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## AETIOLOGY, PATTERN AND MANAGEMENT OF ORAL AND MAXILLOFACIAL INJURIES AT MULAGO NATIONAL REFERRAL HOSPITAL

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## AETIOLOGY, PATTERN AND MANAGEMENT OF ORAL AND MAXILLOFACIAL INJURIES AT MULAGO NATIONAL REFERRAL HOSPITAL

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### ABSTRACT

**Objective:** To establish the aetiology, pattern and methods of management of oral and Maxillofacial injuries (OMFIs) seen at the Oral and Jaw injuries unit of Mulago National Referral Hospital (MNRH) Kampala, Uganda, over a ten year period.

**Design:** A descriptive retrospective study.

**Setting:** Oral and jaw injury unit of Mulago National Referral Hospital, Kampala, Uganda.

**Results:** One thousand two hundred and three patient records met the inclusion criteria. The age range was 1-90 years with a male: female ratio of 4.5:1. The age-group most affected was the 21-30-year-olds. Road traffic injuries (RTIs) were responsible for 61% (n=735 of the injuries, interpersonal violence 27.6% (n=332), accidental falls 12% (n=142) and firearm injuries 2.2% (n=27). Of the maxillofacial fractures (n=1069) isolated mandibular fractures were 62%, isolated mid-facial fractures 24% whereas Pan-facial fractures accounted for 14% .

**Conclusion:** The victims of OMFIs were mostly young men between 21 and 30 years of age. The main aetiological factors were road traffic injuries (RTIs) and interpersonal violence (IPV), while the lower third of the face was most often involved. Consistent with findings in other studies, RTI and IPV remain the two main causes of Maxillofacial injuries and public health measures targeting prevention should focus on these areas.

### INTRODUCTION

In sub-Saharan Africa, trauma is reported to be prognostically worse than in many other regions of the world. Almost 90% of the world's deaths from trauma occur in the low and middle-income countries most of which are in sub-Saharan Africa (1). This is attributed to a number of factors including poorly developed casualty transport systems and ill-equipped health facilities. The aetiology of Oral and Maxillofacial Injuries (OMFIs) varies from region to region and is influenced by among others socio-economic and environmental factors. The major aetiological factors world-wide include road traffic injuries (RTIs), interpersonal violence (IPV) and fire arm injuries (FAIs) among others. The trend of RTIs in the developed world has been that of decline as compared to what is observed in most developing economies. This may be due to better road infrastructure, strict enforcement and observation of road traffic rules.

The rising trend of RTIs in developing countries

has been demonstrated by studies done in Nigeria, Brazil and north Jordan (2,3,4). A similar scenario has been observed regionally, including Kenya where the trend of RTI as an aetiological factor of OMFIs was shown in one of the studies to have been on the rise (5). The motorcycle transport system locally known as "boda boda" has evolved as a means of circumventing chronic traffic jams on major roads in Uganda and for its ability to pass through difficult terrain inaccessible to standard four wheel-vehicles. In addition to its versatility, the motorcycle is an affordable alternative means of transport for many people. However, most of the motorcycle riders are self-trained with hardly any knowledge of road traffic rules, making a ride on a motorcycle highly prone to crashes.

In many developed countries, IPV is increasingly becoming a major cause of orofacial trauma and this has been attributed to alcohol and drug abuse. Studies done in the United Kingdom and New Zealand attest to this trend (6,7). This scenario is, however, gradually unfolding in the developing world especially among

the youth who are the main victims of drug and abuse of other addictive substances including alcohol. This has contributed to an increase in IPV-associated orofacial injuries among this category. Findings from one Kenyan study showed that IPV was responsible for 74.9% of the mandibular fractures whereas another study done in Zimbabwe showed that IPV accounted for 89.8% of all the mandibular fractures managed at Harare Central Hospital, 80.7% of the victims in this study were males (8,9). A previous study in Uganda, however, found that IPV accounted for only 25% of the jaw fractures (10). The objective of this study was to establish the aetiology, pattern and methods of management of OMFIs at the Oral and Jaw Injuries unit of MNRH over a ten year period.

### MATERIALS AND METHODS

The study was based on the patient-records at the Oral and Jaw injuries unit in Mulago National Referral Hospital (MNRH). MNRH is the only hospital in Uganda with an established Oral Surgical Unit and serves a large population of Kampala city. It also receives referrals from the rest of the country and even beyond the national borders like the Eastern

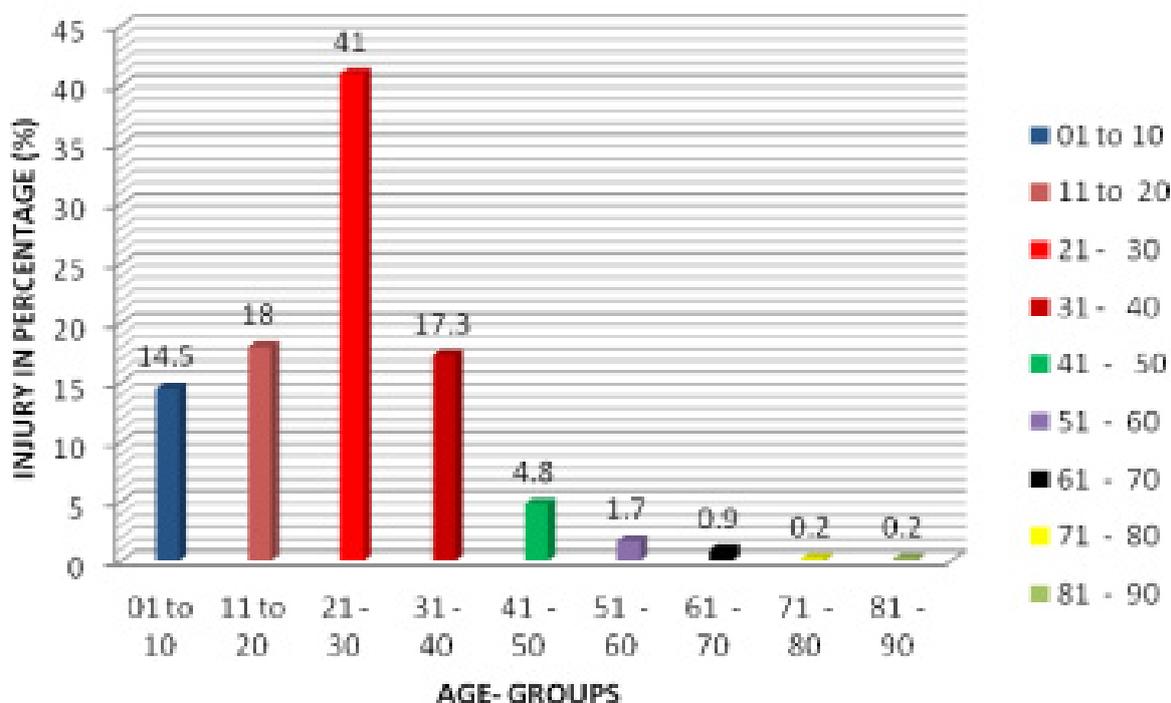
Congo region, Southern Sudan and Western Kenya.

This was a descriptive retrospective study based on archival case records. Variables including age, gender and OMFIs aetiological factors were collected. Analysis of the information was done using the statistical package for the social sciences (SPSS) version 17 for windows.

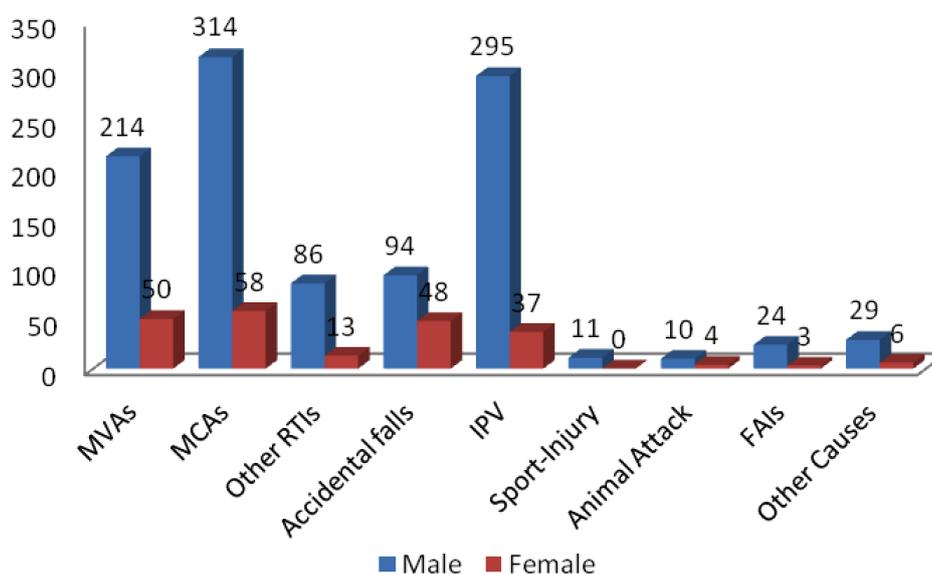
### RESULTS

A total of 1203 records were retrieved and analysed, these included 990 males and 213 females (ratio= 4.6:1). The age range was 1-90 years with a mean age of 25.82 years ( $\pm 15.13$  STD). The mean age for males was 26.55 years ( $\pm 14.44$  STD) whereas that of females was 22.43 years ( $\pm 17.63$  STD). This age difference was statistically significant ( $P < 0.05$ ). Overall, the 21-30- year-old age group was the most affected comprising 41% (n=493) of patients followed by the 11-20 and 31-40 year-olds, respectively (Figure 1). The number of injuries sustained according to aetiological factor are illustrated (Figure 2). Males were more prevalent victims of OMFIs for every aetiological factor analysed.

**Figure 1**  
*Distribution of OMFIs according to age-groups.*



**Figure 2**  
Distribution of injury according to gender and aetiological factor.



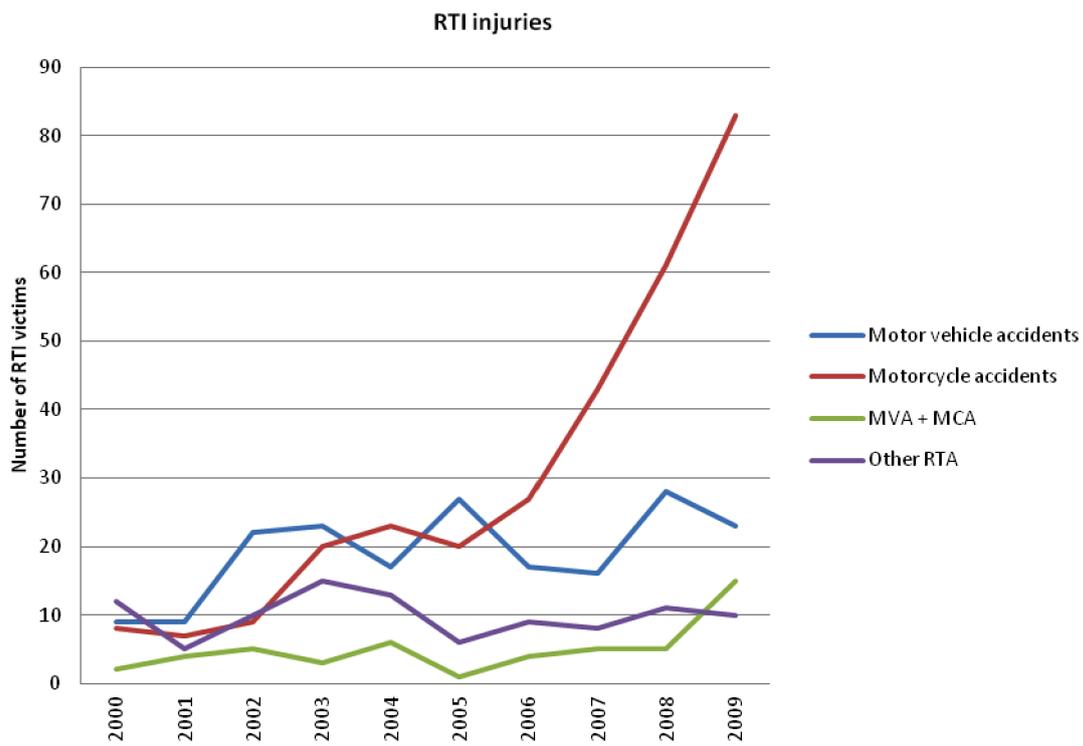
The motorcycle was responsible for the highest number of RTI-related injuries 50.6% (n=372) and the motorcyclist 29.8% (n=219) was most affected by the RTI-related injuries. The motorcycle was also responsible for the highest number of passengers that suffered OMFIs. These findings were statistically significant  $P < 0.05$ . (Table.1). Figure 3 Shows the

trend of OMFIs for RTI-related aetiological factors over the ten-year period. The trend of motorcycle accident victims shows a steeper rise as compared to those due to other RTI-aetiological factors of OMFIs. The rise of MCA-related injuries was exponential between 2006 and 2009. Other RTI-related aetiological factors showed more fluctuating trends.

**Table 1**  
Victims of RTI according to aetiology (n=735).

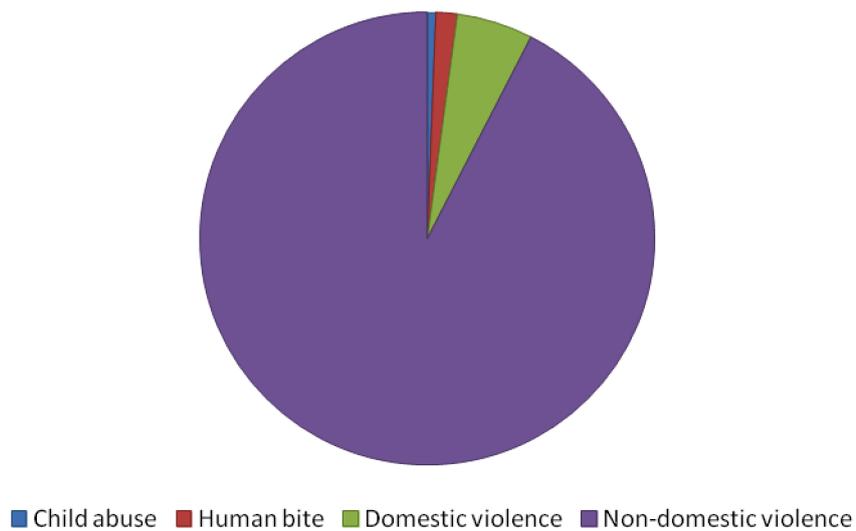
	Passenger	Pedestrian	Motorist	Motorcyclist	Bicycle rider	Others	Total	%
Motorvehicle	97	97	6	44	17	3	264	35.9
Motorcycle	111	70	1	173	16	1	372	50.6
Bicycle	9	14	0	2	73	1	99	13.5
Total	217	181	7	219	106	5	735	
Percentage	29.5	24.6	1.0	29.8	14.4	0.7		100

**Figure 3**  
Annual trend of RTI-related OMFIs over the 10 -year period



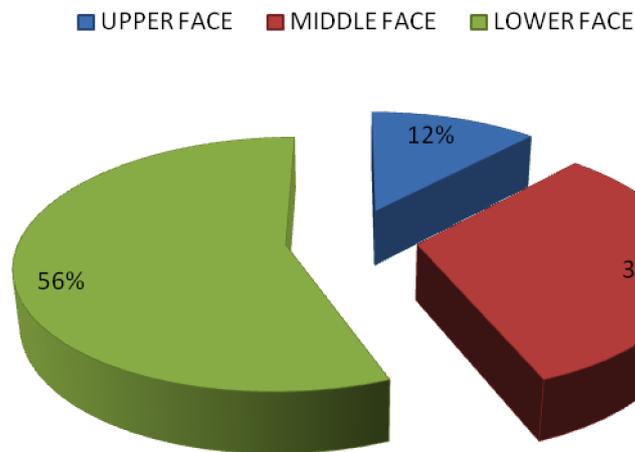
Most of the IPV-related OMFIs were due to non-domestic violence 92% (n=305) domestic violence 5% (n=17), human bite 2% (n=7) whereas the least number of IPV-related OMFIs were due to child abuse 1% (n=3) (Figure 4).

**Figure 4**  
Aetiological factors of IPV-related OMFIs (n=332)



Anatomically, the lower third of the face was the most affected by OMFIs while the upper third was least affected (Figure 5).

**Figure 5**  
*Distribution of facial injuries by anatomical region*



The mandibular fractures mainly presented in multiple pattern 35.3% (n=234). Among the isolated fractures, the body of mandible 32.9% (n=218) were most prevalent. The condylar fractures 0.9% (n=6) were least registered. The single most aetiological agent of mandibular fractures was the IPV 32.4% (n=215), followed by the motorcycle-related injuries 27.5% (n=182). In general RTIs (MCAs, MVAs and O-RTAs) were the most aetiological factors of mandibular fractures being responsible for a total of 56.9% of them (Table 2).

**Table 2**

*Pattern of mandibular fractures according to aetiology (n=663).*

	Mvas	Mcas	O-Rtas	Fais	Ipv	Sport	Fall	Animal	Others	Total percentage (%)
Condyle	1	2	1	1	0	0	1	0	0.9	6
Ramus	3	3	0	2	6	0	2	0	0	16
2.4										
Angle	7	9	2	0	8	0	1	0	2	29
4.4										
Body	57	48	11	8	76	1	9	3	5	218
32.9										
Symphysis	25	25	8	1	16	0	6	1	1	83
12.5										
Dento alveolar	28	15	9	2	14	0	7	0	2	77
12.5										
Multiple	61	50	12	10	95	0	4	1	1	234
35.3										
Total	182	152	43	24	215	1	30	5	11	663
(%)	27.5	22.9	6.5	3.6	32.4	0.2	4.5	0.8	1.7	
100										

Motorcycle accidents (MCAs) were responsible for the highest percentage 42.5% (n=165) of injuries in the mid-facial region followed by motor vehicle accidents (MVAs) and IPV, respectively. Most of

the mid-face injuries presented as dental alveolar fractures 36.3% (n=141) followed by zygomatic fractures 32.5% (n=126). The least injury of the mid-face recorded was the le forte111 type of fractures

(Table 3). Among the concurrent injuries sustained with OMFI's head injury was the most prevalent followed by limb fractures, eye injuries and others respectively (Figure 6). A total of 1622 surgical

procedures were done on the 1203 victims. Individual procedures expressed as percentages of the total number of patients (Table 4).

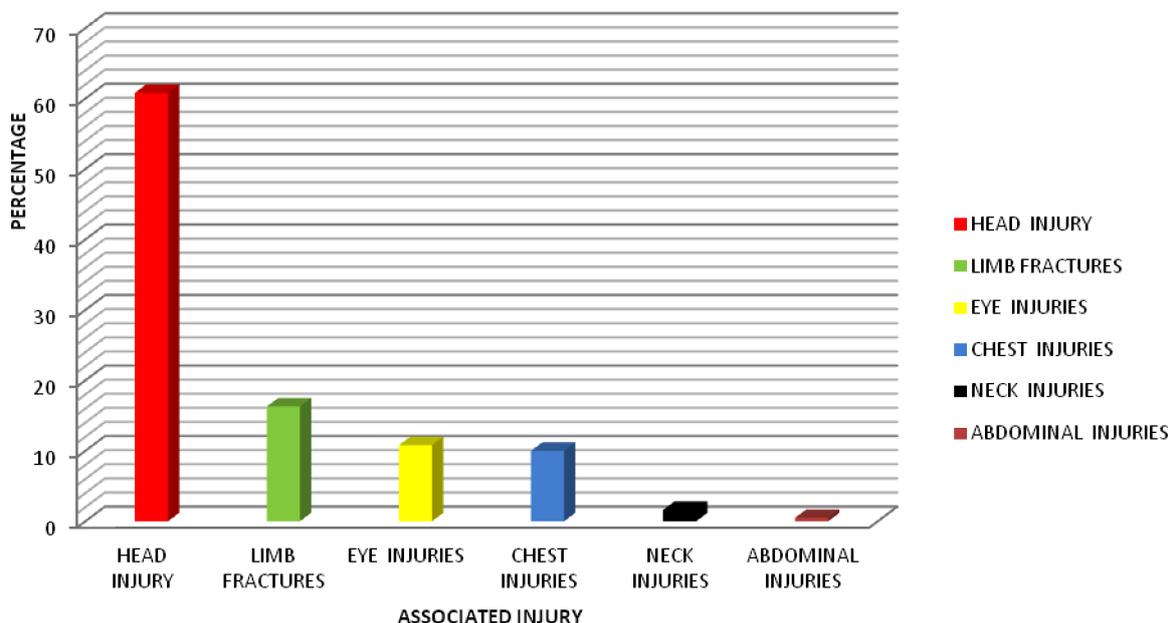
**Table 3**  
*Pattern of mid-face fractures according to aetiology (n=388).*

	MVA	MCA	O-RTA	IPV	FALL	FAI	SPORT	ANIMAL	OTHERS	TOTAL	% -AGE
Nasal Fractures	6	11	3	1	1	0	0	2	1	25	6.4
Zygomatic Fractures	20	50	12	30	1	1	7	3	2	126	32.5
Le Forte I	17	27	2	0	0	1	0	0	0	47	12.1
Le Forte II	11	26	5	0	2	1	0	0	2	47	12.1
Le Forte III	0	2	0	0	0	0	0	0	0	2	0.5
Dentoalveolar	36	49	17	19	12	2	1	2	3	141	36.3
Total	90	165	39	50	16	5	8	7	8	388	100
%-Age	23.2	42.5	10.1	12.9	4.1	1.3	2.1	1.8	2.1		

**Table 4**  
*Definitive management of OMFI-patients*

Definitive Treatment	No. of procedures	Percentage (%) out of 1203
Soft tissue repair	727	60.4
Open reduction & internal fixation (ORIF).	48	4.0
Closed reduction (intermaxillary fixation with eyelets or arch bars.	559	46.5
Arch bar-wiring for dentoalveolar fractures	172	14.3
Other forms of management.	116	9.6
Total	1622	134.8

**Figure 6**  
*Injuries associated with OMFI's*



## DISCUSSION

OMFIs may occur in isolation or multiplicity and often involve both skeletal and soft tissue structures. The sex distribution with a high male: female ratio of 4.6:1 in this study was comparable to that found in other studies (3,6,8,9,11). Literature from different areas shows varying ratios of male: female, but the males are consistently seen to be more affected by OMFIs in all the studies. This male-to-female ratio may be attributed to aggressive and high risk male behaviour.

Most of the victims of OMFIs in this study were young men in the 20-30 year- old age group and similar observations has been made in other studies done in Kenya, Lahore- Pakistan and United Kingdom (8,12,13). The high incidence of OMFIs in this age group is not surprising given their high level of activity that exposes them to high injury risk including contact sports, high speed driving, interpersonal violence and use of mood altering drugs (2,14).

In general RTIs were responsible for the highest number of OMFIs most of which were as a result of MCA. The exponential rise in the trend of motorcycle-related OMFIs from the year 2000 to 2009 is probably due to the increasing number of unemployed young men involved in motorcycle transport business (*boda boda*) as an alternative form of employment. The ever increasing traffic jams on most urban roads has popularised public transport by the motorcycle as an alternative means that is both cheaper and more versatile.

These observations were comparable to studies elsewhere including Malaysia where RTIs were responsible for 73% of OMFIs and motorcycle injuries accounted for 60% of the RTIs (11). In a Nigerian study it was also observed that 72% of the OMFIs sustained by their study population were due to RTIs (15,16). In Kenya where earlier studies had shown that IPV was the major aetiological factor of mandibular fractures, RTIs were seen to be on the rise by subsequent studies (5).

In this study the bicycle was responsible for 8.2% of all the OMFIs and 13.5% of RTI-related OMFIs that were recorded. Most road traffic regulations tend not to address non- motorised forms of transport on the roads, yet from this study they contributed substantially to RTI- related OMFIs, which points to a necessity of incorporating regulations for non-motorised forms of transport in road traffic rules. IPV was second to RTI as an aetiological factor of the OMFIs in this study and was comparable to a previous Ugandan study (15) To the contrary, studies done in Kenya and Zimbabwe on mandibular fractures as well as some studies done in developed countries showed that IPV was the main aetiological factor of OMFIs (6,8,9). IPV often reflects peoples' way of social life and psychological stress levels in a community. Use

of alcohol and abuse of narcotic drugs are a major factor in the increase of IPV especially in developed countries (6). The male gender as observed in this study tends to be more affected by IPV due to non-domestic causes.

Different studies have shown different prevalence of distribution of facial injuries, however, findings of this study concurred with what was observed in a previous Ugandan and Lahore-Pakistan studies (15, 12). Most fractures of the mandible were multiple in nature, but the most common fractures of the mandible occurring in isolation involved the body. Studies done in Malaysia, Nigeria and Brazil have shown that fracture distribution of the mandible is related to Aetiology; whereas RTIs are commonly associated with symphyseal and condylar fractures, while IPV mainly affects the body and the angle of the mandible (11,18,19).

The maxilla was found to be the most affected bone in the mid-facial region as observed in a previous Ugandan study, however, other studies have reported the zygoma to be more affected by OMFIs in the mid-face (2,16). The pattern of soft tissue injuries (STIs) also varied according to aetiology. Whereas STIs due to fire arm injuries and biting animals were avulsive in nature those from RTIs presented mainly as lacerations and abrasions. Similar observations were made in studies done in Kenya and Nigeria (20, 21, 22).

In cases where OMFIs were associated with other injuries, head injury was the most prevalent followed by limb fractures, eye and chest injuries respectively. Comparable findings were observed in a Kenyan study where 15-45% of head injuries were found to be associated with OMFIs (5). The prevalence of head injury is most likely due to anatomical proximity and in a number of trauma cases the extent of OMFIs may act as markers for severity of head injury (19).

A high number of patients in this study underwent soft tissue repair mainly due to lacerations and a few soft tissue avulsions which was comparable to a Nigerian study where 62.2% of the victims were treated for soft tissue injuries (16). A large proportion of skeletal injuries were managed by means of closed reduction which included intermaxillary fixation with eyelet wires and arch bar splinting, whereas a very small percentage of the victims were managed by ORIF. This was comparable to a previous Ugandan study (15) and a similar situation was reported in a Nigerian study where 98% of mandibular and 70.1% of zygomatic fractures were managed by closed reduction (2). In comparison to the developed world and more advanced economies, most facial fractures are managed by open reduction and internal fixation (ORIF) (24, 25).

In conclusion, OMFIs affects mostly young males between 21 and 30 years of age. The main aetiological

agents were road traffic crashes especially motorcycle accidents and IPV. The trend of OMFIs especially due to MCAs was on the rise over the ten year period and the mandible was found to be the most affected bone by OMFIs. Skeletal injuries were commonly managed by closed reduction, whereas ORIF was rarely utilised at this MNRH unit.

The difference in forms of definitive management of skeletal injuries between the developed and developing countries might be due to differences in financial affordability of the services and availability of expertise to render the specialised services

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