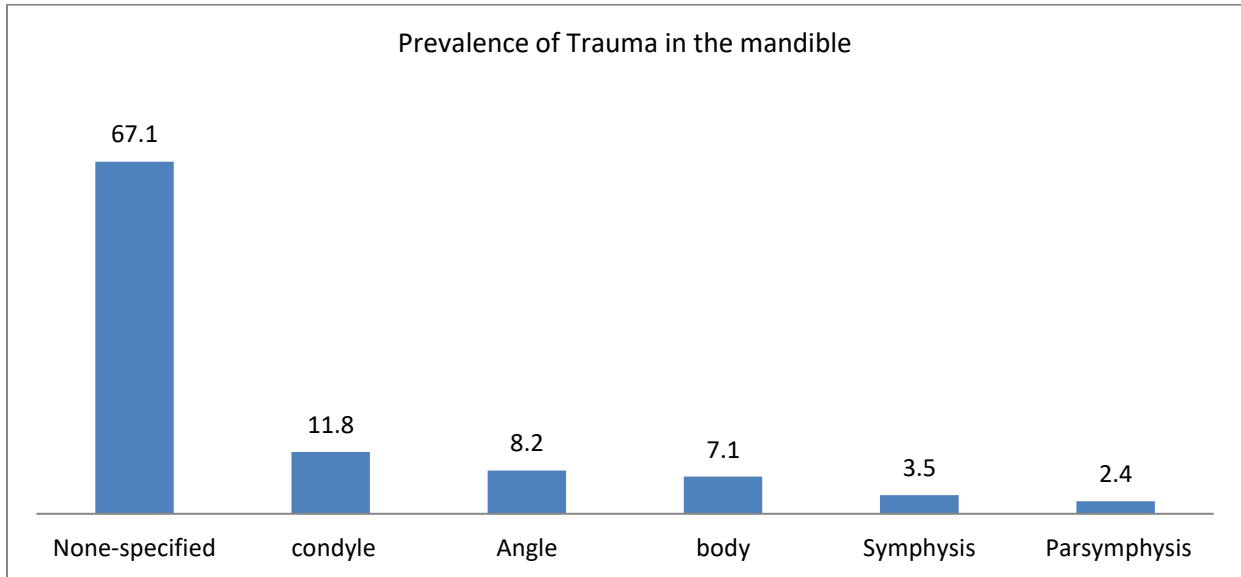
Other fracture sites include: nasal (27%), orbital (16%), dent alveolar (10%), frontal (7%) and soft tissue (5%) (Fig.5).

Fig. 5: Details of other trauma sites



- Figure 6 showed the distribution of trauma in the mandible among 335 patients with mandibular fracture (note: 67% of the patients the site was not specified).
- The condyle fracture had the highest proportion reported by (11.8%) of the patients
- Only (8.2%) of the patients reported angle fracture
- (7.1%) of the patients reported body fracture
- The minority of the patients reported symphysis and parasymphysis (3.5%) and (2.4%) respectively

Figure 6: Distribution of trauma in the mandible



3.5 Investigation of Maxillofacial Injuries

For diagnosis of maxillofacial injuries various x-ray views was used specially to diagnose mandibular fractures while CT Scan most often used to diagnose mid facial injuries with p-value <0.001 (Table 2).

Fig. 7. Diagnostic tools used

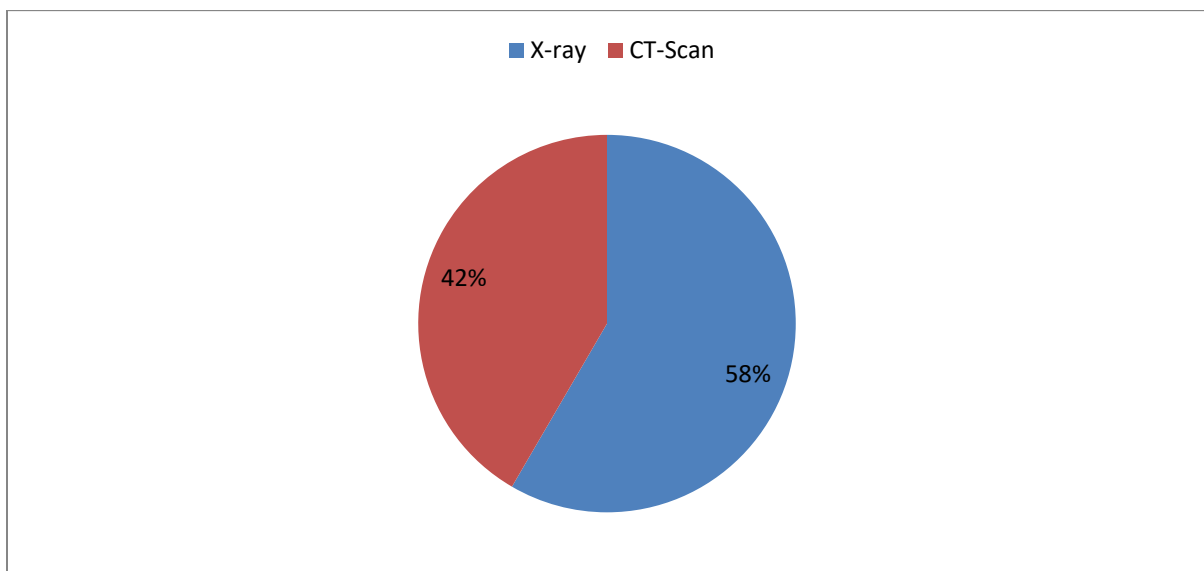


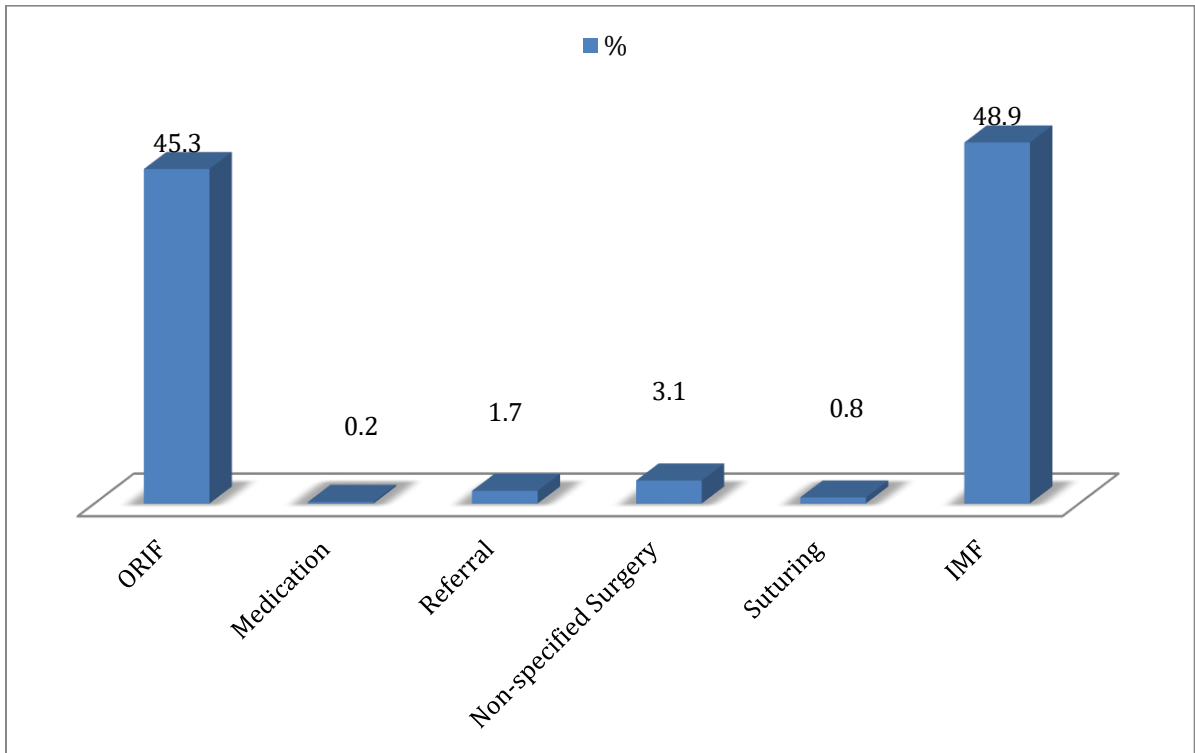
Table 2. Investigation of Maxillofacial Injuries

Investigation	Other sites	Mandible	
X-ray	112 (30.6%)	253 (69.4%)	< 0.001
CT-Scan	235 (88.6%)	30 (11.4%)	
	Other sites	Mid face	
X-ray	358 (98%)	7 (2%)	< 0.001
CT-Scan	189 (71.4%)	76 (28.6%)	

3.6 Treatment Modalities

- Most of the facial fractures (with sufficient details available) were treated by inter maxillary or mandibulomaxillary fixation (48.9%) followed by open reduction and rigid internal fixation (ORIF) (45.3%).
- 1.7% of patients were referred to other centre for management
- Soft tissue suturing only was account for 0.8%.
- The least treatment modalities were medication.

Fig. 8. Treatment modalities



DISCUSSION

4.1 Discussion

Fujairah is one of the seven emirates that make up the United Arab Emirates, it covers approximately 1,166 km², or about 1.5% of the area of the UAE, and is the fifth-largest emirate in the UAE. Its population is around 152,000 inhabitants (National Bureau of Statistics, 2013).

The incidence and epidemiological causes of maxillofacial (MF) trauma and facial fractures vary widely in different regions of the world due to social, economic, cultural consequences, awareness of traffic regulations and alcohol consumption. According to the studies in the developed countries, assault is the leading cause of facial fractures followed mostly by motor vehicle accidents, pedestrian collisions, sports and industrial accidents, but the leading cause shifts to road traffic accidents in underdeveloped or developing areas of the world followed by assaults and other reasons including warfare (Iida et al., 2001; Motamedi, 2003; Gassner et al., 2003; Al-Ahmad et al., 2004; Bakardjiev & Pechalova, 2007; Lee et al., 2010; Ramli. et al., 2011; van den Bergh et al., 2012).

The majority of patients who suffer maxillofacial injuries in the Emirate of Fujairah and surrounding regions report directly or are referred by the primary health facilities to the Fujairah Hospital. This is because, the Fujairah hospital has the only oral and maxillofacial treatment centre in the Emirate, therefore, any of the cases that were

considered complicated in the district and regional hospitals which may need the attention of the maxillofacial surgeon were referred here. Since some soft tissue injuries could be handled at the primary centres, it is expected that a significant number may have been missed in this study. Despite this drawback, this study gives a good picture of the true pattern of occurrence of maxillofacial injuries in Fujairah and its neighbourhood.

In the current study, men had a higher frequency of oral and maxillofacial injuries compared to women with a male to female ratio of 5:1. This is similar to studies done in Sharjah, UAE and in other sub-Saharan African countries like Zimbabwe, Senegal, and Nigeria, which reported ratios of 5:1, 4.5:1 and 5.4:1 respectively (Oduanya 1985; Larroque 1986; Khan 1988; Al-Ahmad et al., 2004), but less than the 7:1 ratio reported by El-Khateeb and coworkers (2007). This high frequency of maxillofacial injuries in men has been attributed to the fact that men are involved in more high-risk activities, e.g. occupation in construction, driving or factory work and sports activities that expose them to a higher risk for injuries (Dongas & Hall 2002). Furthermore, men are involved in physical, social altercations more often than women, hence are more prone to getting injured than women. On the contrary, in the UAE, like in most Arab societies, women spend most of their time carrying out the less risky social chores hence the low incidences of injuries. The most commonly affected age group in this study was 21-30 years, which was similar to the findings of other studies from developing countries (Adekeye 1980; Kwing et al., 1991; el-Sheikh et al., 1992; Al-Ahmad et al., 2004; El-Khateeb and Abdullah 2007) . These findings most possibly reflect the greater physical activity and self-mobility seen in this young section of the population. Another study in the UAE found that the incidence of craniomaxillofacial fractures was highest in the 20-

to 29-year age group; this is in agreement with our findings (Al-Ahmad et al., 2004). However, our findings differ from those of an earlier study in Al-Ain, UAE that found the highest incidence of craniomaxillofacial injuries in 16- to 20-year-olds (Klenk & Kovacs 2003). This difference can be explained by the fact that Al-Ain Oasis is smaller than Fujairah Emirate, with fewer driving restrictions and less police patrol, and many young teenagers drive without actually being licensed to do so.

About 24% of the subjects in this study are children and adolescents, consistent with many previous series (Motamedi, 2003; Al-Ahmad et al., 2004; Ansari, 2004). But compared with other UAE studies, the present study has a higher number of children and adolescents with craniomaxillofacial fractures (Klenk & Kovacs, 2003; Al-Ahmad et al., 2004). This discrepancy may be explained by differences in sample collection that was adopted in the present study.

The present study showed that RTA constituted the most (34.4%) common cause of injury. These results are similar to the findings of other studies done in most developing countries (Olasoji et al., 2002; Al-Ahmad et al., 2004; El-Khateeb et al., 2007). It was reported that RTA was responsible for 34.42% to 90.15% of all the skeletal and soft tissue injuries of the face (Haug & Fossa, 2000; Klotch, 2000 Aksoy et al., 2002). The other significant etiologic factors of injuries in the maxillofacial region are assaults (Aksoy et al., 2002) and sports injuries (Zahoor et al., 2010), which were also noted in the current study.

In the UAE, RTA is on the rise because of a gradual increase in the number of motor vehicles and motorcycles. Improvements in infrastructure have not kept abreast with the surge in motor vehicles and motorcycles on the roads. Frequent traffic jams have made the use of motorcycles a quick, attractive and prominent mode of transportation in both urban and suburban areas because they can pass through narrow pathways. This, coupled with the fact that it is a much cheaper means of transport compared to commercial taxis has attracted many people to use them. However, a sizable portion of the motorcycles is owned by the youth who in most cases easily take avoidable risks that result in accidents. Furthermore, some of the motorcyclists often either because of ignorance or negligence does not abide by traffic rules and regulations. It has also been mentioned that poor vehicle maintenance and the poor educational background of the drivers compound the problems.

In contrast to these findings, a study conducted in Glasgow (Ellis et al., 1985) reported assaults and falls respectively, to be the most common causes of oral and maxillofacial injuries. Reasons for the differences in the etiological pattern could be due to socioeconomic differences, which exist between the developed, and developing countries. Such a change in etiological factors, where previously RTA was the most common causes of the current situation is in agreement with data from other developed countries (King et al., 2004; Laski et al., 2004).

Skeletal and soft tissue injuries of the face constitute quite a significant portion of the workload of the oral and maxillofacial surgeons (Ugboko et al., 1998). Being the most

exposed part of the body, the face is particularly vulnerable to such injuries. Between twenty and sixty percent of all those involved in automobile accidents usually suffered some levels of facial fractures (Kihlbert, 1965; Nahum et al., 1970). Soft tissue injuries have been reported to be the commonest injuries in oral and maxillofacial trauma. (Timothy & Mitchener, 2010).

The results of this study indicate that mandibular fractures were common in patients who sustained facial trauma and this was comparable to other reports from other regions. (Brown & Cowpe, 1985; Ansari, 2004; Erol et al., 2004). The position and anatomy of the mandible is such that it is the most prominent and therefore often the most likely fractured bone of the facial region. The mandible is a strong bone but has certain areas of weakness. It is thin at the angles where the body joins with the ramus and the neck of condyle. The mental foramen through which mental nerve and vessels extend to the tissues of lateral aspect of the face and lower lip is large in some individuals and is an area of weakness through which fractures frequently occur. These factors contribute to the occurrence of high numbers of fractures of the mandibular symphysis, angle, and body as shown by this study.

In other studies midfacial bone fractures especially Le Fort types and orbital floor fractures were reported to be commoner than mandibular fractures (Gassner et al., 2003; Gassner et al., 2004). Motor vehicle accidents tend to be the primary cause of most mid-face fractures and lacerations due to the face hitting the dashboard, windshield and steering wheel or the back of the front seat for passengers in the rear. Fractures of the

maxilla are usually caused by a direct impact to the bone and vary from simple alveolar fracture and fracture involving only the maxillary bone to extensive fracture of the entire mid-facial skeleton. The mechanism involved in fracture of the maxilla is the force sustained from the so-called "quest passenger" type of injury. This occurs in automobile, airplane, and other high-speed accidents when the patient is thrown forward and strikes the middle third of his face against the instrument panel, the back of a seat or the head of another individual (Adekeye 1980). In the current study, motor vehicle accident was the leading cause of oral and maxillofacial injuries. Of the mid-facial skeleton fractures, the zygomatic complex fracture was the predominant type. These fractures resulted from direct trauma. The zygoma is a buttress of the facial skeleton and the bone of the face that gives the cheek area prominence. This bone has its broadest and strongest attachment with the maxilla, a thin, weak attachment to the sphenoid bone, and a moderately strong attachment with the frontal bone. It forms the lateral superior wall of the maxillary sinus and may be pneumatized with air cells connecting with the maxillary sinus. Therefore, because of these aforementioned factors, zygoma is easily fractured by direct impact.

It has been shown that the most serious immediate life-threatening complication following maxillofacial trauma is airway obstruction. So securing the airway by the most immediately available means, including endotracheal intubation or surgical airway where necessary to be performed immediately if there is any doubt about the future stability of the patient. Treatment priorities in patient presenting with oral and maxillofacial injuries have been divided into three different stages according to the need for acute urgent, urgent and necessary intervention (Ardekian et al., 1998). It is recommended that urgent

therapy should be given within 8 hours after the trauma and this was done to most of our patients.

In the present study, almost all the patients with oral and maxillofacial injuries were given analgesic for pain control and prophylactic antibiotics. Surgical wound debridement and wound suturing were the most common treatment for soft tissue injuries. This was done immediately after complete assessment and stabilization of the patient according to the usual protocol of this institution. Most of the facial fractures were treated by open reduction and rigid internal fixation (ORIF) (45.3%) and (48.9%) were treated using inter maxillary or mandibulomaxillary fixation. For patients who presented with serious conditions, these procedures were delayed until adequate stabilization of the patient. Nevertheless, during the interim the patients were put on strong broad-spectrum antibiotics.

4.2 Study Limitations

1. This is a retrospective study, thus all the limitations related to retrospective study design were observed, namely incomplete records and lack of detail information about the injuries and the long-term outcomes.
2. This was a hospital based study, therefore some patients with oral and maxillofacial injuries may not report to Fujairah Hospital due to socio- economic or other reasons such as distance. [1]
[SEP]
3. It was necessary for some patients to have advanced radiographic investigations in order to reach a definitive diagnosis, but due to its unavailability, only conventional

radiographs were used therefore in such patients some of the fractures might have been missed. [17]
[SEP]

4.3 Conclusion:

This study shows that maxillofacial injuries in Fujairah are similar to national, regional characteristics, and road traffic accidents were the most common cause of maxillofacial injuries. Industrial causes were the second most common cause of maxillofacial trauma. These findings should alert the authorities, particularly the government and the Road Traffic Authorities on the need for the enforcement of existing traffic laws, and general improvement of the socio-economic condition of the population.

4.4 Recommendations

- The laws regarding seat belts tightening, speed limits and traffic rules must be observed strictly
- An awareness campaign to educate the public, especially the drivers about the importance of restraints and protective measures in motor vehicles should be introduced.
- To get a good pattern of oral and maxillofacial injuries in the emirate of Al-Fujairah a prospective study with a large sample representing the whole emirate is recommended.

REFERENCES

- Abu-Zidan F, Abbas A, Hefny A. Effects of Seat Belt Usage on Injury Pattern and Outcome of Vehicle Occupants After Road Traffic Collisions: Prospective Study. *World J Surg.*2012;36:255.
- Adekeye E. Fractures of the zygomatic complex in Nigerian patients. *J Oral Surg.* 1980;38:596-9.
- Adekeye E. The pattern of fractures of the facial skeleton in Kaduna, Nigeria: A survey of 1,447 cases. *J Oral Surg.*1980;49 491-5.
- Adeyemo W, Ladeinde A, Ogunlewo M, James O. Trends and characteristics of oral and maxillofacial injuries in Nigeria: A review of Literature. *Head Face Med.*2005;1:7.
- Agrawal K, Mishra S, Panda K. Primary reconstruction of major human bites wounds of the face. *Plastic Reconstr Surg.*1992; 90:394-8.
- Akama M, Chindia M, Masigo F, Guthua S. Pattern of maxillofacial and associated injuries in road traffic accidents. *East Afr Med J.*2007;84:287-95.
- Aksoy E, Unlu E, Sensoz O. A retrospective study on epidemiology and treatment of maxillofacial fractures. *J Craniofac Surg.*2002;13:772-5.
- Al-Ahmad H, Jaber M, Abu Fanas S. Epidemiology of facial injuries in Sharjah United Arab Emirates: Review of 230 cases. *Oral Surg Oral Med Oral Pathol.* 2004;98:166-70.
- Al-Khateeb T, Abdullah F. Craniomaxillofacial injuries in the United Arab Emirates: a retrospective study. *J Oral Maxillofac Surg.*2007; 65: 1094-101.
- Almasri M. Severity and causality of maxillofacial trauma in the Southern region of Saudi Arabia. *Saudi Dent J.*2013;25:107–10.
- Ansari M. Maxillofacial fractures in Hamedan Province, Iran: a retrospective study (1987-2001). *J Cranio Maxillofac Surg.*2004;32:28-33.
- Anwar B. Aetiology and incidence of maxillofacial fractures in the north of [L]Jordan. *J Oral surg.*1998;86:31-5. [L] [SEP]
- Ardekian L, Rosen D, Klein Y, Peled M, Michaelson M, Laufer D. Life threatening complications and irreversible damage following maxillofacial trauma. *J Oral*

- Surg.1998; 29:253-6. ^[L]_[SEP]
- Armstrong B. Lacerations of the mouth. Emerg Med Clin North Am.2000; 18:471-80.
 - Avner J, Baker M. Dog bites in urban children. Paediatrics.1991; 88:55-7. ^[L]_[SEP]
 - Baig M. Current trends in the management of maxillofacial trauma. Ann R ^[L]_[SEP]Aust Coll Dent Surg. 2002; 16:123-7. ^[L]_[SEP]
 - Bakardjiev A, Pechalova P. Maxillofacial fractures in Southern Bulgaria - a retrospective study of 1706 cases. J Craniomaxillofac Surg.2007; 35:147–50.
 - Bali R, Sharma P, Garg A, Dhillon G. A comprehensive study on maxillofacial trauma conducted in Yamunanagar, India^[L]_[SEP]. J Inj Violence Res.2013;5:108-16.
 - Bener A, Absood G, Achan N, Sankaran-Kutty M. Road traffic injuries in Al-Ain City, United Arab Emirates. J R Soc Health.1992;112:273-6. ^[L]_[SEP]
 - Brasileiro B, Passeri L. Epidemiological analysis of maxillofacial fractures in Brazil: A 5-year prospective study. Oral Surg Oral Med Oral Pathol Oral Radiol Endod.2006;102:28-34.
 - Brown R, Cowpe J. Patterns of maxillofacial trauma in two different cultures. JR Coll Surg Edin.1985;30:299-302.
 - Dongas P, Hall G. Mandibular fracture patterns in Tasmania, Ten Years Of Mandibular Fractures: An analysis Of 2137 Cases. Aust Dent J.2002;47:131-137. ^[L]_[SEP]
 - El-Sheikh M, Bhojar S, Emsalam R. Mandibular Fractures in Benghazi- Libya: A retrospective Analysis. JIDA.1992; 63:367-70.
 - Ellis E,Moos K,El-Attar A. Ten years of mandibular fractures: An Analysis of 2137 patients. J Oral Surg.1985;59:120-9.
 - Erol B, Tanrikulu R, Gorgun B. Maxillofacial fractures: Analysis of demographic distribution and treatment in 2901 patients (25-years' experience). Cranio Maxillofac Surg.2004; 32:308-12.
 - Fasola A, Obiachima A, Arotiba J. Soft tissue injuries of the face. A 10 years review.Afr J Med Sci.2000;29:59-62.
 - Fleisher G. The management of bite wounds. N Engl J Med.1999;340:138-40. ^[L]_[SEP]
 - Fortunato M, Fielding A, Guernsey L. Facial bone fractures in children. J Oral

- Surg.1982;53:22.
- Gassner R, Tuli T, Hachl O, Moreira R, Ulmer H. Cranio. Maxillofacial trauma in children: a review of 3,385 Cases with 6,060 injuries in 10 years. J Oral Maxillofac Surg.2004;62:399- 407.
 - Gassner R, Tuli T, Hachl O, Radisch A, Ulme H. Cranio Maxillofacial trauma: a 10 year review of 9,543 cases with 21, 067 injuries. J Craniomaxillofac Surg.2003; 31:51-61^[SEP]
 - Gassner R, Ulmer H, Tuli T, Emshoff R. Incidence of Oral and Maxillofacial skiing injuries due to different injury mechanisms. J Oral Maxillofac Surg.1999; 57:1068-73. ^[SEP]
 - Glapa M, Kaurie J, Doll D, Degiannis E. Early Management of gunshot injuries to the face in civilian practice. World J. Surg.2007;31:2104-10. ^[SEP]
 - Greenbarg A. Management of Facial fractures. N.Y. State Dental J.1998;68:42-47.
 - Gustav O. Kruger. Text book of Oral and Maxillofacial Surgery 6th Ed Mosby Company, St.Louis Missouri, U.S.A., 1984; 333-427. ^[SEP]
 - Hachl O, Tuli T, Schwabegger A, Gassner R. Maxillofacial trauma due to work-related accidents. Int. J Oral Maxillofac Surg.2002;31:90-3. ^[SEP]
 - Han Z, Li H, Li J, Xing R. Fibular flap combined with lateral crural flap for reconstruction of oral and maxillofacial defect. J Zhonghua Zheng Xing Wai Ke Za Zhi. 2008; 24:430-433.
 - Hasnah H, Syed I. Motorcycle accident is the main cause of maxillofacial injuries in the Penang Mainland, Malaysia. Dent Traumatol. 2011; 1: 19–22.
 - Haug R, Fossa J. Maxillofacial injuries in the pediatric patient. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2000; 90:126-134.
 - Haug R. Management of the trochlea of superior oblique muscle in the ^[SEP]repair of orbital roof trauma. J Maxillofac Surg. 2000; 58:602-606.
 - Hefny A, Idris K, Eid HO, Abu-Zidan F. Factors affecting mortality of critical care trauma patients. Afr Health Sci. 2013 Sep; 13(3): 731–735.
 - Henderso M, Wood R. Compulsory wearing of seatbelts in NSW, Australia- and

- evaluation of its effects on vehicle occupant deaths in the first year. *Med J Aust.* 1973; 2:797-801.
- Hull A, Lowe T, Finlay P. The psychological impact of maxillofacial trauma: an overview of reactions to trauma. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2003; 95: 515-520.
 - Hussain H, Rahman N, Rahman R, Nor G, Ai Idrus S, Ramli R. Maxillofacial trauma with emphasis on soft tissue injuries in Malaysia. *Int J Oral Maxillofac Surg.* 2007; 36:797-801. [L] [SEP]
 - Iida S, Kogo M, Sugiura T, Mima T, Matsuya T. Retrospective analysis of 1502 patients with facial fractures. *Int J Oral Maxillofac Surg.* 2001; 30: 286–290.
 - Kartz R, Barnes G, Larson H, Lyon T, Brunner D. Epidemiologic survey of accidental dental-facial injuries among US Army personnel. *Community Dent. Oral Epidemiol.* 1979; 7:30. [L] [SEP]
 - Kassan A, Lalloo R, Karien G. Retrospective analysis of gunshot injuries [L] [SEP] to the maxillofacial region. *Sad J.* 2000; 55:359-363. [L] [SEP] [L] [SEP]
 - Kerim O, Yilmaz G, Sinan A, Bayar. An analysis of maxillofacial fractures: A 5 yr survey of 157 patients. *Military Med.* 2004; 169(9): 723-7. [L] [SEP]
 - Khan A. A retrospective study of injuries to the maxillofacial skeleton in Harare, Zimbabwe. *Br J Oral Maxillofac Surg.* 1988;26:435-439.
 - Kihlbert J. Head injury in automobile accidents. *Automobile Injury Research Report*, 1965 No VJ- 1823-R 17.
 - Kilasara D, Mecky I, Shubi F. Epidemiology and management of maxillofacial fractures treated at Muhimbili National Hospital in Dar es Salaam, Tanzania 1998-2003. *Int Dent J.* 2006;56:131-134.
 - King R, Sciana J. Mandible fracture patterns: suburban trauma center experience. *Am J Otolaryngol.* 2004;25:301-307.
 - Klenk G, Kovacs A. Etiology and pattern of facial fractures in the United Arab Emirates. *J Craniofac Surg.* 2003;14:78-9. [L] [SEP]
 - Klotch D. Frontal sinus fractures: anterior skull base. *Facial Plast Surg.* 2000;16: 127-134. [L] [SEP]

- Kun H, Sun H. Analysis of facial bone fractures: An 11-year study of 2094 patients. *Indian J of Plastic Surg.* 2010;43:42-8. [L][SEP]
- Kwing C, Wing Y, Alfred T. Incidence of maxillofacial trauma in the Hong Kong region Members contributions 1991;93:51-9.
- Larroque E. Epidemiologic des traumaties maxillo-faciux au senegar. *Odontostomatol Trop* 1987; 3:195.
- Laski R, Ziccardi V, Broder H, Janal M. Facial trauma: a recurrent disease? The potential role of disease prevention. *J Oral Maxillofac Surg.* 2004;62:685-688. [L][SEP]
- Le B, Dierks E, Ueeck B, Homer L, Potter B. Maxillofacial injuries associated with domestic violence. *J Oral Maxillofac Surg.* 2001;59:1277- 83.
- Lee J, Cho B, Park W. A 4-year retrospective study of facial fractures on Jeju, Korea. *J Craniomaxillofac Surg.* 2010;38:192–6.
- Lee K. Epidermiology of facial fractures secondary to accidental falls. *Asian J Oral Surg.* 2009;21:33-7. [L][SEP]
- Magennis P, Shepherd J, Hutchison I, Brown A. Trends in facial injuries: [L][SEP]increasing violence more than compensate for decreasing road trauma. *BMJ.* [L][SEP]1998;316:325-32. [L][SEP]
- Malara P, Malara B, Drugacz J. Characteristics of maxillofacial injuries resulting from traffic accidents a 5 year review of the case records from Department of Maxillofacial Surgery in Katowice, Poland. *J Head Face Med.* 2006; 2:27.
- McFadyen J, Shulman J. Orofacial injuries in youth soccer. *J Paeditr [L][SEP]Dent.* 1999;21:192-196. [L][SEP]
- Ministry of Interior, Federal Law to Walk & Password. Rule number 721; years 2008.
- Moshy J, Mosha H, Lema P. Prevalence of maxillo-mandibular fractures in Mainland Tanzania. *East Africa Med. J.* 1996;73:37. [L][SEP]
- Motamedi M. Primary management of maxillofacial hard and soft tissue gunshot and shrapnel injuries. *J Oral Maxillofac Surg.* 2003;61:1390-1398. 63.
- Motamedi M, Behnia H. Experience with regional flaps in the comprehensive treatment of maxillofac soft tissue injuries in war victims. *J Craniomaxillofac Surg.* 1998;27:256-265.

- Motamedi M. An assessment of maxillofacial fractures: a 5-year study of 237 patients. *J Oral Maxillofac Surg.* 2003;61(1): 61–64.
- Mwaniki D, Guthua S. Occurrence and Characteristics of Mandibular Fractures in Nairobi, Kenya. *Br J Oral Maxillofac Surg.* 1990;28:200-202.
- Nahum A, Siegel A, Brooks S, Proc 14th STAPP Car conference. New York: Society of Auto mobile Engineers; 1970 The reduction of collision injuries. Past, Present & future I – 43.
- National Bureau of Statistics.2013; UAE in figure 2012.
- Odhiambo W, Guthua S, Macigo F, Akama M. Maxillofacial injuries caused by terrorist bomb attack in Nairobi, Kenya. *Int J Oral Maxillofac Surg.* 2002;31:374-377.
- Odusanya S. Maxillo-facial fractures in Southern Nigeria (1976-1981). *Odontostomatol Trop.*1985; 3:153.
- Ogonni F, Akinwande J, Fagade O, Arole G, Odusanya S. Facial dog bites in Southern Nigerian children, an analysis of eighty cases. *Trop Doc.* 2002;32:239-240.
- Ogonni F, Akinwande J, Fagade O, Arole G, Odusanya S. Pattern of soft tissue injuries to the oral–facial region in Nigerian children attended at teaching Hosp. *Int. J Paed Dent.* 2002;12:202-206.
- Olasoji H, Tahir A, Arotiba G. Changing picture of facial fractures in northern Nigeria. *Br J Oral Maxillofac Surg.* 2002;40:140-143.
- Peng X, Mao C, Zhang Y, Zhang L, An J, Yu G. Oral maxillofacial traumatic defects reconstruction with free flaps. *Zhonghua Kou Oiang Yi Xue Za Zhi.* 2007;43:650-652.
- Perry M. Maxillofacial trauma –developments, innovation and controversies. *J Injury.* 2009;40:1252-1259.
- Peter R, Mary K, Demetrios D, George V, Jay J. Tetanus and Trauma: A review and recommendations. *J of Trauma Infec Critical Care.* 2005;58:1082-1088.
- Phullipo L, Mchembe M, Mabula B, Kanumba S, Gilyoma J. Etiology spectrum, injury characteristics and treatment outcome of maxillofacial injuries in Tanzania

- teaching hospital. *J Trauma Manag Outcomes*. 2011;5:7.
- Popakosta V, Koumoura F, Mourouzis C. Maxillofacial injuries sustained during soccer: Severity and risk factors. *J Dent Traumatol*. 2008;24:193-196.
 - Rahman R, Ramli R, Rahman N, Hussain H, Idrus S, Hamid A. Maxillofacial trauma of paediatric patients in Malaysia: a retrospective study from 1999-2001 in three hospitals. *Int. J Paeditric Otolaryngol*. 2007;71:929-936.
 - Ramba J. Fractures of facial bones in children. *Int. J of Oral Surg*. 1985; 14:472.
 - Ramirez G, Arenas O, Vivanco-Cendano B, Saurez-Moreno M, Puerto-Alvarez F, Quironga-Via H. Profile of maxillofacial trauma in bicycle accident. *Cir Cir*. 2004; 73: 167-174.
 - Ramli R, Rahman N, Rahman R, Hussaini H, Hamid, A. A retrospective study of oral and maxillofacial injuries in Seremban Hospital, Malaysia. *Dent Traumatol*. 2011;27(2):122–126.
 - Rath E. Surgical treatment of maxillary nerve injuries. The infraorbital nerve. *Atlas Oral Maxillofacial Surg Clin North Am*. 2001;19:31-41.
 - Ringler D, Einy S, Giveon A, Goldstein L, Peleg K. Maxillofacial trauma resulting from terror in Israel. *J Craniofacial Surg*. 2007;18:62-66.
 - Rowe N, Kelly H. Fractures of facial skeleton. Churchill and Livingstone, second Ed 1962 . 24.
 - Saddki N, Schaimin A, Daud R. Maxillofacial injuries associated with intimate partner violence in women. *BMC Public Health*. 2010;10:268.
 - Sambajon V, Johns F, Ochs M. Management of avulsive injuries of the nasal bones: review of the literature and three case reports. *J Craniomaxillofac Trauma*. 1998;4:24-31.
 - Shaikh S. Epidemiology of facial trauma in a sample of patient aged 1-18 yrs. *Injury*. 2002; 339:669-671.
 - Stefanopoulos P, Tarantzopoulos A. Facial bite wounds: management update. *Int J Oral Maxillofac Surg*. 2005;34:464-472.
 - Subhashraj K, Nandakumar N, Ravindran C. Review of maxillofacial injuries in Chennai, India of 2748 cases. *Br J Oral Maxillofac Surg*. 2007; 47:637-639.

- Timothy A. Oral–maxillofacial injury surveillance in the department of defense 1996-2005. *Am J Pev Med.* 2010;38:886-893. [L] [SEP]
- Ugboko V, Odusanya S, Fagade O. Maxillofacial fracture in a semi – urban teaching hospital. A review of 442 cases. *Int J Oral Maxillofac Surg.* 1998;27:286-289.
- Van den Bergh B, Karagozoglu K, Heymans M, Forouzanfar T. Aetiology and incidence of maxillofacial trauma in Amsterdam: a retrospective analysis of 579 patients. *J Craniomaxillofac Surg.* 2012;40(6):e165–e169.
- Van Hoof P, Markx C, Stekelenburg E. The different patterns of fractures of facial skeleton in four European countries. *Int J Oral Surg.* 1977;6:11. [L] [SEP]
- Vetter J, Topazian R, Goldberg M, Smith D. Facial fractures Occurring in a Medium Sized Metropolitan Area: Recent Trends. *Int J Oral Maxillofac Surg.* 1991;20:214-216.
- White M, Johnson P. Heckler F. Management of maxillofacial and [L] [SEP] neck soft tissue injuries. *Clin Sport Med.* 1989;8:11-23. [L] [SEP]
- Wolff K. Management of animal bite Injuries of the face, experience with 94 patients. *J Oral maxillofac Surg.* 1998;56:838-843. [L] [SEP]
- Wood E, Freer T. Incidence and aetiology of facial injuries resulting from motor vehicle accidents in Queensland three-year period. *Aust Dent J.* 2001;46:284-288. [L] [SEP]
- Yoffe T, Shohat I, Shoshan Y, Taicher S. Aetiology of maxillofacial trauma a 10-year survey at the Chaim Sheba Medical center, Tel Hoshomer. *J Harefuah.* 2008;147:192- 196. [L] [SEP]
- Zahoor A, Noor A, Omary A, Khalid M. Assesment of Maxillofacial injuries: A 5 – year study of 2112 patients. *Ann Pak Inst Med Sci.* 2010; 6:113- 115. [L] [SEP]

APPENDICES

Appendix I

Data Collection Form

Epidemiology of Maxillofacial Injuries

A. Demographic details:

- i. **Age: (yrs.)**-----
- ii. **Gender** M F
- iii. **Marital status:** single married Divorce widowed
- iv. **Race:** Arab Asian European others.....
- v. **Nationality:** UAE Arab Indian/Pakistani others
- vi. **Address (Emirate):** Dubai Sharjah Abu Dhabi RAK
Ajman OAQ
- vii. **Area of residence:** Rural City
- viii. **Education level:** please select one
 - a. Illiterate
 - b. Primary
 - c. Intermediate
 - d. Secondary
 - e. University
 - f. High grade
 - g. Other.....
- ix. **Occupation:** please select one
 - a. Trade or manual work
 - b. Office/clerical
 - c. Businessman
 - d. Semiprofessional
 - e. Home duties
 - f. Army
 - g. Retired
 - h. Student
 - i. Unemployed
 - j. Prisoner
- x. **Living arrangement:**
 - a. With parents
 - b. With husband/wife

- c. With family
- d. Institution
- e. Camp or hostel
- f. Others
- g. Unknown

B. Injury information:

- I. Date of injury
- II. Admission date
- III. Discharge date
- IV. Investigation taken none x ray CT scan other
- V. Glasgow coma scale (GCS) on admission
 - i. Mild 13-15, ii. Moderate 9-12 iii. sever <8
- VI. Glasgow coma scale (GCS) on discharge
 - i. Mild 13-15, ii. Moderate 9-12 iii. Sever <8
- VII. Length of coma -----minutes or hours
- VIII. Length of post traumatic amnesia-----minutes or hours
- IX. Associated injuries:
 - i. Head and neck
 - ii. Spinal injury
 - iii. Abdominal
 - iv. Chest injury
 - v. Pelvic
 - vi. Upper extremity
 - vii. Lower extremity
 - viii. Other injuries
- X. Diagnoses (please select one)
 - i. Mandible (condyle, angle, body, symphysis, parasymphysis)
 - ii. Zygomatic arch
 - iii. LeFort I LeFort II LeFort III
 - iv. Combination lease specify-----
 - v. Other-----

C. Cause of injury:

- I. Car driver
- II. Car passenger
- III. Pedestrian
- IV. Assault
- V. Motorcyclist
- VI. Fall
- VII. Industrial
- VIII. Gun shot

IX. Other-----

If road traffic accident (RTA) is the cause of the injury please specify the following:

- i. type of vehicle involved: a. 4 wheel b. small car c. heavy vehicle d. other
- ii. speed violation: a. yes b. no
- iii. careless driving: a. yes b. no
- iv. traffic violation: a. yes b. no
- v. Alcohol and drugs: a. yes b. no

D. Treatment received

- I. None
- II. Admitted for observation only
- III. Medication only
- IV. Surgery (Rigid internal fixation, wiring, suspension)
- V. Referred to other center for further treatment
- VI. Patient died (no treatment given)
- VII. Length of stay at the hospital-----days

E. Injury severity (according to abbreviated injury scale)

- I. Uninjured
- II. Minor
- III. Moderate
- IV. Sever
- V. Serious
- VI. Critical
- VII. Maximum
- VIII. Patient died as a result of the injury

F. Follow-up:

Last time patient come for follow-up.....

Number of follow-up visits.....

Patient referred to rehabilitation Yes No

Complete recovery and return to work Yes No

Reported residual difficulties on discharge from hospital or post traumatic brain injury (select the appropriate situation)

- i. None reported
- ii. Physical problems
- iii. Communication problems
- iv. Concentration problems
- v. Memory problems

- vi. Personality/ behavior
- vii. Vision problems
- viii. Other problems (please specify)-----
- ix.** Lost to follow-up

Appendix II: Ethical Approval Form

UNITED ARAB EMIRATES
MINISTRY OF HEALTH & PREVENTION



الإمارات العربية المتحدة
وزارة الصحة ووقاية المجتمع

Ministry of Health and Prevention Research Ethics Committee

Study Title: The patterns of oral and maxillofacial injuries among patients attending Fujairah Hospital-UAE
Study Short Name: Oral and Maxillofacial Injuries

Subject: Approval Reference No: MOHP/DXB/SUBC/ NO -6/2016

Dear Dr Mohamed Jaber

In regards to the above mentioned Study protocol, this is to confirm that on the meeting dated (05/12/2016), the Ministry of Health and Prevention Research Ethics Dubai Subcommittee has reviewed the Study protocol as well as all the documents submitted in the Submission file from the ethical point of view and has approved the conduct of above mentioned study.

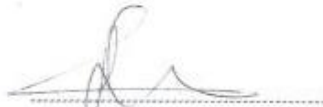
Opinion: Approval

Please find below a list of approved documents:

Document	Version/date
Application Form	Ministry of Health and prevention Application Form-amended
Protocol	Research Protocol amendment 1
Data collection sheet	Epidemiology of Maxillofacial injuries - appendix 1
Investigators CV	CV of Principal Investigator and co-investigator
GCP Certificate	GCP Certificate of PI

The MOHP Research Ethics Committee is organized and operated according to guidelines of the International Conference on Harmonization and constituted according to ICH-GCP requirements.

Yours sincerely,


Dr. Suad Hannawi

6.12.16
Date

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