

East African Medical Journal Vol. 89 No. 9 September 2012

MAXILLOFACIAL SOFT TISSUE INJURIES IN NAIROBI, KENYA

E. K Bernard, BDS, MDS, Consultant Oral and Maxillofacial Surgeon, Kenya Defence Forces, M. K. Akama, BDS, MDS, Fellow AO CME, Lecturer, W. A. Odhiambo, BDS, MDS, Senior Lecturer, M. L. Chindia, BDS, MSc, FFDRCS, Associate Professor, Department of Oral and Maxillofacial Surgery, B. Mua, BDS, MPH, MBA, Pg.Dip(STI), Lecturer, Department of Perodontology, Community and Preventive Dentistry, University of Nairobi, P. O. Box 19676-00202, Nairobi, Kenya

MAXILLOFACIAL SOFT TISSUE INJURIES IN NAIROBI, KENYA

E. K BERNARD, M. K. AKAMA, W. A. ODHIAMBO, M. L. CHINDIA and B. MUA

ABSTRACT

Objectives: To determine the aetiological factors and pattern of occurrence of maxillofacial soft tissue injuries (MF-STIs) presenting at a Kenyan National Referral Hospital in Nairobi.

Design: A cross-sectional study.

Settings: The accident and emergency department of the Kenyatta National Hospital (KNH) between September 2009 and December 2009.

Subjects: Four hundred and twenty two patients treated for MF-STIs.

Results: The male to female ratio was 3.3:1. Motor vehicle accidents (MVA) were the leading cause of MF-STIs (44.6%) followed by interpersonal violence (IPV) (39.1%). MVA (50.0%) was the leading cause of MF-STIs in the less than 12- year-olds while falls from heights (58.3%) was the leading cause in under five-year-olds. IPV (48.1%) was the leading cause of facial fractures. There were no skeletal fractures observed in the under five-year-olds. Head injury (36%) and fractures of the long bones (52%) were the most common associated injuries.

Conclusion: The leading causes of MF-STIs apparently differ from those of skeletal fractures.

INTRODUCTION

Maxillofacial (MF) soft tissue injuries (STIs) are often overlooked in clinical surveys compared to fractures, yet these injuries negatively impact both on function and esthetics. Previous surveys on MF injuries in Kenya have reported widely on the causes of MF skeletal injuries whereas the causes of MF-STIs remain obscure. Studies elsewhere have demonstrated varying aetiology of MF-STIs compared to MF fractures. However, interpretation of the surveys on MF-STIs based on aetiology is difficult because of the variation in the classification of injuries that are used.

Many studies pertaining to the incidence and causes of MF injuries in general have been published but reported statistics vary widely. The aetiology of maxillofacial injuries in general differs from one country to another because of socio-economic, cultural and environmental factors (1-5). The causes of maxillofacial fractures have changed over the past

years with changes in lifestyle, industrialisation, transportation and legislative measures. As a result, causes of MF injuries in general differ in various parts of the world. The main causes worldwide are motor vehicle accidents (MVAs), interpersonal violence (IPV), falls, firearm injuries (FAIs) and sports-related injuries (2-5). Although MVA is still the main cause for MF injuries in developing countries, recent data from developed countries have shown IPV to have been the dominant cause. Age and gender influence the incidence and aetiology of facial injuries (2, 3). Generally, MF trauma predominantly affects young men. Multisystemic trauma is common in MF injuries (1, 2, 6). More than 50% of patients with MF injuries in general have concurrent multisystemic trauma requiring multidisciplinary management between emergency physicians and surgical specialists (1, 8,14). The purpose of the present investigation was to prospectively audit the aetiological factors and pattern of MF-STIs that occurred over a four month period.

MATERIALS AND METHODS

The study was conducted at the KNH-Accident and Emergency (A&E) department and the maxillofacial (MF) clinic. KNH is the largest National Referral And Teaching Hospital and is located in Nairobi. The study was an hospital-based cross-sectional survey that took place over a four month period between 1st September and 30th December 2009. Data were obtained through interviews, clinical examination and evaluation of the imaging investigations of the participants. The sample included all consecutive patients who presented with MF-STIs and with or without associated skeletal MF injuries. The aetiology of the MF-STI related to MVA, FAI, IPV, animal bites, falls and sports injuries were recorded. Associated MF fractures and systemic injuries were also recorded. The information in the data capture chart was coded and analysed using the Statistical Package for Social Sciences (SPSS) version 13.0 for Windows with the assistance of a statistician. The Chi-square and the Student's t-test statistical procedures were used. Statistical testing was considered significant only when the p-value was < 0.05.

RESULTS

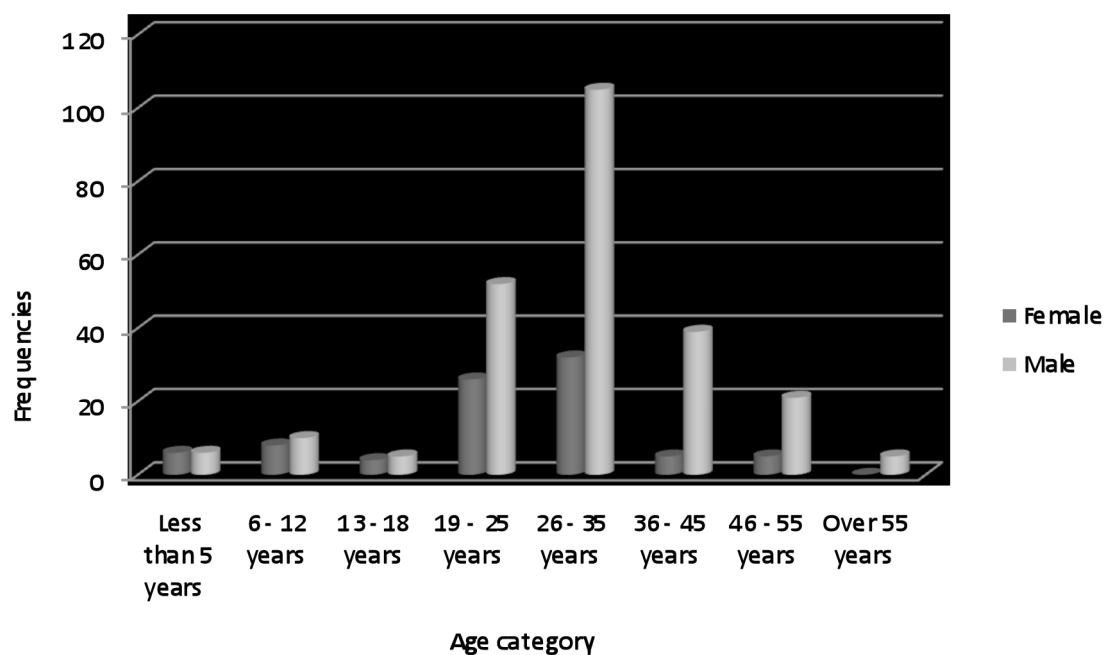
Aetiology, age and gender distribution: During the four months of study, 1,289 patients presented at the KNH-A&E department with diverse injuries among whom 32.7% were attended to for MF injuries. Among patients with MF injuries, 81.7% had facial STIs whereas 18.2% had facial fractures in isolation and 26.7% had facial fractures in combination with STIs. Generally, of all the patients with facial trauma there were 23.2% females while males comprised of 76.8%, giving a male to female ratio of 3.3: 1. The mean age for patients who sustained STIs in general was 29.5 years (range of 2 to 88 years) while the average was 31 years for men and 25 years for women. The average number of facial injuries per month was 109.5 (Figure 1).

The leading causes of MF-STIs in children below five years of age were falls from heights (58.3%) and MVAs (33.3%). IPV as a cause of injury in this age category was not remarkable. For the children less than five years of age the ratio of males to females was 1:1. Falls from heights were the most common cause of injury among children less than 12 years of age and 47 years constituted 10.4% of all MF injuries. A bimodal distribution was notable at the age groups 13-25 and 36-45 years. The highest proportion of injuries was in the 19-25-year-old and 26-35-year-old age categories. IPV and MVAs were the leading causes of injury in the 26-35-year-old age category. MVA was the most frequent aetiological factor of MF-STIs (44.6%) followed by IPV (39.1%) (Table 2).

The number of MF-STIs due to IPV was higher in men (42.8%) compared to women (26%). However, both IPV (42.8%) and MVA (42.45%) caused a larger percentage of injuries in men (n=257) (Table 3). Figure 2 depicts clinical features of MF-STIs arising from different aetiological factors. Cases of IPV related to alcohol consumption constituted 14.1%. Individuals in the 26-35-year-old age group had the highest proportion of injuries associated with alcohol consumption (44.4%). Among the patients with MF-STIs 32.8% had associated MF skeletal fractures including 50.4% of them involving the mandible. The leading cause of MF skeletal fractures occurring without soft tissue injury was IPV (48.1%), and was predominantly non-domestic IPV (40.6%). The male: female ratio was 6.6:1 compared to MFSTIs where the male: female ratio was 3:1. Females sustained fractures predominantly from MVA (71.4%) whereas males sustained fractures mainly from non-domestic IPV (44.3%). Domestic IPV comprised of only 28.6% of all the fractures sustained among females whereas MVA-related skeletal fractures among males constituted 19.7%. The age groups most were those between 13-25 years (males 87%) and 26-35 years (females 89.7%). Orthopaedic injuries (38.8%) were the most common concurrent systemic injuries (Table 4).

Figure 1

Distribution of the patients with MF-STIs according to age groups.

**Table 1**

Causes of MF-STIs among children below 12 years

Cause of injury	% Proportion
Motor vehicle accidents	50.0%
Fall from height	35.7%
Interpersonal violence	14.3%
Total	100.0%

Table 2

Distribution of injuries according to the associated etiological factors.

Cause of injury	% Proportion
MVA	44.4%
IPV	38.7%
Fall from height	10.2%
Firearm injuries	2.1%
Human Bites	3.3%
Animal bites	0.9%
Sports injuries	0.3%

Table 3*Distribution of the aetiological factors associated with injuries sustained by males and females*

	Male	Female	Chi value p<0.05 df=1
MVA	106	48	1.897
IPV	107	28	7.188
Falls from height	28	7	0.392
Human bites	6	5	2.538
Firearm Injuries	7	-	-
Animal Bites	2	-	0.671
Sports injuries	1	-	-

Table 4*Distribution of the associated systemic injuries according to the aetiology.*

	MVA	IPV	Falls from heights	Human and Animal bites	Firearm Injuries	Total
Head Injury	24	14	3	0	0	41
Chest Injury	8	5	0	0	0	13
Abdominal/Pelvic injury	7	1	0	0	0	8
Long bones fractures	33	17	1	0	0	52

Figure 2*Clinical features of MF-STIs arising due to MVA (A), Human bite (B), FAI (C), and IPV (D)*

A



B



C



D

DISCUSSION

In this study, the principal causes of MF-STIs were MVAs and IPV. The burden of MVA has been on the increase in Kenya over the last four decades unlike the developed countries, where the pattern is that of a reduction in the number of MVA and an increase in IPV and sports injuries (6-9). Evidently, young adults (26-35 years) were at the highest risk of MF injury due MVA. Males injured due to MVA in this study constituted 70.27% of all the cases of injury. Other studies in other centres have also shown a male preponderance in MVAs (2, 6, 7, 9). Reports from other regions of the world showed that MVAs were the leading cause of MF injuries (6, 8, 9, 10). The second most common cause of MF-injury in this series was IPV which comprised of 39.1% of all the cases. Both IPV and MVA formed a larger percentage of injuries in men which concurs with various other studies (8, 9, 11, 12). A considerable proportion of those injured due to domestic IPV were females (72.7 %), whereas majority of those injured due to non-domestic IPV were males. Cases of child abuse resulting in MF-injuries were very few. Remarkably, most IPV-related injuries occurred at night. The victims of non-domestic IPV were primarily men in the age category of 26-35 years.

Regarding MF-STIs sustained by victims who had consumed alcohol 24 hours prior to injury, majority were as a result of non-domestic IPV. The 26-35 -year-old age groups formed the highest proportion of all the cases of IPV related to alcohol (8). Alcohol consumption increases the risk of MF injury due to IPV as demonstrated in other studies. In a study in the UK 55% of the assault cases were related to alcohol consumption (8). Notably IPV still contributes significantly in the generation of MF trauma in Kenya. In the UK (12) and South Africa (13) notably, IPV was the most common cause of MF injury. Falls as the third major cause of facial injury showed a bimodal distribution in the ages of 13-25 and 36-45 years. Falls from heights were the second leading cause of injury among children less than 12 years, whereas MVA was the most frequent cause in this age category. In other studies falls from heights (14) and dog bites accounted for the majority of injuries in the children less than 12 years, but with increasing age, assaults become a major factor (15). Falling from a height was the leading cause of injury among children less than five years which was in agreement with other published literature (14-16). Generally the male: female ratio was 5.4:1, but was 1:1 in the < 12-year-old children. This is similar to the findings in other studies (15, 16) in children below five years, both genders had an almost equal exposure to the aetiologic factors and risks of sustaining STIs from falls. The bimodal distribution among the age groups described in the western literature was not

evident in this study (8, 14, 17).

Human bites constituted a small proportion (3.2%) compared to the other causes of the MF injuries. In a study in Nigeria, human bites in adolescents have been reported to have been a significant cause of MF-STI (16). This affected males and females almost in equal proportions.

In this study there were very few reported cases of MF-STIs due to animal bites. There was only one case of a donkey bite involving a five-year-old and another case of dog bite of a five-year-old boy who had strayed from home. In other studies, animal-related MF-STIs were most commonly as a result of dog-bites in which the peak incidence occurred in children aged less than ten years with an exponential decrease in frequency with increasing age (9). Animal bites causing MF-STI inflicted by cows, donkeys and wild animals have been documented (18, 19).

The frequency of firearm-related injuries (FAI) and the number of deaths associated with them has been shown to be on the increase in Kenya recently (20). Fortunately though, firearm-related injuries are not yet among the leading causes of trauma compared to the United States where FAIs are still the second leading cause of injury related deaths. Generally, the risk of MF injuries in sporting activities in Kenya is minimal. Only one case of sports related MF-STIs was reported during the period of the study. It could be that majority of the population engage in non-contact sporting activities like athletics and as such injuries due to sports are few. According to Hill *et al.* the risk of MF injuries that result from sporting accidents is relatively small (21). Some peculiarities in the causation of MF fractures were noted compared with MF-STIs. The male: female ratio was 6.6:1.0, which was higher than that recorded for STIs. The leading cause of facial skeletal fractures was IPV, unlike STIs where MVA were the leading causes. This concurs with the observation by Mwaniki *et al.* regarding the causes of mandibular fractures (4, 5). The risk factors for skeletal injury among females were different from those of males, whereas the risk factors for STIs were the same for both males and females. In Kenya and Zimbabwe IPV has been reported to be the leading cause of facial fractures, which concurs with the observations made on skeletal fractures in this study (4, 5). However, compared to MF-STIs MVAs are the leading cause. Associated MF skeletal fractures occurred in 32.8% of all the MF-STI cases. The most common associated systemic injuries were orthopaedic and head injury. These are common injuries resulting mainly from IPV and MVA. Falls resulted in more associated head injuries than orthopaedic injuries. Reports from other studies differ. Cannel *et al.* found that the most commonly associated systemic injuries were abdominal followed by thoracic injuries (22). Perhaps this correlates with the differences in the predominant causes of injury. In

Kenya MVAs are the leading cause of injury, which predominantly causes orthopaedic injuries whereas in the UK the predominant cause is IPV (1, 6, 9).

In conclusion, our study has shown that MVA remains the principal cause of MF-STIs significantly followed by IPV. There is variation regarding the predominant causes of MF skeletal injury compared to MFSTIs. Fractures of the long bones and head injury are the most important associated injuries.

ACKNOWLEDGEMENTS

To the Director and the management of Kenyatta National Hospital, the University of Nairobi and Kenyatta National Hospital research and ethics committee for permission to carry out this study. The Doctors and staff of the accident and Emergency department of the Kenyatta National Hospital for the daily assistance while evaluating patients and collecting data.

REFERENCES

- Down K.E., Boot D.A. and Gorman D.F.: Maxillofacial and associated injuries in severely traumatized patients: implications of a regional survey *J. Oral Maxillofac. Surg.* 2003; **61**:61-64.
- Akama MK, Chindia ML, Macigo FG, Guthua SW. Pattern of maxillofacial and associated injuries in road traffic accidents. *East Afr. Med J.* 2007; **84**:287-295.
- Akama M.K, Guthua S.W, Chindia M.L: Management of complex orofacial soft tissue injuries. *Afri. J. Oral Health Sci.* 2000; **1**:1-27.
- Mwaniki D, Radol JWO, Miniu E, Manji F. The occurrence and pattern of facial bone fracture in Nairobi. *East Afr. Med. J.* 1988; **65**:759-763.
- Mwaniki DL, Guthua SW. Occurrence and characteristics of mandibular fractures in Nairobi, Kenya. *Br. J. Oral Maxillofac. Surg.* 1990; **28**:200-202.
- Hussaini HM, Rahman NA, Rahman RA, et al, Maxillofacial trauma with emphasis on soft-tissue injuries in Malaysia. *Int. J. Oral Maxillofac. Surg.* 2007; **36**: 797-801.
- Macharia WM, Njeru EK, Muli-Musiime F, Nantulya V. Severe road traffic injuries in Kenya, quality of care and access. *Afr. Health Sci.* 2009; **9**: 118-124.
- Hutchison I, Magennis P, Shepherd JP, Brown AE. Survey of facial injuries. Part I: aetiology and the association with alcohol consumption. *Br. J. Oral Maxillofac. Surg.* 1998; **36**:4-14.
- Bolt R.W., Watts P.G. The relationship between aetiology and distribution of facial lacerations. *Injury Extra* 2004 **35**: 6 – 11.
- Adeyemo WL, Ladeinde AL, Gunlewe MO, Olutayo J. Trends and characteristics of oral and maxillofacial injuries in Nigeria: a review of the literature. *Head & Face Medicine* 2005; **1**:7-11
- Magennis P, Shepherd J, Hutchison I, Brown A. Trends of facial injuries: increasing violence more than compensates for decreasing road trauma. *Brit. Med. J.* 1998; **316**: 325-326.
- Hussain K, Wijetunge DB, Grubnic S, Jackson IT: A comprehensive analysis of craniofacial trauma: *J. Trauma* 1994; **36**:34-35.
- Bamjee, Y, Lownie, JF; Cleaton-Jones, PE; Lownie, M A; Maxillofacial injuries in a group of South Africans under 18 years of age. *Br. J. Oral Maxillofacial Surg.*: 1996; **34** : pp 298-302.
- Kotecha S, Scannell J, Monaghan A, Williams R.W. A four year retrospective study of 1,062 patients presenting with maxillofacial emergencies at a specialist paediatric hospital. *Brit. J. of Oral and Maxillofacial Surg.* 2008; **46**: 293-296 .
- Zarina S. Shaikh , Stephen F. Worrall. Injury Epidemiology of facial trauma in a sample of patients aged 1-18 years, *Int. J. Care Injured* 2002; **33**: 669-671.
- Oginni F.O, Fagade J, Akinwande F, Arole, Odusanya SA. Pattern of soft tissue injuries to the oro-facial region in Nigerian children attending a teaching hospital. *Inter. J. of Paed. Denti.* 2002; **12**: 201-206.
- Grisso JA, Schwarz DF, Wishner AR, Weene B, Holmes JH, Sutton RL. Injuries in an elderly inner-city population. *J. Am. Geriatr. Soc.* 1990; **38**:1326-1331.
- Ugboko VI, Olasoji HO, Ajike SO, Amole AOD, Ogundipe OT. Facial injuries caused by animals in northern Nigeria. *Brit. J. of Oral and Maxillofacial Surg.* 2002; **40**: 433-437.
- Kitala P M, McDermott JJ, Kyule M N, Gathuma J M Community-based active surveillance for rabbies in Machakos district, Kenya: *Prev. Vet. Med.* 2000 ; **29**: 44 : 73-85.
- Odhiambo W A, Guthua SW, Chindia ML, Macigo FG. Pattern and clinical characteristics of firearm injuries. *East Afr. Med. J.* 2008; **85**: 107-112.
- Hill CM, Burford K, Martin A, Thomas DW. A one-year review of maxillofacial sports injuries treated at an accident and emergency department. *Brit. J. of Oral and Maxillofacial Surg.* 1998; **36**: 44 – 47.
- Cannell H, Paterson A, Loukota R. Maxillofacial injuries in multiply injured patients *Brit. J. of Oral and Maxillofacial Surg.* 1996; **34**: 303-308.