Prevalence of Oral and Maxillofacial Injuries among Patients Managed at a Teaching Hospital in Rwanda

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Abstract

Background: Oral and maxillofacial injuries have been shown worldwide to be a major cause of disability and orofacial deformity. The magnitude and causes of oral and maxillofacial injuries varies from one country to another or even within the same country depending on prevailing conditions such as socioeconomic, cultural and environmental factors. **Objectives:** To assess the magnitude and etiology of oral and maxillofacial injuries in relation to socio-demographic data among patients attending Kigali University Teaching Hospital (CHUK), Dental department. **Methodology:** A prospective cross-sectional study recruited a total of 182 subjects who were interviewed to obtained information on socio-demographic data and the cause of the inflicted injuries. Diagnoses of the different types of hard and soft tissue injuries were done by clinical examination of patient and where necessary radiographic investigations were requested to confirm hard tissue fractures. All collected information was recorded in the clinical form. Gathered data was coded and entered into a computer and analyzed using SPSS version 17. **Results:** Prevalence of oral and maxillofacial injuries was 16%. Most patients (53.8%) were in 21-30 age group with a male to female ratio of 2.2:1. The commonest hard tissue injuries sustained were dentoalveolar and mandibular fracture at 59.3% and 19.8% respectively, while trauma to the lip was the commonest (38.7%) soft tissue injury among the patients. Road traffic accident collectively accounted for 59.8% of all the etiological factors of oral and maxillofacial injuries. **Conclusion and recommendations:** The prevalence of oral and maxillofacial injuries was 16%. Road Traffic Accident accounted for most of the injuries in the study population. Prevention strategies of maxillofacial injuries among others should emphasize on reduction of road traffic accidents with particular attention to motorcycle and motor vehicle accidents.

Key words: Prevalence, oral, maxillofacial, injuries, Rwanda

Introduction

Oral and maxillofacial injuries refer to injuries of the orofacial soft tissues, facial skeleton, teeth and associated specialized soft tissues within the head and neck region as a result of wounding or external violence. These injuries can lead to orofacial deformity and malfunction greatly diminishing quality of life and worker productivity. [1] The causes of oral and maxillofacial injuries include road traffic accident (RTA), falls, assaults, sports, domestic and interpersonal violence. These etiological factors have been shown to vary in different countries or within the same country depending on factors such as socioeconomical, cultural and environmental conditions. [2]

Current information indicates that road traffic accident remained the major etiological factor for these injuries in developing countries. [3, 4] Findings from other parts of Africa particularly Nigeria have shown an increase in other etiological factors of maxillofacial injuries such as assaults, sport injuries and industrial accidents. [2] It is important to understand that maxillofacial traumas represent one of the greatest challenges to public health services worldwide, because of their high incidence and significant financial cost involved in their management. These injuries are often associated with morbidity and varying degrees of physical, functional and aesthetic damage. [5, 6] Equally important to know is the fact that these injuries occur in a significant number of general trauma patients and management includes treatment of facial bone fractures, dentoalveolar trauma, soft tissue injuries, as well as concomitant or associated injuries. [4, 7]

Several studies for determination of the prevalence and etiology of maxillofacial traumas have been carried out worldwide with the aim of characterising patterns, identify new trends for occurrences of these injuries, plan and evaluate preventive measures and health policies, and develop priority goals for research in this area. [2,4,8] It was interesting to find out that the epidemiological features varies tremendously and seems to be related to local prevailing factors of the country under study. [4, 9] In East Africa, studies assessing the prevalence, etiological factors and pattern of maxillofacial injuries have been done in Tanzania and Uganda. Studies done in Tanzania by Deogratius and Ahmed found that generally, mandibular fractures were

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higher than maxillary one. In study done by Deogratius mandibular fracture were two folds more than maxillary one while in Ahmed study mandibular fractures were four times higher than maxillary fractures. [4,10] Ahmed et al found that the distribution of maxillary fractures was; Le-Fort I in 66.7 %, Le Fort II were 29.4%, 10.7% were Le Fort III and 49% were dentoalveolar fractures. A study done in Uganda characterizing the prevalence of maxillofacial trauma revealed a different magnitude of these injuries. Among the most prominent injury was mandibular fracture, which accounted to 66% of all the maxillofacial fractures. [11]

Rapid socio-economic transformation and population increase currently seen in Rwanda calls for expansion in infrastructures such as roads, availability of transport, hospitals to improve public services. The pattern and etiological factors of oral and maxillofacial injuries in Rwanda need to be determined as such database is necessary for planning prevention strategies and management of these cases in order to reduce treatment costs and the burden to the few available oral health workers involved in management of these injuries. Of recent, only general information is available in Rwanda patterning morbidity and mortality caused by road traffic accident [12], however, no specific data in detail and magnitude of maxillofacial injuries and other related etiological factors apart from RTA was provided.

Information on the actual magnitude, pattern and etiological factors of oral and maxillofacial injuries in Rwanda is missing. Such information is fundamental for assessing health service needs, for the development of prevention programs and treatment protocols for these injuries. This is vital in Rwanda, which faces a critical shortage of health care workers especially specialized oral health personnel who manage these cases. The aim of this study was therefore to assess the magnitude and etiological factors of oral and maxillofacial injuries among patient attending Kigali university teaching hospital (CHUK) and use the findings to institute prevention programs and treatment protocols.

Study methods

Study design, population and area

A prospective cross-sectional study design was used to determine the prevalence and aetiology of oral and maxillofacial injuries among patients of all ages attending stomatology department at Kigali University Teaching Hospital, (CHUK) in a period of one month, June 2011.

Data collection

All patients consented to the study and those who met the inclusion criteria were interviewed and examined to obtain information on socio-demographic data, causes and the presented types and anatomical sites of oral and maxillofacial injuries. Secondary consent was obtained from attendants of patients who were unconscious and who couldn't express themselves and information regarding their socio-demographic data were obtained from their attendants.

Examination to ascertain the type of injury sustained was done on the dental chairs in the dental department or in the causality department for the emergency cases that needed consultation of dental personnel. Patients were examined for the different oral and maxillofacial hard and soft tissue injuries such as facial bone fractures, dentoalveolar fractures, dislocation, soft tissue trauma such as facial bruises, lacerations, cut wound abrasion, penetrating wound etc. Appropriate radiographic investigations were requested for patients who presented with signs of facial bone fractures in order to precisely ascertain the type of bones fractured. All information gathered from patient interview and examinations were recorded in a specially designed clinical form, which had the details of the patient's socio-demographic data, causes, type and anatomical sites of the injuries. The collected data were coded and entered onto computer for analysis.

Data analysis

Analysis was done using SPSS version 17-computer software program for frequencies and percentages. The results were presented using tables of frequencies/percentages to express the prevalence of oral and maxillofacial injuries with socio-demographic data, causes, types and anatomical sites of the sustained injuries to the study population.

Ethical considerations

The study was conducted after getting ethical clearance from Kigali Health Institute and the permission from Kigali University Teaching Hospital (CHUK) administration. Thorough explanation of the purpose of the study and how data will be treated with respect and confidentiality was provided to the participants.

Patients signed a written consent before participating to the study and they were free to participate without interfering with required treatment planned for them.

Results

A total of 1141 patients with different dental and orofacial problems attended CHUK during the study period. Overall prevalence of oral and maxillofacial injuries was 16%.

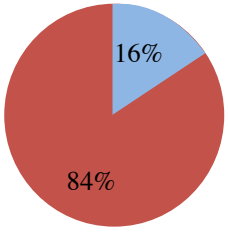

Figure 1 Overall prevalence of oral and maxillofacial injuries

The distribution of oral and maxillofacial by age among the study subjects revealed that the age group 21-30 years presented with more than half (53%) of the total oral and maxillofacial injuries and the least injuries (7.7%) were seen in 0-10 age group (Table 1). Furthermore the proportional of injuries was more than two folds (69.2%) in males as compared to (30.8%) in female.

Table 1 Prevalence of oral and maxillofacial injuries according to age and Gender

Age group (Years)	N (%)	CI (%)
0 - 10	14(7.7%)	4.6 - 12.5
11- 20	18(9.9%)	6.3 - 15.1
21 - 30	98(53.8%)	46.6 - 60.9
31 - 40	28(15.4%)	10.9 - 21.3
≥ 41	24(13.2%)	9.0 - 18.9
Total	**182(100%)**	
Gender	**N (%)**	**CI (%)**
Male	126(69.2%)	62.2 - 75.5
Female	56(30.8%)	24.5 - 37.8
Total	**182(100%)**	

Causes of oral and maxillofacial injuries

The most frequently cause of oral and maxillofacial injuries was motorcycle and motor vehicle accident with a proportion of (24.7%) and (20.9%) respectively. Fall accident accounted to (17.6%) and bicycle accident was (14.3%). Assault and domestic violence had relatively the same proportional, 7.7%) and 7.1% respectively while injuries due to sports accident presented with 5.5% of the overall study subjects.

Table 2 Frequency of the causes of injuries

Causes	N (%)
Sports accident	10(5.5%)
Moto vehicle	38(20.9%)
Motorcycle	45(24.7%)
Bicycle	26(14.3%)
Domestic violence	13(7.1%)
Fall accident	32(17.6%)
Assault	14(7.7%)
Others	4(2.2%)
Total	**182(100%)**

Proportion of the type/anatomical sites for hard and soft tissue injuries sustained by patients

Tooth fracture has been showed to be the most affected hard tissue involved with injuries (39%), followed by the alveolar bone fracture (20.3%), mandibular fracture (19.8%) and Le fort I (7%). Other sites for hard tissue involvement were seen in small proportion such as multiple sites injuries (4.1%), condylar fracture (2.9%), zygomatic fracture (2.9%), Le fort III (1.7%), Le fort II (1.2%) and zygomatic arch fracture (1.2%). Only 10 (5.4%) out of 182 subjects were found to have not sustained any hard tissue injury.

Table 3 Frequency of injuries according to the anatomical sites

Hard tissue injury	N (%)
Tooth fracture	67(39%)
Alveolar bone fracture	35(20.3%)
Le Fort I	12(7%)
Le Fort II	2(1.2%)
Le Fort III	3(1.7%)
Mandibular fracture	34(19.8%)
Condylar fracture	5(2.9%)
Zygomatic fracture	5(2.9%)
Zygomatic arch	2(1.2%)
Multiple site fractures	7(4.1%)
Total	**172(100)**
Soft tissue injury	**N (%)**
Tongue	11(6.1%)
Oral mucosa	37(20.4%)
lips	70(38.7%)
Cheeks	17(9.4%)
Frontal region	13(7.2%)
Submandibular area	5(2.8%)
nose	9(5%)
Eyelids	5(2.8%)
Multiple sites	14(7.7%)
Total	**181(100%)**

Furthermore, the most frequent site of soft tissue injuries was found to be the lips with a frequency of 38.7% followed by oral mucosa (20.4%), cheeks (9.4%), multiple sites (7.7%), frontal region (7.2%), the tongue (6.1%), the nose (5%), eyelids and submandibular area (2.8%) as showed by the table above. Only one subject was found to have exclusively involved in hard tissue injury.

Distribution of participants by type of soft tissue injuries

With regard to the type of soft tissue injuries, the most frequently type seen was tissue lacerations that accounted for (22.1%), followed by abrasion injuries (16.6%), 6.6% presented with multiple soft tissue injuries and the least seen (2.7%) was burn wounds.

Table 4 Frequency of soft tissue injuries

Soft Tissue injury.	N (%)
Bruises	27(15%)
Lacerations	40(22.1%)
Abrasion	30(16.6%)
Avulsion	22(12.2%)
Burns	5(2.7%)
Cut wound	17(9.4%)
Penetrating wound	16(8.8%)
Bite wound	12(6.6%)
Multiple types	12(6.6%)
Total	**181(100%)**

Discussion

In this study, 1,141 patients age ranged from 1 month to 70 years attended CHUK stomatology department, between March to April 2011 and among them 15.7% (n =182) cases presented with oral and maxillofacial injuries (Figure 1). This prevalence of maxillofacial injuries within the study period of one month seems to be high. Findings from a one-year study by Twagirayezu et al [12] on assessment of pattern of road traffic injuries at the emergency department in the same setting revealed a prevalence of 29.6% of injuries associated with head region. Though Twagirayezu study focused only on injuries due to RTA where as this study included oral and maxillofacial injuries of different causes, the difference seen in the magnitude of injuries may be due to the duration of the study period that was shorter in this current study. However, the high prevalence of maxillofacial injuries obtained in this study correlates with that of 16% among trauma patients in Austria. [13]

The distribution of oral and maxillofacial injuries by age among the study subjects revealed that the age group 21-30 represented the peak age of incidence of these injuries (Table 1). This finding is not different from reports from other parts of the world. [14, 15] The possible explanation for this as also reported in literature is that this age group is the most active age group that are involved in different activity such as travelling for day-to-day activities, take part in dangerous exercises and sports, driving motor vehicles carelessly, and are most likely to be involved in violence hence placing them at high risk of sustaining these injuries. [14, 15]

With regard to gender, male to female ratio distribution of oral and maxillofacial injuries of 2.2: 1 found in this study shows that male are at more than two fold being involved in oral and maxillofacial injuries than female (Table 1). A study done in Uganda revealed a ratio of 7.7:1 [11], that of Nairobi found a ratio of 8.4:1 [16] and a male to female ratio of 4.3:1 was obtained in Tanzania. [17] The general trend in many countries shows the same preponderance for male than female at even high proportion than that found in East Africa. [18] The higher preponderance of male subjects could be attributed to the fact that males are involved in many out-doors activities than females in many African settings, Rwanda included, hence are likely to be involved in RTA accident, violent conduct, participate in sports and other related activities associated with injuries. In this study however, the male to female ratio is low compared to the other studies from East Africa. [11,16,17] This may be attributed to the small sample size used in this study hence this may have reduced the power of the study.

It is obvious from this study that collectively, 58% of all cases of oral and maxillofacial injuries were caused by road traffic accident (Table 2). The higher proportion of injuries due RTA seen in this study contradicts with that of 13.7% from a study done in Tanzania [10] and slightly higher than that of 50.6% obtained in Uganda. [11] In this study the motorcycle has been incriminated as the most cause of maxillofacial injuries. The same findings have also been reported in Uganda [11] where they are called "bodaboda". The relatively similar findings of RTA among the study population in Rwanda and Uganda may be related to the use of motorcycles as common means of transport in these countries. However, the high prevalence of maxillofacial injuries due to RTA revealed in this study correlates with the general trend in developing countries which places road traffic accident as the main etiological factor for oral and maxillofacial injuries. [3, 4, 23]

In the present study, fracture of the tooth and alveolar bone (dentoalveolar fracture) constitutes more than half (59.3%) of the type of injury sustained in the study subjects (Table 3). High occurrence of dentoalveolar fracture of (49%) was also reported in United Arab Emirates. [4] The high proportion of dentoalveolar injuries seen in this study may be due to frequent use of motorcycle in Rwanda as a means of transport in ordinary people, which despite the use of helmets that protect most part of the head, it leaves part of the dentoalveolar region less protected. This is also supported by the fact that motorcycle accident contributed to about 25% and ranked the first with regard to the causes of oral and maxillofacial injuries in Rwanda (Table 2). Fracture of the mandible of 19.8% obtained from this study (Table 3) is not in agreement with studies done in Tanzania and Uganda, which revealed a prevalence of 70.7% and 66% of mandibular fracture respectively. [10, 11] Several studies in literature documented assaults and domestic violence as the major cause of mandibular fractures [10, 11, 19], the low proportional of mandibular fracture evidenced in this study may be correlated with the low proportion of reported domestic violence and assaults in the present study (Table 2), which from other studies particularly those from some East African countries have been greatly incriminated with mandibular. [10, 11]

Regarding the types of soft tissues injuries, the most frequent type was tissue lacerations (24.4%) followed by soft tissue abrasion (18.3%). Other type of soft tissue injuries such as bruises, avulsion, penetrating wound, bite wound, cut wound and burns wound were seen in small proportional. These findings are in agreement with some other studies, which portrayed relatively the same picture. [20, 21, 22] The pattern and types of soft tissue injuries seen in this study may be associated with the different cause of injury where motorcycle accident would be more causative to soft tissue tearing and laceration.

Conclusion and recommendation

The prevalence of oral and maxillofacial injuries was high and most of the injuries were due to RTA. The age group 21 to 30 years was the most frequently involved in oral and maxillofacial injuries. Dentoalveolar region is the most exposed and mobile hard tissue that was mostly involved on injuries.

Preventive strategies of oral and maxillofacial injuries among others should emphasize on reduction of road traffic accidents particularly motorcycle and motor vehicle accidents through intentional reinforcement of strategies for implementation of road safety rules by traffic police.

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Conflict of interests

Authors of this study declared no conflict of interest in relation to presentation of this manuscript.

Authors' contributions

All the authors participated in the design of the research proposal at one stage or another. MMH was the principal investigator working closely with MCH and SRM in all stages of this study. GM, JN, AN and ER apart from participating in some stages of research proposal, played an important role in data collection and data entry. The principal investigator with an invaluable assistance from other co-authors made the data analysis possible.

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