

Prevalence, Pattern and Factors associated with Dentoalveolar Injuries of Permanent Dentition in Trauma Victims Presenting at Mulago Hospital, Uganda

A. Okeny, A. Kutesa, L. Muwazi, A. Mwanika. CM. Rwenyonyi*

Department of Dentistry, College of Health Sciences, Makerere University, Uganda

***Corresponding Author:** CM. Rwenyonyi, Department of Dentistry, College of Health Sciences, Makerere University, Uganda.

ABSTRACT

Dentoalveolar injuries are a common problem worldwide and their prevalence, pattern and etiologic factors vary from country to country and within the same country. The study was carried out among oral and maxillofacial trauma victims presenting in Mulago Hospital to establish the prevalence, pattern and factors associated with dentoalveolar injuries of permanent dentition. This was a hospital based descriptive case series study among oral and maxillofacial trauma victims attending Oral and Maxillofacial Surgery unit of Mulago Hospital. Data were collected using a questionnaire in form of an interview, clinical examination and patients' medical records. The data were analysed using Statistical Package for Social Sciences. A total of 246 patients with dentoalveolar injuries were recruited in the study. Approximately 76.0% were male presenting a male to female ratio of 3.2:1 with a mean age of 27.2 ± 9.6 (range, 5 to 58) years. Dentoalveolar injuries associated with fracture of the mandible were recorded in 27.5% of cases; crown fracture without root fracture in 19.7% and tooth avulsion in 15.6%. The anterior teeth were more frequently involved compared to the posterior; 85.4% versus 14.6%. The maxillary central incisors were the most affected teeth (25.8%). Most participants (78.0%) had accidents and in urban areas. Road traffic accidents were the most common cause of injury (51.2%) followed by assault (34.6%). It is evident, most participants were victims of road traffic accidents especially motorcycles, and assaults. Despite acknowledging the protective usefulness of helmets against maxillofacial injuries, most motorcycle riders never use them indicative of the need to reduce road traffic accidents through community sensitization on road safety measures and enforcement of traffic laws and regulations such as donning helmets.

Keywords: Dentoalveolar injuries, permanent dentition, road traffic accidents, trauma

INTRODUCTION

Previous survey¹ showed that the data on dentoalveolar injuries vary from one country to another and even within the same country depending on the prevailing socioeconomic, cultural and environmental factors. Trauma to dentoalveolar is injury resulting from an external force² and the face being anatomically prominent part of the body is vulnerable to such injuries. Dentoalveolar injuries may occur as a result of various causes³. About 20% to 60% of victims involved in automobile accidents have some level of facial fractures with dentoalveolar injuries⁴.

Injuries due to contact sports, usually occur in early childhood while road traffic accidents (RTAs) and assault are frequent in early adult hood, and are often associated with alcohol abuse⁵. Richard⁵ observed that the factors which

influence the outcome or type of dentoalveolar injury are a combination of energy impact, resilience of the impacting object and the angle of the direct or indirect impacting force.

Majority of cases of oral and maxillofacial trauma involve dentoalveolar and orofacial soft tissue injuries whereas the frequency of facial bone fractures not involving dentoalveolar tissues are relatively low. The reported frequency of tooth avulsion ranges from 1% to 16% of traumatic injuries to the permanent teeth, especially the maxillary central incisors in both the permanent and primary dentition^{2,3}. Gutman³ postulated that maxillary teeth with an overjet of more than 4 mm are 2 to 3 times more likely to be injured compared to the normally aligned teeth. He also found that sports accidents and fights are the most common causes of dental trauma in teenagers. Injuries of the alveolar portion of the mandible and maxilla

are common and can even result following a relatively low impact force, at times involving segmental fractures with multiple teeth and the supporting alveolar bone.

Other studies⁶⁻¹⁰ in developed countries indicated that the prevalence of dentoalveolar injury ranges from 14.0% to 19.0% with an average of 17.0% in permanent dentition. These values were comparable to 15.4% reported in South Africa¹¹. In Nigeria, it was revealed that maxillofacial injuries in general and dentoalveolar injuries in particular have male predominance over female counterparts with a ratio of 2:1¹². This male predominance, however, is evident in permanent and not in the primary dentition. Dentoalveolar injuries recorded in Kenyatta National Hospital, Nairobi, boys were more affected than girls: 63.0% versus 37.0%¹³. They observed that falls were the leading cause of injuries (73.5%) and most injuries involved two teeth (47.1%) with the maxillary central incisors being the most affected teeth (64.0%).

In Uganda, there are a few reports^{14,15} on dental mutilations in traditional practices. However, specific information on dentoalveolar injuries is scarce. The aim of this study was to establish the prevalence, pattern and factors associated with dentoalveolar injuries in trauma victims attending Mulago Hospital, Uganda.

MATERIAL AND METHODS

Study Design

This was a hospital based descriptive case series study.

Study Setting

The study was carried out in Oral and Maxillofacial Surgery (OMFS) clinic of Mulago Hospital. The hospital is a national referral and teaching facility located in Kampala, the capital city of Uganda. It has a capacity of 1500 beds. The OMFS clinic is specialized in managing patients with oral and maxillofacial conditions including dentoalveolar injuries. The clinic has an Out Patients Unit and a 22 bed capacity ward. Oral and maxillofacial trauma patients report to the hospital through the Casualty/Emergency Department and depending on their condition, are either sent to the OMFS Out Patients Unit or to the ward. Some of the patients are referred directly to the OMFS Out Patients unit from lower health facilities. They are attended to by a team of oral and

maxillofacial surgeons, senior house officers, dental surgeons, interns and nurses.

Selection of Study Participants

The participants consisted of trauma victims with dentoalveolar injuries that reported to OMFS unit of Mulago Hospital. The participants were selected by consecutive recruitment.

Inclusion Criteria

- All participants who reported with dentoalveolar injuries of permanent dentition.
- The patients who consented to participate in the study.

Exclusion Criteria

Patients with dentoalveolar injuries who on their own or whose attendants could not recall the history and/or cause of the injury.

Study Sample Size

The sample size (n=237) was determined based on anecdotal prevalence of dentoalveolar injuries (19%) among patients who reported in OMFS unit, Mulago Hospital in 2011 (Okeny, 2012 unpublished), the standard value (1.96) corresponding to 95% confidence interval and the acceptable margin of error of 5%¹⁶.

Study Variables

Independent variables: age, sex, place of residence, location where the injuries took place and cause of the injury.

Dependent variables: prevalence and pattern of dentoalveolar injury.

Data Collection

Background information was collected using a validated structured questionnaire and the participants were examined by the Principal Investigator (AO) to record any injuries of hard facial tissues and teeth using a mouth mirror, dental probe and tongue depressor in an overhead artificial light. The findings of dentoalveolar injuries were recorded based on Andreasen and Andreasen² classification on a record form. Soft tissue injuries were excluded in this study. Before clinical examination, the examiner was trained and calibrated against an Oral and Maxillofacial Surgery Consultant in recording dentoalveolar injuries with a Cohen's kappa value of at least 0.83.

Radiographic Investigations

Radiographs including orthopantomograph, periapical and occlusal views which were routinely requested by the attending surgeons were interpreted by the Principal Investigator with the help of an Oral Radiologist to confirm the clinical findings on the nature of the injuries of dentoalveolar hard tissues.

Data Management and Analysis

The data were double checked for errors and completeness after each day's work. The data sheets were secured in a safe place under lock and key. The data were entered into a computer and again double checked for any errors and completeness. The analysis was done using Statistical Package for Social Sciences Inc. (SPSS version 17 for windows, Chicago, Illinois, USA). Frequency distributions were used to summarize the data and presented in tables and figures.

Ethical Consideration

The study protocol was approved by Makerere University School of Health Sciences Research and Ethical Committee and Mulago Hospital Research and Ethics Committee. Informed consent was obtained from the study participants /guardians of children below 18 years of age in accordance with Helsinki Declaration¹⁷. In addition to the consent, the children were requested to assent to the study. The consent/assent form was translated from English into the local language (Luganda) for participants who did not understand English. They were informed that they were at liberty to accept or refuse to participate in the study without being coerced and their refusal would not affect their relationship with investigators. No personal identifiers were used in recording the data and the final report on the findings is anonymous.

Study Limitations

1. The study relied on existing radiographs due to limited funding.
2. Some dentoalveolar injury patients with other severe injuries could have been referred to other units for specialized treatment during

the study, which could have led to loss of data.

RESULTS

A total of 1524 oral and maxillofacial trauma patients presented in Mulago Hospital, among whom 16.1% (n=246) had dentoalveolar injuries. About 76% of the patients with dentoalveolar injuries were male presenting a male: female ratio of 3.2:1 (Table 1). Most affected age groups were 16-25 and 26-35 years, with an overall mean age of 27.2 ± 9.6 years (Table 1). Most participants had dentoalveolar injuries that occurred in urban compared to rural areas (78.0% versus 22.0%). Majority of participants were business persons (42.3%) followed by students (35.8%, Table 1). About 86.7% of the participants were pedestrians and 11.8% were motor cycle riders.

Table1. The frequency distribution of the participants according to sex, age, occupation and site of accidents (n=246)

Variables	Categories	Number	Percentage
Sex	Male	187	76.0
	Female	59	24.0
Age groups (years)	05-15	20	8.1
	16-25	90	36.6
	26-35	94	38.2
	36-45	34	13.8
	46 and above	8	3.3
Site of accident	Urban	192	78.0
	Rural	54	22.0
Occupation	Motorcycle riders	29	11.8
	Informal business	104	42.3
	Drivers	4	1.6
	Housewife*	29	5.3
	Students	88	35.8
	Teachers	8	3.0

*These were exclusively housewives without any other occupation.

Pattern of Dentoalveolar Injuries

Most participants had dentoalveolar injuries associated with fracture of the mandible (27.5%), followed by those with tooth crown fracture without root fracture (19.7%, Fig. 1). Fracture of the maxilla and intrusion/extrusion were the least recorded each involving 3% of the participants.

Prevalence, Pattern and Factors associated with Dentoalveolar Injuries of Permanent Dentition in Trauma Victims Presenting at Mulago Hospital, Uganda

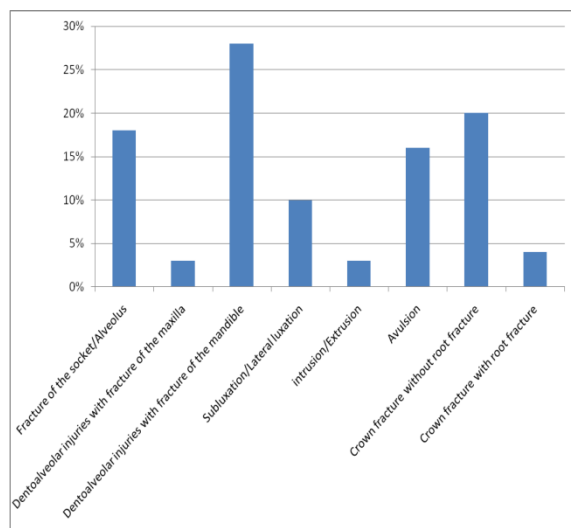


Fig1. The frequency distribution of participants according to pattern of dentoalveolar injuries (n=246)

Teeth Injured

Most participants had trauma of anterior teeth as compared to the posterior: 85.4% versus 14.6%. The maxillary central incisors were most affected (25.8%) followed by maxillary lateral incisors, 19.5% and mandibular central incisors (11.5%, Fig. 2).

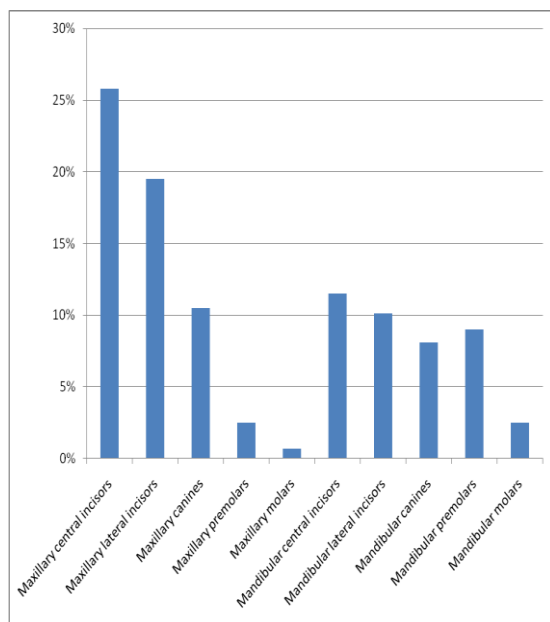


Fig2. The frequency distribution of permanent teeth with traumatic injuries (n=750)

Factors Associated with Dentoalveolar Injuries

The majority of the participants with dentoalveolar injuries were due to road traffic accidents (51.2%) followed by assault (34.6%, Table 2). Motor cycles contributed 80.2% of all

the road traffic accidents (Table 2). About 88.6% of the motor cycle riders said they never use helmets. Approximately 3.4% of the cyclists were putting on helmets during injury. All motor cycle riders thought helmets are useful in preventing dentoalveolar injuries. None of the vehicle occupants who sustained dentoalveolar was putting on seat belt. Most causes (69.0%) of dentoalveolar injuries in the 5 to 15 year age group were falls.

Table2. Frequency distribution of participants according to factors associated with dentoalveolar injuries (n=246)

Factors	Number	Percentage
RTA (n=126)	101	80.2
Motor cycles		
Cars	25	19.8
Assaults	85	34.6
Falls	27	11.0
Sports	6	2.4
Others	2	0.8

DISCUSSION

Considerable variation has been reported in the profile of dentoalveolar injuries with respect to the geographical location, socioeconomic status, and cultural background¹. Omer et al.¹ recommended that the effectiveness of various preventive and educational programs with respect to dentoalveolar trauma may be reflected through continuing audit of the causes and pattern of injuries in different parts of the world, which was the purpose of the present study. The present study was a cross sectional case series design similar to previous studies^{1,13,18}. The clinical examiner (AO) was trained and calibrated against a Consultant Oral and Maxillofacial Surgeon, which standardized the clinical recording of dentoalveolar injuries. However, the intra-examiner reproducibility was not assessed because the criteria for recording dentoalveolar injuries are so clear that errors are so minimal². To avoid alteration in diagnostic findings from one participant to another, the examinations were done in similar conditions on a dental chair in artificial light using a mouth mirror and tongue depressor with finger palpation. Radiographic interpretations were done in consultation with an Oral Radiologist to eliminate errors in diagnosis.

In the present study, the prevalence of dentoalveolar injuries was 16.1%, which falls in the range of 14.0% to 19.0% recorded elsewhere among patients with oral and maxillofacial trauma⁸⁻¹⁰.

About three quarters of the patients who sustained dentoalveolar injuries were male (Table 1) in support of previous studies in Nigeria¹², Kenya¹³, Pakistani¹⁸ and India¹⁹. This observation is attributed to gender based activities where male tend to be more involved in trauma predisposing activities like riding motorcycles, contact sports, physical violence following drug and alcohol abuse compared to female²⁰. Betsy *et al.*²⁰ also found that female are 3 to 4 times less likely to be involved in high risk behaviors than the male counterparts putting men more at risk than women from trauma. The gender distribution also revealed a male preponderance in all the age groups in agreement with other studies^{18,19,21}. Most dentoalveolar trauma patients were employed in the informal sector (Table 1) and particularly pedestrians who fall in the lower socioeconomic class, which corroborates previous findings in Rawalpindi, Pakistan¹. Overall, the middle age group (16 - 35 years) was the most vulnerable to dentoalveolar injuries (Table 1), which is consistent with findings in previous studies in Pakistani¹, India¹⁹ and Turkey²¹. It could be postulated that this age group is the most active especially in fending for their livelihood and are thus more vulnerable to accidents.

More than three quarters of the dentoalveolar injuries occurred in urban areas (Table 1) and particularly due to RTA and assault (Table 2), similar to a previous survey in Uganda²². This finding may partly be attributed to the high prevalence of business involving transport on roads with congested traffic in urban areas.

In the present study dentoalveolar injuries associated with fracture of the mandible and crown fracture without root fracture were most prevalent (Fig.1), which corroborates previous studies^{1,18,19}. This implies that the factors associated with dentoalveolar injuries tend to determine the type of injuries sustained. It is probable that RTA and assaults lead into high external force to the dentoalveolar structures thus causing the type of injuries seen in the present study.

The high proportion of mandibular fractures seen in the present study may additionally be attributed to the anatomical prominence of the mandible.

Most teeth involved in injuries were in the anterior segment particularly the maxillary central incisors (Fig. 2). This finding is in agreement with other studies^{11,13,18,19,23}. It was previously reported that the more proclined the maxillary incisors are, the more prone they are to injuries. However, in the present study, tooth inclination was not assessed.

Despite all motorcycle riders acknowledging that helmets are useful in preventing dentoalveolar injuries, about 89% reportedly never used them. This finding is consistent with Muhammad *et al.*¹⁸ who reported that helmets and seat belts are rarely used although they are mandatory by law in Pakistan.

Assault contributed about a third of dentoalveolar injuries (Table 2), a value higher than 5% recorded in Pakistan¹⁸. The younger age group of 5-15years commonly sustained injuries due to falls and sports activities, consistent with previous studies³.

CONCLUSIONS AND RECOMMENDATION

Road traffic accidents especially motorcycles, and assaults were the main factors associated with dentoalveolar injuries. Despite acknowledging the protective usefulness of helmets against maxillofacial injuries, most motorcycle riders never use them.

Therefore, there is need to reduce road traffic accidents through community sensitization on road safety measures and enforcement of traffic laws and regulations such as donning helmets.

REFERENCES

- [1] Omer J, Waseem A, Muhammad U, Muhammad W and Lugman U. (2011) Aetiology and pattern of dentoalveolar injuries in patients at armed forces institute of dentistry, Rawalpindi-Pakistan. *J Army Med Corps* 3:123-126.
- [2] Andreasen J, Andreasen A (1994) Textbook and colour atlas of traumatic injuries to the teeth (3rd edition). Copenhagen: Munksgaard,
- [3] Gutman D (2003) Causes, incidence and prevention of trauma to teeth. *Dent Clinics North Am* 39: 1-13.
- [4] Marcenes W, Murray S (2002) Changes in the prevalence and treatment need for traumatic dental injuries among 14-year-old children in Newham, London: a deprived area. *J Community Dent Health* 19: 104-108.
- [5] Richard R. W. (2008) Dentoalveolar injuries. Maxillofacial trauma & esthetic facial reconstruction. Elsevier Ltd. UK. 299-314.

Prevalence, Pattern and Factors associated with Dentoalveolar Injuries of Permanent Dentition in Trauma Victims Presenting at Mulago Hospital, Uganda

- [6] O'Brien M. Children's dental health in the United Kingdom 1993. London: Her Majesty's Stationery Office; 1994.
- [7] Hamdan M, Rock W (1995) A study comparing the prevalence and distribution of traumatic dental injuries among 10-12 year-old children in an urban and rural area of Jordan. *Int J Pediatr Dent* 5: 237-241.
- [8] Kaste Lm, Gift HC, Bhat M, Swango PA (1996) Prevalence of incisor trauma in persons 6 to 50 years of age: United States, 1988-1991. *J Dent Res* 75(2 suppl):696-705.
- [9] Marcenés W, Alessi O, Trebert J (2001) Causes and prevalence of traumatic injuries to the permanent incisors of schoolchildren aged 12 years in Jaragua do Sol, Brazil. *Int Dent J* 50: 87-92.
- [10] Ravishankar M (2010) Prevalence of traumatic dental injuries to permanent incisors among 12 years old school children in Davangere- South India. *Chin J Dent Research* Vol 13: No. 1.
- [11] Hargreaves A, Matejka J, Cleaton-Jones P, Williams S. (1995) Anterior tooth trauma in eleven year-old South African school children. *J Dent Children* 39: 353-355.
- [12] Adeyemo W, Ladenida A, Ongunlewe M (2005) Trends in characteristics of maxillofacial fractures in Nigeria: A literature review. Doi: 10.1186/1746-160x-1
- [13] Masiga M, Chindia M, Muriithi H (2005) Dental injuries in 0-15 years old at Kenyatta National Hospital. *East Afr Med J* 82: 592-597.
- [14] Pindborg JJ (1969) Dental mutilation and associated abnormalities in Uganda. *Am J Physiol Anthropol* 31:383-390.
- [15] Graham E, Peter K, Heather L, Mark A, Domoto P, Lynch H and Egbert M (2000) Dental injuries due to African traditional therapies for diarrhea. *West J Med* 173(2): 135-137.
- [16] Kish L (1965) Survey sampling. New York, John Wiley and sons, Inc.
- [17] World Medical Association (2008) Ethical Principles for Medical Research Involving Human Subjects, Helsinki Declaration. 59th General Assembly, Seoul, Korea.
- [18] Muhammad M, Dilabazhlan (2010) Age, gender distribution and etiology of dentoalveolar fractures. *Pak Oral Dent J* 30: 2.
- [19] Pranav K and Namita K. (2012) A retrospective analysis of maxillofacial injuries in patients reporting to the tertiary care hospital in East Delhi-India. *Int J Crit Illness Injury Sci.* 2: 6-10. Doi: 10.4103/2229-5151.94872.
- [20] Betsy T, Colin F, Edna O, Catriona W and Susane D. (2003) Risk taking behavior in men: Substance use and gender (literature review). Health Development Agency. <http://www.hda.nhs.uk>
- [21] Hilal A, Gulden U and Vedat T. (2009) A retrospective study of dentoalveolar injuries in Diyarbakir-Turkey. *J Int Dent Med Res* 2(3): 86-97.
- [22] Kobusingye O, Galukande D and Leff R (2001). Injury patterns in rural and urban Uganda. Journal website: injuryprevention.bmj.com
- [23] Gholamreza S, Mohammad H, Kalantar M, Alireza A, Pooyan S (2010) Prevalence and patterns of combat sport related maxillofacial injuries. *J Emerg Trauma Shock (Tehran)* V3 (4), 314-317.

Citation: Okeny A, Kutesa A, Muwazi L, Mwanika A, Rwenyonyi C. Prevalence, Pattern and Factors associated with Dentoalveolar Injuries of Permanent Dentition in Trauma Victims Presenting at Mulago Hospital, Uganda. *International Journal of Research Studies in Medical and Health Sciences.* 2017;2(6):16-21.

Copyright: © 2017 Rwenyonyi C, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.