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SPORTS-RELATED DENTOFACIAL TRAUMA AMONG HIGH SCHOOL STUDENTS IN NAIROBI
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ABSTRACT

Objectives: **To determine the prevalence and pattern of occurrence of sports - related dentofacial injuries among athletes participating in Rugby and Football in Nairobi, Kenya.**
Design: **A descriptive cross-sectional study.**
Setting: **Seventeen Secondary schools participating in either or both Rugby tournamentsand the Nairobi Football League during the 2015 season in Nairobi.**
Subjects: **Five hundred and ten male high school students aged 14 to 18 years.**
Results: **Among the 510 participants in the two sports, 281 (55.1%) had reported having experienced dentofacial injuries. Participants playing both sports had a significantly higher prevalence of dentofacial injuries 24 (66.7%)in comparison to those who participated in rugby 138 (54.3%)and football with 119 (54.1%)(p = 0.02). The most commonly reported injury involved the soft tissue at 68.3%, teeth at 19.5%, a combination of the hard and soft tissues at 8.1% and bone fractures at 3.9%. Regarding the phase of play during which the injuries were sustained, collision accounted for 26.2% followed by tackling (19.7%), having been tackled (18.0%) while lineout (1.17%) was the least cause of dentofacial injury. Of the 281 of the injured respondents, 153 (54.4%) had received first aid treatment with 72 (47.1%) having received treatment on the pitch side. One hundred and eighty three (35.9%) of all the participants reported having had some form of medical insurance while 227 (44.5%) did not have any.**
Conclusion: **More than half of the participants had experienced dentofacial injuries with those of the soft tissue having been the most commonly reported. About a third of the injuries encountered were sustained during collision of players.**

INTRODUCTION

Sporting activities can be competitive or recreational and can at the same time predispose the participant to dentofacial injuries. Dentofacial injuries may affect an individual both physically and psychologically and might require further management as well as long-term follow-up. A sport-related injury is defined as "any discomfort as a result of pain or physical impairment as a result of trauma during a competitive sport which causes the athlete to miss subsequent games"(1).

Dentofacial trauma is a public health problem and can lead to irreversible dental loss even years after the accident. According to several studies (2-4), the prevalence of dentofacial trauma has been reported to be between 6 to 60% in children and young adults with sports-related injuries accounting for 1.4 to 56% of all these cases (5-8). In rugby, the reported dentofacial injury rates have varied between 13 and 56.5% (7, 8). The prevalence rate of dentofacial injuries in high school football has been reported at 28 to 57% (9, 12, 13). The prevalence of sports-related injuries in African studies has been reported to vary from 2.4 to 75% (10-13) with Rwanda reporting the highest prevalence at 75% among football players (10). In Kenya only one community based study has reported on the prevalence of traumatic dental injury as a result of sport (11). The study, however,included a younger age group when related to other studies and did not focus on athletes only as it looked at other causes of dental traumatic injuries among school going children. In the same study, no girl had sustained traumatic dental injuries as a result of sports (11).

The majority of sports-related dentofacial injuries

affect both the hard and soft tissues of the oral cavity including the maxilla and its permanent incisors that have sustained between 50 to 90% of the injuries involving the maxilla and the upper lip. This has also resulted in mobility and fractures of the teeth, jaws in addition to, lacerations and other soft tissue injuries (16). Sports activities will often increase the risk of traumatic injuries to dentofacial tissues and will be exacerbated in persons involved in contact sports such as rugby, football, basketball, hockey and boxing.

In schools, the risks for traumatic injuries during sports include a trip or a fall during training and competitive games, a hit from arms, elbows, forearm, hands, head or from inanimate objects such as balls and hockey sticks. Collision and tackles were shown to be one of the major causes of trauma during sporting activities in several studies. The purpose of this study was to determine the pattern of occurrence of dentofacial injuries among Kenyan amateur athletes participating in rugby and football.

MATERIALS AND METHODS

Five hundred and ten students from 17 football and 12 rugby participating boys' schools in Nairobi, aged between 14 to 18 years (mean = 17 years) participated in the study. Among the participants, 254 played rugby, 220 played football while 36 played both rugby and football. The survey was based on a modified semi-structured interview questionnaire administered by the principal investigator. Some of the variables recorded included the age, school, sports played, position of play, duration of play in a particular sport, history of any dental hard and/or soft-tissue injuries such as tooth mobility, fracture of teeth and the jaw bones, soft tissue injuries on the face such a bruises and lacerations on lips, tongue or cheeks as result of sporting activity. The names of the participants were not recorded. Data were entered into the Statistical Package for Social Scientists (SPSS version 22.0) which was used to perform the statistical tests. Statistical significance was set at $p < 0.05$.

Permission to carry out the study was obtained from the Kenyatta National Hospital and the University of Nairobi Ethics and Research Committee (Ref: KNH-ERC/A/50) and National Commission for Science, Technology and Innovation in Kenya (NACOSTI/P/15/8920/5688).

RESULTS

The self-reported prevalence of dentofacial trauma among the participants was 281 (55.1%) with the senior students (17-18-year-olds) contributing to 185 (65.8%) injuries. The reported prevalence of injuries in each individual sport was higher in participants playing both sports at 24 (66.7%), followed by rugby at 138 (54.3%) and in footballers at 119 (54.1%). Participants who had played sports for a period of between three and five years had the highest prevalence rates of injuries at 28.1% followed by those who had played for one and three years at 26.3% of the injured participants.

Table 1
Reported prevalence of dentofacial injury by Sport and Age

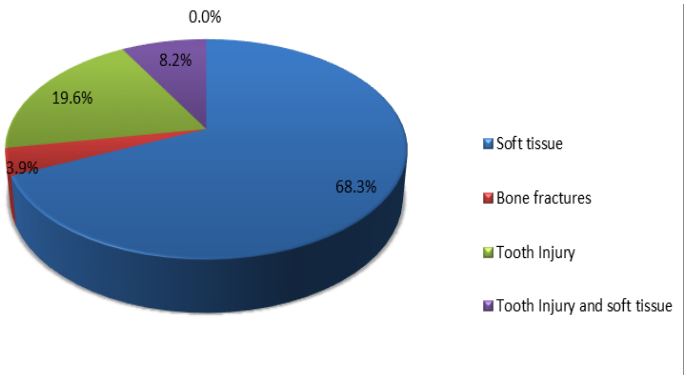
	Prevalence of dentofacial injury by sport		
Type of Sport	Yes n (%)	No n (%)	Test
Rugby	138 (54.3)	116 (45.7)	
Football	119 (54.1)	101 45.9)	$\chi^2 = 2.09$
Both*	24 (66.7)	12 (33.3)	df = 2
Total	281 (55.1)	229 (44.9)	p = 0.35
Age (years)			
14	7 (43.75)	9 (56.25)	
15	22 (39.28)	34 (60.72)	$\chi^2 = 9.17$
16	67(58.26)	48 (41.74)	df = 4
17	86 (53.75)	74 (46.25)	p = 0.06
18	99(60.74)	64 (39.26)	

Both* means participants playing both Rugby and Football

Dentofacial trauma reported by the players was divided into five broad categories: injuries of the soft tissues, bone and teeth, a combination of teeth and soft tissues and combination of teeth, soft tissues and bone. Soft tissue injuries contributed to 193 (68.3%) of the injuries followed by tooth injuries at 55 (19.6%) and lastly bone fractures which were 10 (3.9%) of the total injuries. Some participants reported combination injuries involving tooth and soft tissues at23 (8.2%) (Fig 1).

Figure 1

Types of dentofacial injuries as reported by the participants.



Soft tissue injuries were reported by 193 (68.3%) out of 281 injured participants. About half of these, 99(51.3%) were reported by rugby players, 79 (0.9%) by football players while only 15 (7.8%) who played both sports reported soft tissue injury. Tooth injury accounted for 19.5% of the reported injuries. More than half of these injuries, 29 (52.7%) were reported by football players, 22(40%) by rugby players while only four (7.3%) were reported by those who played both sports. The combination of tooth and soft tissue injury was reported by 23 (8.1%) out of 281 participants with rugby players reporting 10 (43.5%), football players reported nine (39.1%) while those who played both sports had reported four (17.4%) of the combination injuries. With regard to soft tissue injuries, facial bruises accounted for 46.7 %,lip, tongue or cheek cuts were at 53.3%. The hard tissue injuries were tooth mobility at 56.5%, fractured teeth at 37.9% and bone fractures at 5.6%. Maxillomandibular fractures were the least reported injuries as ten participants sustained them with rugby players having accounted for seven (70%), footballers for two (20%) while those who played both sports accounted for one (10%).

Table 2

Distribution of types of Dentofacial injuries as reported by participants in each sport.

Type of Dentofacial injury	Type of Sport: Rugby n	Rugby (%)	Football n	Football (%)	Both* n	Both* (%)	Total n	Total (%)	Test
Soft tissue	99	(51.3)	79	(40.9)	15	(7.8)	193	(68.3)	
Tooth Injury	22	(40.0)	29	(52.7)	4	(7.3)	55	(19.6)	
Tooth Injury and soft tissue	10	(43.5)	9	(39.1)	4	(17.4)	23	(8.2)	χ^{2*}=7.34 p=0.26
Bone fractures	7	(70.0)	2	(20.0)	1	(10.0)	10	(3.9)	
Total	138	(49.1)	119	(42.4)	24	(8.5)	281	(100)	

χ^{2*}=Fischer exact test, Both* means player playing both Rugby and Football

In the current study, the aetiology of dentofacial trauma was described by the phase of play when the injuries occurred (Fig 2).The most common causes of dentofacial injuries were collision in 134 (26.2%), tackling 101 (19.7%) and being tackled 92 (18.0%). The least common causes of dentofacial trauma were shooting, turning, during a lineout and having been hit by an object. Collision was the common cause of dentofacial injuries among rugby players at 72 (28.0%), followed closely by tackling at 69 (26.9%). Similarly among football players, 48 (27.4%) sustained injuries through collision and 36 (20.6%) by being tackled. As was reported in rugby, those who played both sports reported a similar pattern with collision at 14 (17.5%), tackling at 13 (16.3%) and being tackled at 12 (15.0%) as the major causes of injury (Table 3).

Figure 2
Causes of Dentofacial injuries during sporting activity.

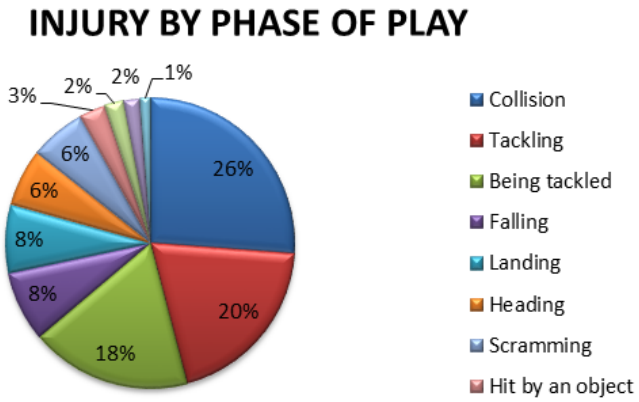


Table 3
Injury by phase of play as a percentage of all injuries reported by sport.

Injury Mechanism	Type of sport						Total	
	Rugby		Football		Both*			
	n	(%)	n	(%)	n	(%)	n	(%)
Collision	72	(28.01)	48	(27.43)	14	(17.50)	134	(26.17)
Tackling	69	(26.85)	19	(10.86)	13	(16.25)	101	(19.73)
Being tackled	44	(17.12)	36	(20.57)	12	(15.00)	92	(17.97)
Falling	17	(6.62)	13	(7.43)	10	(12.50)	40	(7.81)
Landing	16	(6.22)	15	(8.57)	8	(10.00)	39	(7.62)
Heading	0	(0)	27	(15.43)	6	(7.50)	33	(6.45)
Scramming	23	(8.95)	0	(0)	9	(11.25)	32	(6.25)
Hit by an object	7	(2.72)	5	(2.86)	3	(3.75)	15	(2.93)
Turning	2	(0.78)	7	(4.00)	2	(2.50)	11	(2.15)
Shooting	1	(0.39)	5	(2.86)	3	(3.75)	9	(1.76)
Lineout	6	(2.33)	0	(0)	0	(0)	6	(1.17)

Players playing both Rugby and Football

One hundred and fifty three (54.4%) of the injured players reported having sought first aid treatment. Of these, 72 (47.1%) received treatment at the pitch side, 42 (27.5%) at the school infirmary and 39 (25.5%) at a hospital. Of the 281 injured players, 154 (54.8%) had been to a dentist before for either a routine check-up or dental treatment. Regarding medical insurance, 227 (44.5%) of the study participants reported not having had medical insurance while 100 (19.6%) did not know whether they had medical cover or not. Similarly, 124(44.1%)of the injured players had no medical insurance, 106 (37.7%) had medical insurance while 51 (18.1%) were not sure if they had a medical cover.

DISCUSSION

In Kenya, hardly any study has been conducted to determine the prevalence of dentofacial trauma in these two sports among high school students. The study sampled participants from only one county in Kenya which may not give an exact picture nationally. However, the sampled county is the most cosmopolitan of the 47 counties of Kenya and its sample may be a good representation of the Kenyan situation.The responses and experiences of these participants could reflect the prevalence of dentofacial injuries and the injury patterns in these two sports in Kenya. Furthermore, Nairobi City County has well organised rugby and football tournaments than the other counties. Rugby and football are the most popular contact sports in Kenya.

In the present study, the reported overall prevalence of dentofacial injuries was 55.1%. Similar findings were reported among Japanese (8) students in 1998 where 43% of the students sustained dentofacial injuries while participating in rugby and football and in Nigeria where 57.9% of the athletes at a National sports fiesta had experienced dental injuries (20).Our results, however, contrasted the findings of Muasya *et al* (11) that showed that sporting activity accounted for 2.4% of traumatic dental injuries. The difference with the latter study could be attributed to the younger age group they examined and the fact that their study did not focus on sports participants only, rather it was on multiple causes of traumatic dental injuries in primary school children.The competitive nature of these contact sports means that players take greater risks hence increased chances of contact with opposing teams thus increasing their chances of sustaining dentofacial injuries (21).

In rugby, the reported prevalence of dentofacial injuries was 54.3%. In a study by Yamada *et al* (8) in Japan, 56.5% of the rugby players were reported to have sustained dentofacial injuries. Similar findings were reported in an Australian Study (22) among amateur Rugby Union players at 64.9% and in astudy among high school rugby players in England who reported that 41% of them had experienced dentofacial injuries (23).

In football, the reported prevalence of dentofacial injuries was 54.1%. This was also reported in a South African study, with 58.7% football players in South Africa reporting a past history of at least one type of dentofacial injury (12).However, the findings of the present study in football (54.1%) differ with studies reported in Brazil (17), England (9) and Japan (8) where the reported prevalence of dentofacial injuries was 23.1, 12 and 32.3% respectively. This could be due to the fact that in the three studies(8, 9, 17), the athletes were more aware about the significance of mouthguard usage in protecting the oral tissues during sporting activity. The high level of development of these two contact sports in these countries could also have had an impact on the lower prevalence rates of dentofacial injuries.

Our study reports that with increase in the age of participants, the higher the chance of the athlete sustaining a dentofacial injury. This could be because, cumulatively, the duration of play and/or exposure of the athlete to contact sports is increased with age hence a higher chance of sustaining an injury. However, other studies (21,24) have reported that most of the sporting injuries occur amongadolescents and young adults, with the occurrence of injuries decreasing with age. These studies (21,24) may have evaluated the occurrences of these injuries immediately after each tournament and observed fresh injuries as opposed to this present study that relied on the participants reporting injuries long after the tournaments.Furthermore, with increase in age, a participant who plays at an amateur level or professionally could have been trained on safer strategies of play in terms of tackling and fending off opposing players.

With respect to the type of injury, soft tissue involvement at 68.3% was the most common type of reported dentofacial injury followed by those of the hard tissues at 19.5%, a combination of hard and soft tissues at 8.1% and bone fractures at 3.9%. These findings were similar to those in a study done in India (25) and where 55.8% sustained soft tissue but a higher number of the athletes (44.2%) participating in contact sports sustained hard tissue injuries. This could have been attributed to the fact that the soft tissues cover the hard tissue and would be the first to have been contacted when there was any contact between players. Hence, there was a higher chance of the soft tissues having been injured than the hard tissues. Furthermore, it is easier for an athlete to identify and report soft tissue injuries compared to hard tissue injuries which may require more expertise to recognise and diagnose.

In the present study, collision was the leading cause of injuries accounting for about a quarter of the injuries. This was followed by tackling at 19.7%,

being tackled at 18.0% and falling at 7.8%. Similarly, a Finnish study (18) in a similar population reported collisions and tackles at 20.9%. Tin-Oo *et al* (19) in Malaysia also reported similar findings with collision between players, falls and having been hit by an object were the leading causes of dentofacial injuries. In rugby and football, collision was the major cause of dentofacial injury at 28.0 and 27.4% respectively. Similar results were reported in Rwanda (10) whereby 24.2% of the injuries in footballers were caused by collisions. This finding is not surprising as rugby and football are collision sports whereby the body comes into contact with other athletes or inanimate objects. In the present study, almost half of the injured players received treatment on the pitch side compared to a quarter who sought treatment at the school infirmary as soft tissue injuries were the most common type of injury which could have been managed during the time of play. It was also found that almost half of the injured athletes did not seek treatment as they did not see the need. This is shown in a previous study (26) where athletes did not see the need of seeking immediate treatment as the teeth were asymptomatic or they did not notice the injury.

Slightly more than half of the injured athletes reported not having had a medical cover exposing them/their guardians to high costs of dental treatment after traumatic dental injuries. Medical cover has been shown to be quite important during the management of sports-related injuries as it mitigates the high cost of treatment. However, high school rugby and football players in this study did not have any form of special insurance for dental injuries which could have been related to a study among Swiss basketball players who did not have any specialised cover to cater for dental injuries (27). Furthermore, Glendor (28) in Sweden showed, through a qualitative study, that most of the players aged 16 to 19 years did not have any specialised dental cover and that their costs of treatment had to be met by someone else.

In conclusion, slightly over half of the study participants had sustained dentofacial injuries while playing contact sports with rugby and football players reporting similar prevalence's of injury. Collisions were the leading cause of injuries with about two thirds of the injured participants reporting soft tissue injuries. Uptake of medical insurance was low.

We recommend, injury prevention strategies should be adopted to decrease the occurrence of dentofacial injuries in students participating in contact sports.

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