Original Article

Pattern of Occurrence, Presentation and Management of Mid-Face Fractures among Patients attending the Muhimbili National Hospital, Dar Es Salaam, Tanzania

Christopher Kapeshi[1], Farrid Mutatina Shubi[2], Karpal Singh Sohal[2], Elison N.M. Simon[2]

[1]Department of Oral and Maxillofacial Surgery, Lusaka University Teaching Hospital, Zambia.
[2]Department of Oral and Maxillofacial Surgery, Muhimbili University of Health and Allied Sciences, Tanzania.

ABSTRACT

Background: Mid-face fractures are a common occurrence among patients who are attended at the Muhimbili National Hospital (MNH). Despite the fact that quite often their management is carried out through a multidisciplinary approach, some patients end up with permanent complications.

Objective: The main objective of this study was to determine the pattern of occurrence, presentation and management outcome of mid-face fractures among patients attending MNH in Dar es Salaam, Tanzania.

Material and methods: A descriptive prospective hospital-based study was carried out at MNH for a period of one year, from May 2013 to April 2014. All patients with mid-face fractures were included in the study. They were interviewed using a structured questionnaire followed by a thorough clinical examination. Radiological imaging and basic laboratory investigations were done. Details were recorded in a special clinical form. Thereafter, patients were managed according to the MNH protocol. Data obtained were analysed using the Statistical Package for Social Sciences (SPSS) version 19.

Results: Three hundred patients were enrolled in this study. The age range was from 6-62 years (mean of 29.64 ± 9.78), with the highest frequency in the 20-29-year age group and the female to male ratio was 1:10.5. Road traffic crash(RTC) was the most common cause of mid-face fractures accounting for 82% of the cases. Of the RTC, motorcycle accidents were predominant (63.9%).

Five hundred and ninety-four mid-face fractures were recorded of which zygomatic complex fracture was the most (26.8%) prevalent. Definitive treatment was given to 79.7% of the patients. Closed methods were predominantly used. Among the patients who were treated 18% had one or more complications, the most (81.5%) common being aesthetic impairment.

Conclusion: Road traffic crashes and in particular motorcycle accidents constituted the major cause of mid-face fractures. Young adult males were the main victims. Zygomatic complex fracture was the most frequently occurring mid-face fracture. The majority of fractures were treated by closed methods and the common complication was aesthetic impairment.

***Corresponding Author:**
Sohal, Karpal Singh
Department of Oral and Maxillofacial surgery,
Muhimbili University of Health and Allied Sciences.
P.O. Box 65014
Dar es Salaam, Tanzania
Telephone: +255 712 723 917
Email: karpal@live.com

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INTRODUCTION

Mid-face fractures may occur in isolation or in combination with other injuries and their diagnosis and treatment remains a challenge that frequently requires a multidisciplinary approach.[1,2]

Reports on the incidence and treatment of maxillofacial injuries are available from different countries.[3,4,5] Majority of these have reported a higher prevalence in males compared to females[6-10]. Moreover, in most of the studies, maxillofacial fractures are reported to be most common in the age group of 20-29 years.[11-15]

Variations on aetiological factors for maxillofacial injuries exist mainly depending on the environmental, cultural and socioeconomic factors.[16-18]The principal causes worldwide are motor traffic accidents, assaults, falls and sports injuries.[16,17,19,20]

In a study done in Nepal the occurrence of mid-face fractures included: orbital floor (22.3%), zygoma fractures (21.5%), zygomatic arch fracture (7.6%), nasal bone fracture (7.0%), supraorbital fractures (4.2%), Le Fort I (2.1%), LeFort II (2.2%) and Le Fort III (1.5%).[21] A study in the United Arab Emirates, however, reported the distribution of mid-face fractures as follows: dento-alveolar fractures (49%), Le Fort I (29.4%) and Le Fort II (10.7%).[11]

The management of complicated mid-facial fractures is challenging even to the most experienced oral and maxillofacial surgeons.[22] Proper treatment of fractures was initially performed by applying intra oral wiring and splints, and later facial fractures were treated with internal fixation using titanium or stainless steel plates and screws and most recently by rigid osteosynthesis. Currently there is a trend away from titanium to bio-absorbable plates and screws and these might finally be replaced by bone glue.[23] Modern techniques using medico-technical advancements involve use of micro-robots and percutaneous endoscopic tools.[24]Some of these approaches, however, cannot be applied in Tanzania due to various reasons including availability and cost.

In Tanzania there is scarcity of studies that have reported on mid-face trauma, hence this study was carried out with an aim of determining the pattern of occurrence and management of mid-face fractures at Muhimbili National Hospital, Tanzania.

MATERIALS AND METHODS

This was a prospective descriptive cross-sectional hospital-based study that took place at the oral and maxillofacial unit of the Muhimbili National Hospital (MNH) in 2013/14.The permission to conduct this study was granted by the Research and Publications Ethical Committee of the Muhimbili University of Health and Allied Sciences (MUHAS).

A convenient sampling technique was used, where by all patients with mid-face fractures who presented at the oral and maxillofacial unit of MNH were included in the study after consenting for participation. Patients diagnosed with mid-face fractures but did not give consent for the study were excluded. Refusal to enrol or withdraw from the study did not in any way affect the patient's right to receive standard treatment.

Participants were interviewed using a predesigned questionnaire whereby data on demographic characteristic, aetiology of injury, clinical presentations and management outcomewere collected.Confidentiality was maintained and identification numbers instead of patients' names were used.

Thorough physical examination was conducted and the results recorded in a special clinical form. Baseline investigations such as full blood picture, chemistry panel and imaging were carried out. Radiological investigations included conventional radiographic views of the skull and computed tomography scan. All patients presenting with mid-face fractures underwent definitive treatment as per the standard protocol on patient management.

The information gathered from the structured questionnaire and clinical forms were entered into a computer, processed and analysed by using

Statistical Package for Social Science (SPSS) version 22.0. Data was summarized in form of proportions and frequency tables for categorical variables. Means, median and standard deviation were used to summarize continuous variables.

RESULTS

Three hundred patients were enrolled in the study with an age range of 6 - 62 years and a mean of 29.64 (± 9.78). There were 26 (8.7%) females and 274 (91.3%) males with a female to male ratio of 1:10.5. The age group of 20-29-year was the most (50%) affected with 150 cases followed by the 30-39 years age group with 77 (25.7%) cases and the 0-9 years age group which had 3 (1%)patients (Table 1).

Table 1: Distribution of the patients by age group and gender

Age Group	Gender		Total
	Male (%)	Female (%)	
0-9	2 (0.7%)	1 (0.3%)	3 (1.0%)
10-19	28 (9.3%)	1 (0.3%)	29 (9.7%)
20-29	141 (47.0%)	9 (3.0%)	150 (50.0%)
30-39	72 (24.0%)	5 (1.7%)	77 (25.7%)
40-49	21 (7.0%)	4 (1.3%)	25 (8.3%)
50-59	6 (2.0%)	3 (1.0%)	9 (3.0%)
60+	4 (1.3%)	3 (1.0%)	7 (2.3%)
Total	**274 (91.3%)**	**26 (8.7%)**	**300 (100%)**

Most (84.7%) of the patients were from Dar-es-Salaam city while the others (15.3%) were from other regions of Tanzania. Most (64%) of the patients had a maximum of primary level of education. A majority (57.7%)of the patients were married followed by single (40%). Sixty three per cent of the patients were employed (Table 2).

Majority (29.3%) of patients sustained injuries during the evening hours (Fig.1). History of getting drunk from alcohol prior to injury was reported in 47 (15.7%) of the cases.

Road traffic crashes accounted for 246 (82.0%)cases followed by assault with 26 (8.7%) cases. Of the 246 cases that were involved in road traffic crashes, motorcycle accidents dominated with 158 (63.9%) cases followed by motor vehicle accidents(Fig. 2 and 3).

Table 2: Social demographic data of patients with mid-face fractures

Social Demographic Data		Age group and Gender														Total
		0-9		10-19		20-29		30-39		40-49		50-59		60+		
		M	F	M	F	M	F	M	F	M	F	M	F	M	F	
Residence	Dar-es-salaam	2	1	24	1	123	8	61	5	15	4	2	3	2	3	**254**
	Other regions	-	-	4	-	18	1	11	-	6	-	4	-	2	-	**46**
Educational level	No formal	-	-	1	-	9	2	2	-	1	1	1	-	3	2	**22**
	Primary	2	1	21	1	96	2	41	4	15	3	4	1	1	-	**192**
	Secondary	-	-	4	-	30	2	24	1	4	-	1	1	-	-	**67**
	Tertiary	-	-	2	-	6	3	5	-	1	-	-	1	-	1	**19**
Marital status	Single	2	1	26	1	74	5	10	-	1	-	-	-	-	-	**120**
	Married	-	-	1	-	64	3	61	5	20	3	6	3	4	3	**173**
	Co habiting	-	-	1	-	2	1	-	-	-	-	-	-	-	-	**4**
	Divorced	-	-	-	-	1	-	1	-	-	1	-	-	-	-	**3**
Occupation	Unemployed	2	1	19	-	27	2	4	3	-	2	1	2	-	2	**65**
	Employed	-	-	8	1	90	6	58	-	15	2	4	1	1	1	**187**
	Peasant	-	-	-	-	4	-	4	-	3	-	-	-	1	-	**12**
	Petty trader	-	-	1	-	16	1	1	2	1	-	-	-	1	-	**23**
	Businessperson	-	-	-	-	4	-	5	-	2	-	1	-	1	-	**13**

There were 26 (8.7%) assault cases among which interpersonal violence involved 19 (73.1%) cases and others like assault inflicted by thieves involved 7 (26.9%) cases. Falls accounted for 14 (4.7%) cases and sports caused 7 (2.3%)mid-face injuries, among

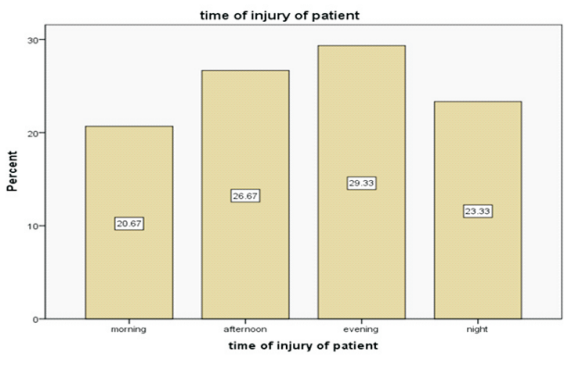

Figure 1: Distribution of the patients according to the time of injury

which the commonest sport was football with 6 (85.7%) cases. Construction accounted for 5 of the 6 occupational accidents.

Figure 2: Frequency distribution of mid-face fractures cases according to the associated aetiology

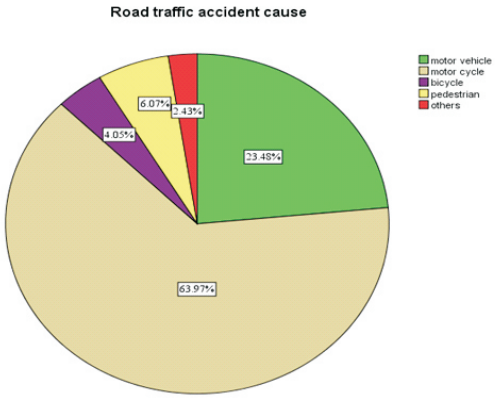

Figure 3: Frequency Distribution of patients according to type of road traffic accidents

Eight patients had compromised airway and one suffered airway obstruction. Twenty eight patients suffered different levels of traumatic brain injury (3 severe, 12 moderate and 13 mild).

Other accompanying clinical features were bleeding, oedema of the face, periorbital ecchymosis, lengthening of the mid-face, abnormal mobility of the mid-face, diplopia, anterior open bite, traumatic telecanthus and sensory disturbances.

Except for two cases all patients had different types of soft tissue involvement. Among the 300 patients, a total of 594 mid-face bone fractures were observed as shown in table 3.

Table 3: Distribution of mid-face fractures according to site and classification.

Mid-face Fracture	Number	Percentage
Zygomatic Complex	159	26.77
Le fort II	98	16.5
Dento-Alveolar	92	15.49
Palatal	56	9.43
Naso-Orbital-Ethmoid	46	7.74
Nasal	45	7.57
Le fort I	31	5.22
Le fort III	26	4.38
Zygomatic Arch	22	3.7
Orbital Blowout	19	3.2
Total	**594**	**100**

The commonest modalities of treatment included maxillomandibular fixation in 115 (38.3%) cases, splinting of the alveolar bone 53 (17.7%), open reduction and internal fixation in 56 (18.7%) and circumzygomatic suspension in 10 (3.3%) cases (Fig. 5). Four patients with blow-out fractures were treated by placement of Foley catheter in the maxillary sinus. The other 62 (20.6%) cases were managed conservatively.

In most 246 (82%) of the patients, management was successful without any complication. In 54 (18%) of the cases, however, there were one or more complications. The commonest complications that were observed included aesthetic impairment in 44 (81.5%) patients while the least common was non-union in one (1.6%) case (Fig 4).

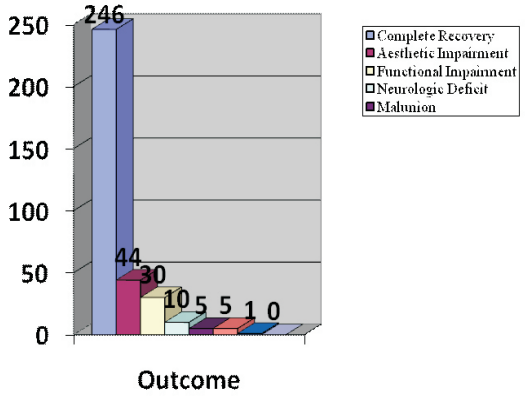

Figure 4: Frequency distribution of Outcome.

DISCUSSION

This was a hospital-based study carried out at the only oral and maxillofacial surgery unit in the country. Almost all patients who suffer maxillofacial injuries in Dar es Salaam and elsewhere in the country were either referred to this centre from other health facilities or reported directly to MNH. Although there might be a few who for one reason or another failed to turn up at this unit, this study provides quite a good picture of the situation regarding mid-facial fractures in the country. Male preponderance was evident with a female to male ratio of 1:10.5 which is in agreement with findings of studies from elsewhere.[11,12,25,26] This is most likely due to the fact that ordinarily females are less likely to engage in risky activities that may result in injuries in the maxillofacial region.[3,27] The occurrence of mid-face fractures was more prevalent in the age group 20-29 years which is also in concurrence with findings of other studies.[14,15,28,29] These findings most possibly reflect the higher involvement in risky behaviours and violence among young adults. Also, the fact that at the extremes of age (i.e. age group 0-9 and 60+) one can hardly engage in adventurous and dangerous activities is reflected in the low numbers of those from these age groups who got injured, which is in agreement with findings of other studies.[12,26]

The current study revealed that RTC was the most (82%) common cause of mid-face fractures. This correlates with other studies from different countries.[11,16,17,19,20,26] However, it is different from findings of a study done in United States that reported an increase in interpersonal violence as a major cause.[28] The reasons for the differences in aetiologic pattern could be socio-economic and cultural differences which exist among developing and developed countries.[11,19,28] Other aetiologic factors of facial bone fractures included assault, occupational activities, sports and falls. This is consistent with previous reports.[11,12,13,26, 30] Among RTCs motor cycle accidents accounted for the greatest proportion (63.97%). This is in agreement with reports from elsewhere which also found motorcycles as the common aetiology of mid-facial fractures.[11,24,31] Motor cycles in Tanzania in general and Dar es Salaam in particular, are mostly ridden by young males. They are used as a cheap and perhaps faster mode of transport. The motorcycle riders usually meander at high speed among vehicles in the process of beating traffic jams. In some situations, this take place in narrow poorly maintained roads, hence increasing the risk. By so doing they predispose themselves, their passengers and other road users to RTC. Most often mid-face fractures, pose a challenge in management because of their multiplicity and occurrence in the vicinity of specialized organs such as the eyes and the nose. Despite the fact that the zygoma is a very strong bone, its prominence in the mid-face makes it more exposed and in case of impact most often tends to fracture along the sutures. This is evidenced by the fact that in the present study the zygomatic complex fracture was the commonest (26.77%) mid-face fracture followed by Le fort II (16.5%) fractures. Similar findings were reported by Adebayo *et al* in Nigeria.[32] Motor vehicle accidents were the second cause of mid-face fractures. This shows a changing trend from previous studies in which this was found to have been the commonest cause.[11,25]

In contrast to some results from other studies intoxication with alcohol or other drugs at the time of injury had a rather low(15.7%) contribution to occurrence of mid-face fractures.[12,26]

The most common clinical features were bleeding from the nose, unilateral or bilateral circumorbital ecchymosis, non-ending subconjuctival haemorrhage on the lateral aspect of the eye as well as loss of cheek prominence. Remarkably, four patients with zygomatic complex fractures also presented with the superior orbital fissure syndrome characterized by ophthalmolplagia, ptosis of the upper eyelid but without involvement of the optic nerve (Figure 5a and 5b). This has not been reported in previous studies of maxillofacial injuries in Tanzania. Most (90.7%) of the patients were reported to have had normal GCS and only 2.3% had scores of below 9 at the time of reporting to hospital.

In the current study 54 (18%) patients suffered from one or more complications, the commonest having been aesthetic impairment (81.5%) followed by functional impairment. Aesthetic impairment was mainly in the form of excessive scaring and colour variation following reconstruction of avulsion injury. Functional impairment presented as loss of body parts like loss of eyes in five patients, loss of teeth and sometimes including the alveolar bone and paralysis of extra-ocular muscles leading to limited eye movements. Two of the patients who suffered superior orbital fissure syndrome experienced the symptoms well beyond six months. Two others got lost to follow up immediately after initial treatment. The other ophthalmic complications led to enucleation of one eye in three patients and one had enucleation bilaterally resulting in total blindness.

CONCLUSION

This study shows that the majority of patients were young adult males and road traffic accidents and in particular motorcycle accidents were the major cause of mid-face fractures. Most patients had multiple bone involvement, among which the zygomatic complex fracture was the most frequent. Closed reduction was the commonest applied forms of management. There were various complications including aesthetic impairment, superior orbital fissure syndrome and loss of one or both eyes.

RECOMMENDATION

There is a need for raising awareness of the community on the importance of exercising high degree of care by all road users.

Improvement of infrastructure such as repairing of potholes and creation of pedestrian lanes in all busy roads might to a large extent reduce the number of road traffic accidents and the number victims thereof.

STUDY LIMITATIONS

Most possibly not all the patients who suffered mid-face fractures attended MNH for treatment due to different reasons including social economic, social-cultural, distance to health facilities or some opted for private hospitals. Some patients for unknown reasons could not be followed-up for longer periods.

Figure 5a

Figure 5b

Figure 5a: Patient with zygomatic complex fracture that resulted in superior orbital fissure syndrome. The patient could not open the right eye.

Figure 5b: Same patient as in Figure 5a, through forced opening the pupils are pointing in different directions due to restricted movement of the right eyeball.

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