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Original Article

Dentistry Section

# Awareness about Dental Injuries Associated with Contact Sports and Use of Mouthguards in Young Trainees Playing Khokho, Kabaddi and Football in Bhubaneswar City: A Cross-sectional Study

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## ABSTRACT

**Introduction:** Dental trauma sustained while participating in sports is the main element that connects dentistry and sports. Sports involving frequent physical contact with other athletes increase the risk of dentofacial injuries. This association underscores the importance of preventive measures, with well-fitted athletic mouthguards identified as a key intervention to mitigate the risk of dentofacial injuries.

**Aim:** To assess awareness about sports-related dental injuries and mouthguard use among young trainees in three contact sports-khokho, kabaddi, and football.

**Materials and Methods:** A cross-sectional study was conducted from May 2023 to July 2023, which included 226 young trainees from the Government College of Physical Education, Bhubaneswar, engaged in football, kabaddi, and khokho. Data was collected using a self-structured questionnaire and were subjected to analysis employing the Chi-square test. Sports-related dental injury was assessed using the Traumatic Dental Injury codes of the World Health Organisation (WHO) Oral Health Assessment Form for Adults, 2013.

**Results:** Eight (8.3%) football players had the highest incidence of upper left central incisor enamel fracture, as determined by the dental injury codes. The majority of the trainees, 206 (91.2%), were aware of what a mouthguard is. However, 135 (59.7%) agreed that mouthguard use should be mandatory during sports practice. A p-value <0.0001 was considered statistically significant.

**Conclusion:** While most trainees displayed awareness of sports-related dental injuries, familiarity with mouthguards was lacking. Football players exhibited the highest prevalence of sports-related dental injuries, followed by kabaddi players, with the lowest incidence observed among khokho players.


**Keywords:** Dental trauma, Sports injury, Sports practice

## INTRODUCTION

Dental trauma sustained during sports is the primary link between dentistry and sports. The goal of sports dentistry is to prevent oral and facial injuries, along with associated oral diseases and their manifestations. It primarily focuses on two things: first, treating orofacial injuries, and second, preventing orofacial injuries caused by sports [1,2]. The Sports Dentistry involves the prevention and treatment of orofacial athletic injuries and related oral diseases, as well as the collection and dissemination of information on dental athletic injuries and the encouragement of research in the prevention of such injuries [3].

Traumatic Dental Injuries (TDI) result from accidental forceful impacts to the teeth and are a relatively common occurrence, with a global average frequency of 15% in permanent dentition [4]. Sports are inevitably accompanied by injuries. Numerous traumatic injuries occur when participating in sports-related activities, with dental and orofacial injuries being the most prevalent variety [5]. The rougher the sport, the higher the risk of injuries.

Sports that involve players physically interacting with each other in an attempt to impede the winning team or individual from the opposition are referred to as contact sports [6,7]. Due to the high-impact contact, athletes who play contact sports are more likely to experience orofacial and dental injuries. Contact sports make athletes more vulnerable to tooth damage, resulting in a very high incidence of dental trauma ranging from 2% to 33% [6].

Orofacial injuries consist of dental injuries (enamel infractions, crown and root fractures, concussions, luxations, and avulsions), lacerations of the soft tissues (lips, cheeks, and tongue), injuries to the temporomandibular joint, and mandible fractures [8].

The sports mouthguard, also known as a mouth protector, has traditionally been considered the most effective device for reducing oral injuries during sporting activities. A mouthguard is an elastic splint designed to fit over the occlusal surfaces of the maxillary teeth up to the second molar, and it should cover the gingivae to separate the soft tissues in the oral cavity from the teeth, thereby preventing lacerations of the lips, tongue, and cheeks. Mouthguards protect the opposing teeth against damage in case of blows to the jaw by absorbing, limiting, and dispersing the forces while minimising the severity of trauma [9]. The athletic mouthguard, also referred to as a gum shield or mouth protector, is defined by the American Society for the Testing of Materials (currently known as ASTM International) as a "resilient device or appliance placed inside the mouth to merely reduce oral injuries, particularly to teeth and surrounding structures" [10]. Properly fitted mouthguards provide protection by absorbing high-impact energy from potentially traumatic blows and by dissipating that energy, which would otherwise be transferred directly to the underlying dentition [11].

The use of mouthguards in contact sports may reduce the occurrence of dental injuries by upto 90% or more [12]. Three general types of mouthguards exist: pre-fabricated mouthguards, which are not fitted to an individual's mouth; 'boil-and-bite' or

mouth-formed mouthguards, which are made from a thermoplastic material that becomes soft and moldable when heated; and custom-made mouthguards, which are fabricated from dental impressions. Custom-made mouthguards usually fit more comfortably and offer more protection than mouth-formed and pre-fabricated mouthguards. They also cause less disruption to oral function [13,14].

The most common method of lowering the frequency of sports-related TDI is the wearing of mouthguards, which is also always advised following a TDI to prevent further harm [15,16]. Most athletes are unaware of the need for mouthguard use, while others are concerned about communication issues, poor retention, breathing issues, and unpleasant aesthetics. Regardless of their skill level, athletes should be aware of preventive and precautionary measures and use basic safety devices such as safety helmets, face protectors, and mouthguards that are fitted appropriately.

The prevalence of dental injuries in international sports, including football, is well documented in the literature, whereas regional sports receive far less attention [4]. Sports like kabaddi and kho kho are among those that have garnered the least attention. Despite the popularity of kabaddi and football as national and international sports, there is a dearth of research examining dental injuries caused by kabaddi and football or how to prevent them. Therefore, this study was intended to assess the awareness of dental injuries and mouthguard usage among young trainees who engage in these three contact sports, as well as to evaluate the experience of dental trauma among the trainees in the Bhubaneswar city of Odisha.

## MATERIALS AND METHODS

A cross-sectional questionnaire survey was conducted at the Government College of Physical Education, Bhubaneswar, after obtaining prior permission from the authorities. The study was approved by the Institute Ethics Committee (IEC) of Kalinga Institute of Medical Sciences, Bhubaneswar, Odisha. The study was carried out from May 2023 to July 2023. The study population included Bachelor of Physical Education (B.P.Ed) and Master of Physical Education (M.P.Ed) students enrolled in the respective courses. Out of 280 students, a total of 226 participants aged 21-28 years old, both males and females, were selected according to the inclusion and exclusion criteria. The sports were chosen based on the likelihood of dental injury.

**Inclusion criteria:** The trainees aged 21-28 years old, being trained in kho kho, kabaddi, and football, and those subjects who provided informed consent were included in the study.

**Exclusion criteria:** Trainees who were unwilling to participate in the study were excluded.

### Procedure

A self-structured questionnaire, along with an information and consent sheet, was manually distributed to the participants. The investigator provided instructions on how to fill out the questionnaire, and the participants themselves completed the form.

The self-structured questionnaire, framed in English, consisted of 20 questions (4 open-ended and 16 close-ended questions) divided into 3 sections:

- **Section 1:** Socio-demographic data which included age and gender;
- **Section 2:** Awareness of sports-related dental injuries consisted of the kind of sport, duration of practice, knowledge, and experience of dental injury;
- **Section 3:** Awareness of the use of mouthguards which included awareness, importance, and mandating the use of mouthguards during sports practice.

The construct and content of questions and domains were reviewed by four experts from the Department of Public Health Dentistry. Content validity was tested by a panel of four experts, including three professors from the Department of Public Health Dentistry and a biostatistician. Face validity was assessed through a pilot study conducted with the physical education college trainees. Corrections to the questionnaire were made according to the expert panel's feedback. The reliability coefficient for each question was calculated using Cronbach's Alpha ($\alpha$), which was found to be 0.908, reflecting strong internal consistency among the 20 items assessed. This suggests a high level of reliability in the measurement instrument.

After the completion of filling out and collecting the forms, the participants were screened for any dental injury. Type III clinical examinations was carried out as per American Dental Association specifications using plane mouth mirrors and Clinical Practice Improvement (CPI) probes under adequate natural illumination [17]. Any sports-related dental injuries were assessed using the Traumatic Dental Injury codes of the WHO Oral Health Assessment Form for Adults, 2013 [18]. Teeth affected by dental trauma were coded as follows: 0=No sign of injury, 1=Treated injury, 2=Enamel fracture only, 3=Enamel and dentine fracture, 4=Pulp involvement, 5=Missing tooth due to trauma, 6=Other damage, 9=Excluded tooth [18].

## STATISTICAL ANALYSIS

Statistical analyses were performed using the Statistical Package for Social Sciences (SPSS) software version 25.0. Descriptive statistics were used for demographic variables. Awareness of sports-related dental injuries and mouthguard use were assessed using the Chi-square test, with $p \leq 0.001$ considered statistically significant.

## RESULTS

The total study population comprised 226 trainees, of whom 142 (62.8%) were males and 84 (37.2%) were females. Among the total population, 96 (42.5%) were football trainees, 58 (25.7%) were kabaddi trainees, and 72 (31.9%) were kho kho trainees. The mean age of the study population was 23.18±1.669 years, and the mean years of practice for the study population was 6.10±2.49.

[Table/Fig-1] shows the prevalence of dental trauma related to each of the three sports. It was observed that the frequency of enamel fractures of the upper left central incisor (tooth number 21) was highest in football players (8.3%), followed by enamel fractures of the upper left central incisor in kabaddi players (6.9%). The prevalence of treated injuries of the upper left central incisor after sports-related dental injury was highest among kabaddi players (10.3%) (p-value <0.0001).

| Tooth number | | Football (n=96) | | Kabaddi (n=58) | | Khokho (n=72) | | Chi-Sq. | p-value |
|---|---|---|---|---|---|---|---|---|---|
| | | n | % | n | % | n | % | | |
| 12 | No sign of injury | 94 | 97.9 | 57 | 98.3 | 72 | 100.0 | 434.186 | <0.0001* |
| | Treated injury | 0 | 0 | 1 | 1.7 | 0 | 0 | | |
| | Enamel fracture | 2 | 2.1 | 0 | 0 | 0 | 0 | | |
| 11 | No sign of injury | 85 | 88.5 | 53 | 91.4 | 66 | 91.7 | 329.743 | <0.0001* |
| | Treated injury | 7 | 7.3 | 4 | 6.9 | 2 | 2.8 | | |
| | Enamel fracture | 4 | 4.2 | 1 | 1.7 | 4 | 5.6 | | |
| 21 | No sign of injury | 85 | 88.5 | 48 | 82.8 | 71 | 98.6 | 329.664 | <0.0001* |
| | Treated injury | 3 | 3.1 | 6 | 10.3 | 1 | 1.4 | | |
| | Enamel fracture | 8 | 8.3 | 4 | 6.9 | 0 | 0 | | |
| 22 | No sign of injury | 93 | 96.9 | 56 | 96.6 | 72 | 100.0 | 422.504 | <0.0001* |
| | Treated injury | 1 | 1.0 | 2 | 3.4 | 0 | 0 | | |
| | Enamel fracture | 2 | 2.1 | 0 | 0 | 0 | 0 | | |
| 31 | No sign of injury | 95 | 99.0 | 57 | 98.3 | 72 | 0 | 218.071 | <0.0001* |
| | Treated injury | 1 | 1.0 | 1 | 1.7 | 0 | 0 | | |
| | Enamel fracture | 0 | 0 | 0 | 0 | 0 | 0 | | |
| 41 | No sign of injury | 94 | 97.9 | 58 | 100.0 | 72 | 100.0 | 218.071 | <0.0001* |
| | Treated injury | 2 | 2.1 | 0 | 0 | 0 | 0 | | |
| | Enamel fracture | 0 | 0 | 0 | 0 | 0 | 0 | | |

**[Table/Fig-1]:** Prevalence of injuries based on the type of sport.
*statistically significant
Chi-sq.=Chi-square test

[Table/Fig-2] displays the awareness of sports-related dental injuries associated with football, kabaddi, and kho kho. This domain consists of 8 closed-ended questions with multiple options. Five items in the scale are dichotomous in nature, whereas the other three items are multichotomous. Out of 226 participants, 131 (58%) responded that they believed dentofacial injuries could occur during sports practice, while the remaining 95 (42%) had no knowledge about dentofacial injuries during sports practice. Amongst all respondents, 41 (18.1%) reported experiencing some dental injury during their sports practice. Of those who had experienced injury, 24 (10.1%) had chipped teeth, 14 (6.2%) had tooth fractures, two (0.9%) had knocked out teeth, and two (0.9%) had jaw fractures. The majority of participants (136, 60.2%) believed it was possible to replant a knocked-out tooth. Only 21 (9.3%) out of the 41 who had sustained sports-related dental injuries had visited a dentist after experiencing a sports-related dental injury.

[Table/Fig-3] shows the awareness of the use of mouthguards by the study participants. This domain consists of four closed-ended dichotomous questions. The majority of participants, 206 (91.2%), were aware of what a mouthguard is; however, only 135 (59.7%) of them felt that it was mandatory to wear a mouthguard during sports practice.

[Table/Fig-4] shows the awareness of the use of mouthguards during sports practice by the study participants. This domain consists of four closed-ended questions. Three items in the scale are multichotomous

| Question number | Questions (Awareness) | | Frequency | Percentage | Chi-Sq. | p-value |
|---|---|---|---|---|---|---|
| Q5. | Time duration of practicing this sport per day | <5 hours | 175 | 77.4 | 193.221 | **<0.001*** |
| | | 5-10 hours | 51 | 22.6 | | |
| Q6. | Do you think that a dentofacial injury can occur during sports practice? | Yes | 131 | 58.0 | 68.035 | **<0.001*** |
| | | No | 95 | 42.0 | | |
| Q7. | Have you ever seen any dental injury during sports practice? | Yes | 106 | 46.5 | 5.735 | **0.017*** |
| | | No | 120 | 53.1 | | |
| Q8. | If yes, what kind of injury? | None | 117 | 51.8 | 1.00 | 0.317 |
| | | Chipped tooth | 11 | 4.9 | | |
| | | Tooth fracture | 51 | 22.6 | | |
| | | Tooth mobility | 8 | 3.5 | | |
| | | Knocked out tooth | 21 | 9.3 | | |
| | | Jaw fracture | 18 | 8.0 | | |
| Q9. | Have you ever experienced any dental injury during sports practice? | Yes | 41 | 18.1 | 231.698 | **<0.001*** |
| | | No | 185 | 81.9 | | |
| Q10. | If yes, what kind of dental injury it was? | None | 185 | 81.9 | 91.752 | **<0.001*** |
| | | Chipped tooth | 23 | 10.1 | | |
| | | Tooth fracture | 14 | 6.2 | | |
| | | Knocked out tooth | 2 | 0.9 | | |
| | | Jaw fracture | 2 | 0.9 | | |
| Q11. | Do you think that it is possible to replant a knocked out tooth? | Yes | 136 | 60.2 | 540.283 | **<0.001*** |
| | | No | 90 | 39.8 | | |
| Q12. | Have you been to a dentist after sports related dental injury? | Yes | 21 | 9.3 | 9.363 | **0.002*** |
| | | No | 205 | 90.7 | | |

**[Table/Fig-2]:** Awareness of the study participants about sports-related dental injuries.
*Statistically significant
Chi-sq.=Chi-square test

| Question number | Questions (Awareness) | | Frequency | Percentage | Chi-Sq. | p-value |
|---|---|---|---|---|---|---|
| Q13. | Do you know what is a mouth guard? | Yes | 206 | 91.2 | 149.805 | **<0.001*** |
| | | No | 20 | 8.8 | | |
| Q14. | Are you aware that you can use mouth guard during sport practice? | Yes | 159 | 70.4 | 153.080 | **<0.001*** |
| | | No | 67 | 29.6 | | |
| Q15. | Are you aware that mouth guards can prevent dental injury? | Yes | 186 | 82.3 | 37.451 | **<0.001*** |
| | | No | 40 | 17.7 | | |
| Q16. | Do you agree that use of mouth guard should be mandatory during sports practice? | Yes | 135 | 59.7 | 94.319 | **<0.001*** |
| | | No | 91 | 40.3 | | |

**[Table/Fig-3]:** Awareness of the study participants about the use of mouthguards.
*statistically significant
Chi-sq.=Chi-square test

| Question number | Questions (Awareness) | | Frequency | Percentage | Chi-Sq. | p-value |
|---|---|---|---|---|---|---|
| Q17. | Do you wear a mouth guard during sports practice? | Yes | 20 | 8.8 | 8.566 | **<0.001*** |
| | | No | 206 | 91.2 | | |
| Q18. | If yes, what kind of mouth guard do you wear? | No | 206 | 91.2 | 153.080 | **<0.001*** |
| | | Stock | 8 | 3.5 | | |
| | | Boil and bite | 4 | 1.8 | 520.655 | **<0.001*** |
| | | Customised | 8 | 3.5 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Q19. | If you do not wear a mouth guard, why not? | Didn't know | 19 | 8.4 | 142.637 | **<0.001*** |
| | | Not available | 26 | 11.5 | | |
| | | Uncomfortable | 42 | 18.6 | | |
| | | Not necessary | 56 | 24.8 | | |
| | | Aesthetics | 66 | 29.2 | | |
| | | Breathing | 6 | 2.7 | | |
| | | Communication | 9 | 4.0 | | |
| | | Expensive | 2 | .9 | | |
| Q20. | How often do you wear a mouth guard during sports practice? | Sometimes | 18 | 8 | 332.292 | **<0.001*** |
| | | Always | 2 | 0.8 | | |
| | | Never | 206 | 91.2 | | |

**[Table/Fig-4]:** Awareness of the study participants about the use of mouthguards during sports practice.
*statistically significant
Chi-sq.=Chi-square test

in nature, whereas one item is dichotomous. Out of 226 participants, 4 (1.8%) wore boil and bite type mouthguards, 8 (3.5%) wore stock type mouthguards, and 8 (3.5%) wore customised mouthguards. The majority (66, 29.2%) reported having aesthetic issues with the use of mouthguards. Approximately 56 trainees (24.8%) believed it was not necessary to use a mouthguard. Among the remaining participants, 26 (11.5%) did not have access to a mouthguard. The majority (206, 91.2%) reported 'never' wearing a mouthguard. Amongst the rest, 18 (8%) 'sometimes' wore mouthguards, and only two (0.8%) 'always' wore mouthguards during sports practice.

## DISCUSSION

Dental trauma is one of the most common dental emergencies that significantly impacts athletes. In the present study, 56 young trainees (24.7%) have sustained one or multiple dentofacial injuries. However, 41 sports trainees (18.1%) have experienced sports-related dental injuries. A similar study conducted by Galic T et al., indicated that 58 young athletes (25.3%) had sustained one or multiple sports-related orofacial injuries, while 31 athletes (13.5%) had experienced sports-related dental injuries [11]. In another study by Qudeimat MA et al., and Tsuchiya S et al., the prevalence of traumatic dental injury among soccer players was reported to be 25% and 13.3% among Japanese athletes, respectively [4,19].

In contrast, a study by Selva S et al., reported a higher prevalence of orofacial injuries among kabaddi players (75%) [6]. Similarly, a study by Tiwari V et al., found that the prevalence of orofacial injuries during sports activities was 39.1% in contact sports athletes, which was higher compared to the present study [20]. However, a study by Iona T et al., showed that the prevalence of orofacial injuries during sporting activities was 12%, which was lower compared to the present study [21]. In the present study, the prevalence of fractured teeth during sports practice was 6.2%. In a similar study conducted by Lana B et al., the prevalence of tooth fractures was found to be 9% among handball players [9]. In comparison to a study conducted by Selva S et al., the prevalence of fractured teeth was 29% among kabaddi players in Madurai city [6].

In the present study, 91.2% of participants were aware of a mouthguard as a protective device during sports practice. This contrasts with the findings of Sathyapsad S et al., and Bawazir OA et al., who reported that 58% and 57.3%, respectively, were aware of the use of mouthguards [1,22]. The rate of awareness of mouthguards was 48.6% in the study conducted by Mojarad F et al., [23].

In the present study, the prevalence of jaw fractures was 0.9%. However, a study conducted by Fernandes LL et al., determined that the prevalence of jaw fractures was 4.6% in combat sports [24]. Additionally, in the present study, 60.2% of participants believed it was possible to replant a knocked-out tooth. In contrast, 24.48% knew it was possible to replant an avulsed tooth, and 20.23% of players were aware of immediate replantation in the study conducted by Uzel I et al., Avulsion (knocked-out tooth) may cause serious periodontal damage with lifelong consequences, which is why coaches, trainers, and sports officers should educate individuals about emergency procedures following avulsion and dental management of such cases [25].

Regarding mouthguard usage, in the present study, 8.8% of participants wore mouthguards during sports practice, which contrasts with the studies conducted by Lana B et al., Galic T et al., and Mojarad F et al., who reported that 28%, 49%, and 23.9% of participants wore mouthguards, respectively [9,11,24]. In other contrasting studies by Qudeimat MA et al., and Uzel I et al., only 1% and 0.29%, respectively, wore mouthguards, which was much less compared to the present study [4,20]. Whilst 92% of participants in the present study never wore mouthguards, the study conducted by Padilha ACL et al., reported that 61.9% of rugby players did not use mouthguards during sports [26].

In the present study, 1.8% of participants wore boil and bite type mouthguards, and 3.5% wore stock and customised type mouthguards, which contrasts with a study conducted by Galic T et al., who reported that 52% of young athletes wore custom-made mouthguards [11]. In accordance with a study conducted by Ilia E et al., of the players who wore mouthguards, 0.6% wore stock mouthguards, 58.4% used 'boil and bite' mouthguards, and 41.0% used custom-made mouthguards [7].

In the present study, 11.5% of the trainees refrained from wearing mouthguards due to a lack of availability, whereas, 18.6% found them uncomfortable to wear during sports practice, and 24.8% did not feel it necessary to wear them. Additionally, 0.9% considered mouthguards to be expensive, whilst 2.7% and 4% did not wear mouthguards due to difficulty in breathing and communication, respectively. These findings are in accordance with the study conducted by Neeraja G et al., who outlined reasons for not using mouthguards, with 40% of athletes refraining from using them due to a lack of availability, 27% citing improper fitting of the appliance, 10% experiencing difficulty swallowing, and 8% having speech difficulties [27]. In the study by Uzel I et al., 31.48% considered mouthguards unnecessary, 4.4% reported communication problems, and 1.7% mentioned difficulty in breathing [25]. Another study by Galic T et al., revealed that the most common reason for not wearing a mouthguard was that it was considered unnecessary (37%), uncomfortable (21.5%), or interfering with breathing or communication (5.2%) [11].

Sporting organisations consider mouthguards a crucial item of personal safety gear. Sports-related TDI must be prevented in children and adolescents, as permanent tooth damage can have long-term repercussions. The present study examined the prevalence and types of orofacial injuries and the use of mouthguards in football, kabaddi, and kho-kho players, which have not been sufficiently evaluated previously. Raising awareness, implementing rules mandating the use of mouthguards in high-risk sports, and encouraging athletes to regularly use mouthguards can reduce the rate of injury. Sports-related activities require the use of the best mouthguards. While many believe

that custom-made mouthguards are the most protective, alternative mouthguards that fit comfortably and adjust to the wearer's mouth are also useful.

### Limitation(s)

The main limitation of the study was the use of a self-structured questionnaire as the survey technique, which may result in inconsistencies between objective findings and respondents' subjective experiences of sports-related injury. However, despite this limitation, the findings are still valuable for implementing preventative measures in young trainees' sporting activities. On the other hand, the main strength of the study was the inclusion of kho-kho and kabaddi players. There is a lack of research on sports-related dental injuries and mouthguard use associated with these sports, making this study particularly valuable in addressing this gap in the literature.

## CONCLUSION(S)

The majority of the trainees are knowledgeable about sports-related dental injuries. The prevalence of sports-related dental injury was highest among football trainees, followed by kabaddi players, and least among kho-kho players. The majority of the study participants were unfamiliar with mouthguards as protective equipment to safeguard themselves from dental injuries sustained during sports practice. More than half of the trainees were unaware of the replantation of an avulsed tooth. The availability of suitable mouthguards may lower the frequency of dental injuries sustained during sporting activities. There is a need for educational initiatives that will raise awareness, advance understanding, and encourage the use of appropriate mouthguards by young players.

The fact that dental damage was experienced by training participants in these three contact sports highlights how crucial a mouthguard is. To avoid injuries associated with sports, its usage should be promoted and/or required. To promote the use of mouthguards in contact sports, a team effort from the dentist, coach, and sports physician is necessary.

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