ORIGINAL ARTICLE

Traumatic dental injuries in a tertiary institution in Nigeria: a 4-year retrospective analysis

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ABSTRACT

Background: Traumatic dental injury (TDI) has grown to be a significant public health issue due to its high prevalence as well as the significant negative effects it has on quality of **life.** This study aimed to examine the prevalence and causes of TDI in a Dental outpatient clinic for 4 years.

Materials and methods: A retrospective study was conducted on 52 TDI patients who were treated at a Tertiary Institution's Dental Outpatient clinic between June 1, 2017, and June 1, 2021. Data on age, gender, aetiology, types of teeth involved, types of dental trauma, the day the incidents occurred, and treatment options were retrieved. Traumatized teeth were classified using Andreasen's classification. Statistical analysis was carried out using SPSS version 20.0.

Results: A total of 208 patients with maxillofacial injuries (163 males and 45 females) aged 1 to 81 years were examined. The prevalence of TDI was 25%. Male and female prevalence were 18.2% and 6.7%, respectively. There were 52 TDI patients with a mean age of 16.5 ± 12.02. The most common reason for TDI was motorcycleaccidentsat 30.77%. Avulsion (40.67%) and subluxation (50%) were the most frequently diagnosed injuries in the permanent dentition and primary dentition, respectively. There was no association between trauma source and dentition type (p=0.342), nor was there a difference between trauma source and gender(p=0.863).

Conclusion: The study observed that a high percentage of 40.38% had an injury to three or more teeth resulting in attendant functional and aesthetic complications. Hence public health issue that warrants urgent government attention.

INTRODUCTION

Traumatic dental injury (TDI) is one of the most common maxillofacial injuries worldwide.[1,2] Prevalence is high all over the world, this is influenced by location, culture, health insurance policies, and population's age.[3,4,5,6,7,8] Epidemiological studies from various parts of the world show that the prevalence of TDI varies from 6.4% - 10.5% (9-11)with a male: female of 29.39:14.05. In Brazil, the study of Evelyn *et al*[9] showed a prevalence of 10.5%, with a male to

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Keywords: Dental Injury, Trauma, avulsion, root fracture, Andreasen's classification.

This article is available online at: http://www.mjz.co.zm, http://ajol.info/index.php/mjz, doi: https://doi.org/10.55320/mjz.50.3.423

The Medical Journal of Zambia, ISSN 0047-651X, is published by the Zambia Medical Association

female ratio of 12.2:8.8 while Alkhedra *et al*[10]in Canada reported a prevalence of 6.4% with male to female ratio of 70.9:29.1. In India, Ain*et al*[11] reported 9.3% with male to female ratio 5.06:4.25. In Nigeria the prevalence is reported to be between 6.96% -9.1% (12, 13) Akpata reported a prevalence of 12.4% among children in Lagos, southwest Nigeria.[14]Risk factors associated with **a** higher **prevalence** of dental **trauma** are increased overjet, class II malocclusion, **needfororthodontics,** and male gender.[7,8]

Previous **studies** have shown that the oral **cavity** is the sixth most **commonly** injured body **site, with** dental trauma **accounting** for **approximately** 5% of all injuries leading to the **hospital** or outpatient care.[15,16] Various studies show that domestic accident is the main aetiology of TDI in adult (12)while fall is most implicated in children.[17] **TDI primarily affectsthe** anterior teeth and **can lead to** complications such as tooth loss, **dislocation/subluxation,** crown discoloration, apical periodontitis, **ankylosis, pulpalnecrosis,** and inflammatory root **reabsorption.** It may also include **facial fractures,** depending on the severity of **the** injury.[18, 19, 20, 21,22,23,24] **Several** studies have shown **that** the prevalence of **dental injury** in patients with facial **fractures** ranges from 13% to **23** %.[4,21,22,25,26]

Traumatic dental injuries(TDIs) can cause aesthetic, social, and psychological problems by affecting a patient's appearance and speech, in addition to functional problems.[27] Prompt **and appropriate treatment is necessary to** minimize complications and save the affected **tooth.** Previous studies **have shown that** the incidence of **TDIis** higher late **at night** and on **weekends.**[7, 18] Traumatic dental injury has great public health burden. This has affected quality of life of people. Most the literature studied traumatic dental injury in children. There is dearth of information on adult population. However, the aim of this retrospective study was to investigate the prevalence and causes of TDI at the dental outpatient clinic of our centre over 4 years in mixed population. Findings from this study will add more references to the literature and also help the government to provide policies to regulate the causes of traumatic dental injury.

MATERIALS AND METHODS

This was a retrospective study of 52 consecutive patients **who** presented with TDI at **University of Ilorin Teaching hospital** dental outpatient clinic **in Ilorin Kwara State between 1st** June 2017 and **1st** June **2021 that satisfied the inclusion criteria were selected.** Our hospital is the only University Teaching Hospital in the state, which has a population of 3,192,893 people.[28] Our dental unit is the only dental clinic **providing** specialist care in the city and is **frequented** by dental **patients** and sees these patients every **day of the week. Patients** with **incomplete** data, traumatic brain injury, **edentulous,** and no surgical treatment were excluded from the **study.** Only patients who presented and were treated in our dental outpatient clinic were included in the study and analysed.

All the experiments in this study were conducted in accordance to relevant guidelines and regulations. This research was approved by Ethical review committees of the Ministry of Health, Ilorin, Kwara State (ERC Approval Number: ERC/MOH/2022/10/077). Informed consent was obtained from all subjects and/or their legal guardian(s). A semi-structured questionnaire was used to obtain necessary information, including socio-demographic characteristics, while relevant clinical examination findings such as date of the incident, type of **dental fracture/injury,** location of the **damaged tooth, and tooth injury related to facial fracture** location and treatment options of a consultant maxillofacial surgeon and trained dentists were recorded. Each patient was examined with the use of routine examination set such as mouth mirrors, examination probes, college tweezers and gauge. Other necessary investigations such as vitality test and radiographic assessment were done. **Tooth** injuries were classified according to Andreasen's classification.[29]

Analysis was done using Microsoft Excel 2010 (Redmond, WA, USA) and SPSS 22 (IBM, Armonk, NY, USA. The chi-square test was used for the analysis of non-parametric variables such as gender, types of dental injury, teeth involved, and aetiology of trauma. Statistical significance was set at $p<0.05$.

RESULTS

A total of 208 patients with maxillofacial injuries (163 males and 45 females) aged 1 to 81 years were examined. The prevalence of TDI was 25%. Male and female prevalence were 18.2% and 6.7%, respectively (Table 1). There were 52 TDI patients observed, with a mean age of 16.5 ± 12.02 and 28 (73.07%) males and 14 (26.92%) females ($p < 0.003$). The age ranged from 2 years to 50 years. More than 90% (49) of the patients were below 40 years. (Table 2). The most frequent reason for TDI (table 3) was motorbike accident (30.77%, n= 52), followed by falls from ground (23.08%, n=12) and assault (11.53%, n=6).

Table 1: The number and proportion of participants with traumatic dental injury in study population

	present	%	absent	%	total	%
male	38	18.26	125	60.10	163	78.36
female	14	6.73	31	14.90	45	21.63
total	52	25.00	156	75.00	208	100.00

Table 2; Distribution of study population of sex based on age

AGE	FEMALE	%	MALE	%	TOTAL	%
0-9	8	15.38	12	23.07	20	38.46
10-19.	4	7.69	10	19.23	14	26.92
20-29	0	0.00	8	15.38	8	15.38
30-39	1	1.92	6	11.53	7	13.46
40-49	0	0.00	2	3.84	2	3.84
50-59	1	1.92	0	0.00	1	1.92
Total	14	26.92	38	73.07	52	100.00

There was no association between trauma source and gender (p=0.863); table 3), nor was there a significant difference in trauma source compared to dentition type (p=0.342) (table 4). Periodontal injuries were found to be **the** most **common** injuries in both permanent and deciduous **teeth. Only 1** tooth was **affected** in **(37.7%,n=20)cases,2** teeth were **damaged in (21.2%,n=11),** and 40.38% **(n=** 21) **had Three** or more teeth affected. A total of 136 teeth were affected, **with** an average of 2.61 teeth **damaged** per patient. The upper central incisors **were most commonly affected** (38.9% n=53 **Fig** 1). For permanent Dentition; a total of n=118 teeth were involved in 45 patients. The most diagnosed injury was total tooth loss (40.67%, n=48) followed by enamel dentine fracture without pulp exposure (25.42%, n=30). But for deciduous dentition; a total of n=18 teeth were involved in 10 patients, and the most diagnosed injury was subluxation (50%, n=9) followed by total tooth loss (16.6%, n=3).

Table 3; Association between aetiology and sex

AETIOLOGY	FEMALE	%	MALE	%
Assault	3	21.42	3	7.89
bus accident	0	0.00	1	2.63
Car	2	14.28	3	7.89
fall from ground	4	28.57	8	21.05
fall from height	0	0.00	1	2.63
Lorry	0	0.00	2	5.26
motorbike accident	4	28.57	12	31.57
Sport	1	7.14	5	13.15
tricycle	0	0.00	3	7.89
Grand Total	14	100.00	38	100.00

Fischer exact test p= 0.863 aetiology vs sex

Table 4; Association between aetiology and types of dentition

AETIOLOGY	permanent dentition	%	deciduous dentition	%
Assault	3	6.66	4	40.00
bus accident	1	2.22	0	0.00
car	4	8.88	1	10.00
fall from ground	11	24.44	1	10.00
fall from height	1	2.22	0	0.00
lorry	2	4.44	0	0.00
motorbike accident	15	33.33	2	20.00
sport	5	11.11	2	20.00
tricycle	3	6.66	0	0.00
Grand Total	45	100.00	10	100.00

Fischer exact test p= 0.342 aetiology vs dentition.

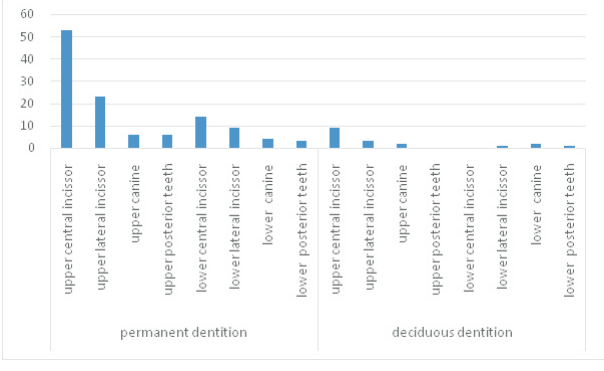

Fig. 1: Distributions of type of affected dentition

The most frequently diagnosed injury was avulsion (37.5%, n=51), followed by enamel-dentine fracture (22.79%, n= 31) then subluxation (20.58%, n=28 fig. 2).While 44 out of 52 patients had associated middle-third facial fractures. A total of 34 out of 52 patients (65.4%) had maxillary dentoalveolar fractures followed by (2, 9.1%) of Le fort 11 fractures.10 out of 52 patients had an associated combination of mandibular fractures fig. 3. A total of (18 out of 52, 34.62%) traumatic dental injury patients had associated mandibular fractures .majority of them were parasymhyseal fractures (6,11.5%) followed by symphysis and body (4, 7.7%) each (fig. 4).

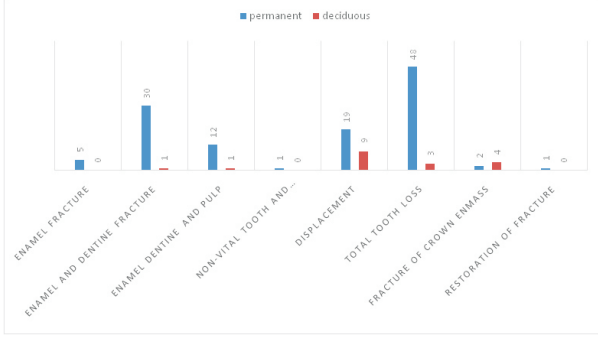

Fig. 2: Distribution of diagnosis of affected dentition

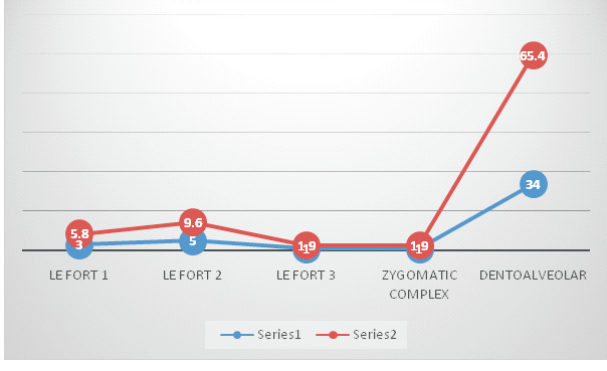

Fig.3; Distribution of traumatic dental injuries in mid-facial fractures

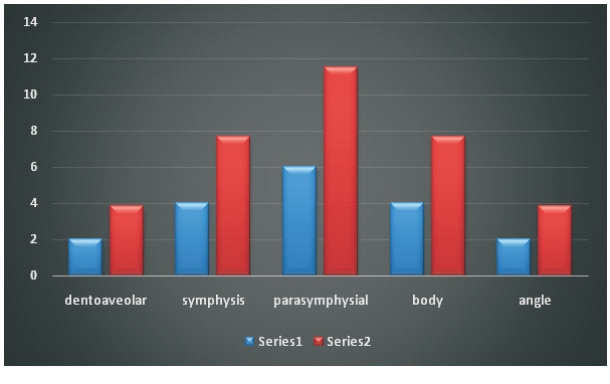

Fig. 4; Distribution of traumatic dental injuries in mandibular fractures

DISCUSSION

This study analysed and evaluated the prevalence and causes of TDI in children and adult population. The result show a prevalence of 25% TDI. Road traffic accident and assault were the major cause for permanent and deciduous dentition respectively. There was a significant association between dental trauma source and gender. However there was no significant association between aetiology and type of dentition. This study reported a TDI prevalence of 25%, close to that reported by Rusli *et al*.[30] of 23.2% while the prevalence of TDI from other Nigerian studies ranged from 6.5% to 19.5 %.(31-34). This might be influenced by the difference in geographical locations. Prevalence is 66% in Korea 27.7%[35] in the UK 11%[36]in Greece and 8.4%[37] in France.[38] This range could be explained by other health insurance systems. In this study, the average age was 16.5 years ± 12.02,73.1% Male and 26.9 % Female; M;F ratio of 2.7:1, this commensurate with other studies on the same topic(11-14,17,18) but the contrast to the finding in the study by Mahmoodi *et al*[27] where the average age of 14.7± 15.720. This could be attributed to varying sample sizes.

Some studies[40, 41, 42] have reported a change in the global cause of TDI from RTA to sports accidents but in our study, RTA by motorcycle was the highest cause of injury in adults and assault followed by fall were the highest cause of injury in deciduous dentition. As it is with previous studies, we had a significant male predominance, many of these studies reported a ratio of 2:1[22, 23, 24, 25, 42] while our study had a ratio of 3.6:1. This could be attributed to few numbers of females being involved in commercial motorcycle riding in this environment. Women tend to be less prone to trauma,[5, 6] violent behaviour and participation in more aggressive types of activities than men.[30]

A high share percentage of patients are in 0-9yrs with a continuous decrease in age which is in tandem with the literature.[5, 6, 43] This may be brought on by poor motor coordination as well as observant and adventurous behaviour[39] in children. Periodontal injuries (subluxation and avulsion) are the most frequent injuries in children, with subluxation accounting for 50% of the case in the current study. Several studies[5, 6, 43] have found a similar trend in deciduous dentition. In this study, the most common injury in permanent dentition was total tooth loss (40.67%), which contrasts with most literature, which reported a higher proportion of enamel and dentine without pulp exposure ranging from 20.2% to 51.6%.[4,40] However, the proportion of enamel and dentin without pulp reported in this study is similar to that in the most reported literature, the plausible explanation being that the permanent teeth are more firmly embedded in the alveolar bone and are more likely to fracture.[21]which has been attributed to the higher elasticity of the supporting tissues, the relatively small roots and reduced alveolar bone support in deciduous dentition.

In our study TDI is more associated with middle third fracture than mandibular fracture this corresponds to the findings by Thoren et al(21), da Silva *et al*[25], and Roccia *et al*[26] but is in divergence to the findings by Previous authors who reported that TDI was significantly more associated with mandibular fractures.[22, 25, 26, 27, 28, 29, 30] An explanation for this may be differences in the mechanism of injuries in which the majority of the TDI in our study were caused by motorcycle accidents, unlike other studies which were due to sports accidents.

In contrast to findings by Iso-Kungas[23] who reported a high prevalence of TDI in the symphyseal region of the mandible,our study revealed a high prevalence in the parasymphyseal region of the mandible. This might be due to the mechanism of the injury which is major as a result of a motorbike accident in our setting. However, this differs from the study results of Roccia *et al*.[25] in which mandibular condylar fracture was the most common bone fracture associated with TDI. Our study showed an average of 2.61 (n=136) injured teeth per patient, with the upper incisors being the most injured teeth, the average injured teeth being higher compared to

previous studies.[5,6 21] This might have been a result of a lower number of participants in our study compared to others. However, the maxillary incisors being the most injured teeth are in line with international literature.[5, 6] Appropriate preventative measures can be achieved by orientating commercial motorcyclists on the importance of Helmets for them and their passengers. Stricter laws on the use of seatbelts and tough penalties against drunk driving should be put in place.

A high percentage of patients with avulsion injuries could not present the affected teeth for reimplantation. Rehabilitation with prosthesis and space maintainers were done for the adults and children respectively. Children who suffered mild subluxation with deciduous teeth whose teeth are at the exfoliation stage were placed on observation and medication. Traumatic dental injuries that occur daily in the dental clinic cannot be completely eradicated, so efforts should be directed towards preventive measures such as educational programs for teachers, parents, careers, coaches, and paramedics that could help reduce the long-term effects of trauma and minimize and achieve better prognosis through prompt and proper treatment. And a reduction of environmental risk factors such as encouraging the use of the frictional type of tiles on the floor against the use of a slippery type of tiles.

Two-thirds of the accidents happened during the weekdays in this study which is in contrast to some studies in which most of the incidents happened during weekends.[37, 38] This could be because the aetiology in these reports were sports accident which is mostly played on weekends while the most frequent aetiology in our report was commercial motorcycle accident which is on daily basis. The range of prevalence might have been influenced by different cultural and socioeconomic diversity.

Limitations to this study included the fact that some TDI patients were also admitted and discharged from the hospital's emergency without presenting at the dental outpatient clinic. This could account for the low figure of the total number of patients with TDI. Most patients with non-severe TDI are not likely to present to the hospital. This might be due to the socio-economic status of the majority of the Ilorin dwellers. Bias may have been introduced in this study because data were collected retrospectively. Nevertheless, the results of this study were largely consistent with those of other studies.

CONCLUSION

In conclusion, our study underscores the alarming prevalence of Traumatic Dental Injuries (TDI) in our population, revealing a concerning 25% incidence rate. Notably, the primary contributors to TDI differed between permanent and deciduous dentition, with road traffic accidents being the predominant cause for permanent dentition injuries, while assaults were identified as the major instigators for deciduous dentition trauma. Furthermore, our analysis revealed a significant association between the gender of individuals and the source of dental trauma, emphasizing the need for targeted preventive measures. Addressing the root causes of these injuries through comprehensive educational programs becomes imperative. Targeting teachers, parents, caregivers, coaches, and paramedics with preventative strategies and primary care knowledge could prove instrumental in minimizing the immediate and long-term consequences of dental trauma.

Early intervention and correct treatment are vital in improving prognosis and reducing the burden on both individuals and the healthcare system. To mitigate the pervasive impact of TDI, we recommend the implementation of robust educational initiatives. These programs should not only focus on creating awareness but also on imparting practical skills for timely and effective response to dental emergencies. Furthermore, a multidisciplinary approach involving collaboration between healthcare professionals, educators, and policymakers is crucial for the successful implementation of preventive measures. Our study also highlights the need for further research in this

field. Future investigations should delve into the prevalence and management of TDI patients, considering factors such as socio-economic status, access to healthcare, and regional variations. Longitudinal studies could provide valuable insights into the lifelong consequences of dental trauma, aiding in the development of targeted intervention strategies and rehabilitation programs.

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