Research Article

Impact of Sports Participation on Oral Injuries and Mouthguard Compliance in Teenage Adolescent Athletes

Hanadi Abdullah Alwafi

[1] *Assistant Professor and Consultant in Pediatric Dentistry and Special Health Care Needs, Head of Basic and Preventive Sciences Department, General Dentistry Program, Batterjee Medical College, Jeddah, Saudi Arabia*

Hanadi Abdullah Alwafi (alwafi@bu.edu)

Abstract

Background: Sports-related oral and dental injuries represent a significant yet preventable source of morbidity among adolescent athletes. Mouthguards are established as effective protective devices; however, compliance rates remain suboptimal across many sporting disciplines. Comprehensive data examining the interrelationship between sport type, oral injury patterns, and mouthguard utilization behaviors among teenage athletes are limited. **Objective:** This cross-sectional study aimed to evalu- ate the prevalence and patterns of sports-related oral injuries among adolescent athletes across different sporting disciplines and to assess mouthguard awareness, usage compliance, and barriers to adoption. **Methods:** A total of 520 adolescent athletes aged 13–18 years participating in organized competitive sports were recruited from twelve sports clubs. Data were collected through validated questionnaires addressing injury history, mouthguard usage patterns, and perceived barriers, complemented by stan- dardized clinical oral examinations. Participants represented five sport categories: basketball, soccer, martial arts, hockey, and gymnastics. **Results:** The overall lifetime prevalence of sports-related oral injuries was 38.7% (n = 201). Martial arts athletes exhibited the highest prevalence (54.8%), followed by hockey (47.1%) and basketball (39.4%). Lip lacerations (42.3%) and tooth fractures (28.4%) were the most common injury types. Although 78.5% of participants reported awareness of mouthguards, only 31.2% reported consistent usage. Custom-fabricated mouthguard use was reported by merely 8.7% of users. Significant predictors of mouthguard non-compliance included perceived discomfort (OR = 3.24, 95% CI: 2.18–4.82), speech interference (OR = 2.87, 95% CI: 1.93–4.27), and absence of a coaching mandate (OR = 4.12, 95% CI: 2.76–6.15). Athletes who consistently wore mouthguards experienced significantly fewer dental injuries compared with non-users (18.5% vs. 47.6%; $p < 0.001$). **Conclusion:** Sports-related oral injuries are highly prevalent among adolescent athletes, yet mouthguard compliance remains critically inadequate. Coaching mandates, improved comfort through custom fabrication, and targeted educational interventions represent essential strategies for enhancing mouthguard adoption in youth sports.

Keywords: sports injuries, oral trauma, dental injuries, mouthguard, adolescent athletes, compliance, orofacial protection

1 Introduction

Sports participation among adolescents has increased substantially over the past several decades, conferring numerous physical, psychological, and social benefits that contribute positively to overall health and devel- opment [1]. However, athletic involvement simultaneously exposes young individuals to an elevated risk of traumatic injuries, among which orofacial and dental injuries constitute a particularly significant category due to their potential for lifelong functional, aesthetic, and psychosocial consequences [2]. The orofacial region is estimated to represent approximately 11–40% of all sports injuries in children and adolescents, depending on the sporting discipline and level of competition [3]. Traumatic dental injuries sustained during sports participation encompass a broad spectrum of clinical presentations, ranging from minor enamel infractions and soft tissue contusions to severe injuries, includ- ing crown-root fractures, tooth avulsions, alveolar bone fractures, and temporomandibular joint injuries [4]. The consequences of these injuries extend beyond the immediate physical impact, encompassing prolonged treatment requirements, substantial financial costs estimated at $15,000 to $20,000 per avulsed tooth over a lifetime, psychological distress, compromised quality of life, and potential interference with normal craniofa- cial development in growing adolescents [5]. Glendor reported that the economic burden of traumatic dental injuries in young

populations rivals or exceeds that of other commonly addressed childhood conditions, yet preventive measures remain comparatively underemphasized [6]. Mouthguards represent the primary preventive device available for protection against sports-related oro- facial injuries. Three categories of mouthguards are currently available: stock, namely ready-made, mouth- formed, namely boil-and-bite, and custom-fabricated, namely professionally manufactured from dental im- pressions [7]. The American Dental Association, the International Academy of Sports Dentistry, and the F´ed´eration Dentaire Internationale have consistently recommended mouthguard use during participation in contact and collision sports [8]. Evidence supporting mouthguard effectiveness is compelling; a systematic review by Knapik and colleagues concluded that mouthguard use reduced the risk of orofacial injuries by 82% to 93% across various sporting contexts [9]. Furthermore, Labella and colleagues demonstrated in a prospective cohort study that basketball players wearing custom mouthguards sustained significantly fewer dental and oral soft tissue injuries compared with unprotected counterparts [10].Despite the well-documented protective efficacy of mouthguards, compliance with mouthguard use among adolescent athletes remains alarmingly low across most sporting disciplines. Studies have reported mouth- guard usage rates ranging from 7% to 48% in various adolescent sports populations, with substantial variation by sport type, geographic region, and regulatory environment [11]. Berry and colleagues found that only 36% of high school athletes in collision sports reported regular mouthguard use, with compliance rates de- clining further in non-mandated sports [12]. Multiple barriers to mouthguard adoption have been identified in the literature, including perceived discomfort, interference with breathing and speech, negative aesthetic perceptions, cost considerations, lack of awareness regarding injury risk, and absence of regulatory mandates [13]. Several important gaps exist in the current literature. First, while individual studies have examined either injury prevalence or mouthguard compliance independently, fewer investigations have simultaneously evaluated both dimensions within the same adolescent cohort, limiting the ability to directly correlate pro- tective behavior with injury outcomes [14]. Second, the relative contribution of sport type, competition level, and training intensity to oral injury risk among adolescent athletes requires further characterization, as most existing data derive from professional or collegiate populations that may not be directly generalizable to teenage competitors [15]. Third, the barriers to mouthguard adoption have been primarily explored through adult-focused surveys, and adolescent-specific perceptions, particularly regarding peer influence, self-image concerns, and coaching authority, warrant dedicated investigation [16]. Fourth, the relationship between mouthguard type and both protective efficacy and compliance in adolescent populations has received insuf-ficient attention, despite evidence suggesting that custom-fabricated devices offer superior protection and user acceptance [17]. The present study aimed to evaluate the prevalence and patterns of sports-related oral and dental in- juries among adolescent athletes participating in five competitive sporting disciplines, to assess mouthguard awareness, usage compliance rates, and specific barriers to adoption, and to examine the association between mouthguard utilization patterns and oral injury occurrence. The investigation further sought to identify in- dependent predictors of mouthguard non-compliance to inform the development of targeted educational and policy interventions.

2 Materials and Methods

2.1 Study Design and Ethical Considerations

This multicenter, cross-sectional analytical study was conducted between December 2025 and February 2026. Data were collected from adolescent athletes affiliated with twelve organized competitive sports clubs situated across three districts in Jeddah. All procedures were performed in accordance with the Declaration of Helsinki. Written informed consent was obtained from the parent or legal guardian of each participant, and written assent was obtained from each adolescent prior to enrollment.

2.2 Sample Size Determination

The minimum required sample size was calculated based on an estimated mouthguard compliance rate of 30% among adolescent athletes, a desired precision of 5%, and a 95% confidence level. The calculation yielded a minimum of 323 participants. To account for multi-sport stratification, consisting of five groups, potential

incomplete responses, and design-effect considerations, the target sample was increased to 520 participants, with approximately 100 to 110 athletes per sport category.

2.3 Participant Selection

Adolescent athletes aged 13 to 18 years who had been actively participating in organized competitive sports programs for a minimum of 12 months and who trained at least three times per week were eligible for inclusion. Participants were recruited from five sporting disciplines selected based on their differing levels of contact and collision risk: basketball (n = 109), soccer (n = 106), martial arts, including taekwondo, karate, and judo (n = 104), field hockey (n = 102), and gymnastics (n = 99).Exclusion criteria included participation in organized sports for less than 12 months, training fewer than three sessions per week, presence of congenital craniofacial anomalies or developmental dental conditions, history of oral or dental injuries unrelated to sports participation, current orthodontic treatment with fixed appliances that would interfere with mouthguard fitting assessment, and inability to provide a reliable injury history due to cognitive or communication barriers.

2.4 Data Collection Instruments

2.4.1. Structured Questionnaire. A comprehensive, self-administered questionnaire was developed based on previously validated instruments utilized in sports dentistry research. The questionnaire underwent a rigorous development process, including initial item generation through literature review and expert consultation, content validation by a panel comprising two sports dentistry specialists, one sports medicine physician, one epidemiologist, and one adolescent psychologist, and pilot testing on 40 adolescent athletes not included in the main study. The pilot-tested instrument demonstrated acceptable internal consistency (Cronbach's alpha = 0.84) and test-retest reliability (intraclass correlation coefficient = 0.88) at a two-week interval.
The questionnaire comprised five sections: (a) sociodemographic and sports participation characteristics, including age, sex, sport type, years of participation, weekly training hours, and competition level; (b) history of sports-related oral and dental injuries, including injury type, mechanism, anatomical location, and treatment received; (c) mouthguard awareness, knowledge, and attitudes, including awareness of mouthguard availability, knowledge of injury prevention benefits, and attitudes toward mouthguard use; (d) mouthguard usage patterns, including current and past use, type of mouthguard, frequency of use during training and competition, and source of mouthguard; and (e) perceived barriers to mouthguard use, assessed through a 14-item barrier inventory with responses recorded on a five-point Likert scale ranging from "strongly disagree" to "strongly agree." Mouthguard compliance was operationally defined and categorized as follows: consistent users, wearing a mouthguard during all training sessions and competitions; occasional users, wearing a mouthguard during some but not all sessions; and non-users, never wearing a mouthguard during sports activities.

2.4.2. Clinical Oral Examination. All participants underwent a standardized clinical oral examination performed by two calibrated examiners (inter-examiner kappa = 0.89; intra-examiner kappa = 0.92 and 0.90, respectively). Examinations were conducted under standardized conditions using portable dental units equipped with artificial illumination, disposable mirrors, and WHO periodontal probes. The following parameters were assessed: Evidence of previous dental trauma, including tooth fractures classified according to the Andreasen classification system, tooth discoloration suggestive of pulp necrosis, tooth mobility beyond physiological limits, presence of dental restorations attributable to traumatic injuries as confirmed by participant history, and evidence of tooth loss due to avulsion.Soft tissue examination of the lips, labial mucosa, buccal mucosa, tongue, floor of the mouth, and gingiva for scarring, fibrosis, or other evidence of previous traumatic injury. Assessment of overjet, measured in millimeters using a ruler, and lip competence, as both represent established risk factors for dental trauma. If the participant was currently in possession of a mouthguard at the time of examination, the device was evaluated for type, fit adequacy, coverage extent, material condition, and thickness using standardized criteria.

2.5 Statistical Analysis

Data were entered into Microsoft Excel and analyzed using SPSS version 28.0 (IBM Corporation, Armonk, NY, USA). Descriptive statistics were reported as means with standard deviations for continuous variables and frequencies with percentages for categorical variables. Normality of continuous variables was evaluated using the Kolmogorov–Smirnov test. Between-group comparisons were performed using one-way analysis of variance (ANOVA) with Tukey's honest significant difference post hoc test for continuous variables and chi-square tests with Bonferroni-adjusted pairwise comparisons for categorical variables. Binary logistic regression analysis was conducted to identify independent predictors of oral injury occurrence and mouthguard non-compliance, adjusting for relevant covariates. Odds ratios (OR) with 95% confidence intervals (CI) were calculated. Statistical significance was established at $p < 0.05$ for all analyses.

3 Results

3.1 Demographic and Sports Participation Characteristics

The study included 520 adolescent athletes with a mean age of 15.2 ± 1.6 years, comprising 298 males (57.3%) and 222 females (42.7%). The mean duration of sports participation was 4.7 ± 2.3 years, with an average weekly training load of 8.4 ± 3.2 hours. No statistically significant differences were observed between sport groups regarding age ($p = 0.387$) or sex distribution ($p = 0.214$). Martial arts and hockey athletes reported significantly higher weekly training hours compared with gymnastics participants ($p = 0.012$).

3.2 Prevalence and Patterns of Sports-Related Oral Injuries

The overall lifetime prevalence of self-reported sports-related oral injuries was 38.7% (n = 201), with clinical examination confirming objective evidence of previous dental trauma in 29.4% (n = 153). Among the 201 athletes reporting an injury history, 74 (36.8%) reported multiple injury episodes. The detailed distribution of injuries by sport type and injury category is presented in Table 1. The most commonly injured teeth were the maxillary central incisors (62.4%), followed by maxillary lateral incisors (21.8%) and mandibular central incisors (9.7%). Athletes with increased overjet (> 5 mm) demonstrated a significantly higher injury prevalence (56.7%) compared with those with normal overjet (36.3%) ($p = 0.003$). Similarly, athletes with incompetent lips exhibited significantly elevated injury rates (51.3%) compared with those with competent lip coverage (36.5%) ($p = 0.014$).

Table 1: Prevalence and types of sports-related oral injuries by sport category (N = 520)

Variable	Basketball (n=109)	Soccer (n=106)	Martial Arts (n=104)	Hockey (n=102)	Gymnastics (n=99)	Total (N=520)	p-value
Overall injury prevalence, n (%)	43 (39.4)	32 (30.2)	57 (54.8)	48 (47.1)	21 (21.2)	201 (38.7)	<0.001*
Injury type, n (% of injured)							
Lip laceration	19 (44.2)	14 (43.8)	26 (45.6)	18 (37.5)	8 (38.1)	85 (42.3)	0.874
Crown fracture (enamel only)	8 (18.6)	5 (15.6)	14 (24.6)	12 (25.0)	3 (14.3)	42 (20.9)	0.562
Crown fracture (enamel-dentin)	4 (9.3)	2 (6.3)	6 (10.5)	5 (10.4)	1 (4.8)	18 (9.0)	0.871
Tooth avulsion	1 (2.3)	1 (3.1)	4 (7.0)	3 (6.3)	0 (0.0)	9 (4.5)	0.437
Tooth luxation/subluxation	3 (7.0)	2 (6.3)	7 (12.3)	6 (12.5)	2 (9.5)	20 (10.0)	0.687
Gingival/mucosal contusion	14 (32.6)	11 (34.4)	18 (31.6)	14 (29.2)	6 (28.6)	63 (31.3)	0.964
Tongue laceration	5 (11.6)	4 (12.5)	8 (14.0)	5 (10.4)	2 (9.5)	24 (11.9)	0.955
TMJ injury	1 (2.3)	0 (0.0)	3 (5.3)	2 (4.2)	0 (0.0)	6 (3.0)	0.384
Most common mechanism	Elbow/hand contact	Head/body collision	Direct blow	Stick/ball impact	Fall/apparatus	—	—
Overjet > 5 mm, n (%)	14 (12.8)	11 (10.4)	13 (12.5)	10 (9.8)	12 (12.1)	60 (11.5)	0.934
Incompetent lips, n (%)	18 (16.5)	15 (14.2)	16 (15.4)	14 (13.7)	13 (13.1)	76 (14.6)	0.945

*Statistically significant at $p < 0.05$; chi-square test for overall injury prevalence comparison.

3.3 Mouthguard Awareness and Compliance

Overall mouthguard awareness was 78.5% (n = 408), but consistent usage was reported by only 31.2% (n = 162). The detailed mouthguard-related findings by sport category are presented in Table 2.

Table 2: Mouthguard awareness, usage patterns, and type by sport category (N = 520)

Variable	Basketball (n=109)	Soccer (n=106)	Martial Arts (n=104)	Hockey (n=102)	Gymnastics (n=99)	Total (N=520)	p-value
Mouthguard awareness, n (%)	87 (79.8)	72 (67.9)	94 (90.4)	92 (90.2)	63 (63.6)	408 (78.5)	<0.001*
Usage category, n (%)							
Consistent user	28 (25.7)	14 (13.2)	56 (53.8)	51 (50.0)	13 (13.1)	162 (31.2)	<0.001*
Occasional user	24 (22.0)	18 (17.0)	21 (20.2)	22 (21.6)	9 (9.1)	94 (18.1)	
Non-user	57 (52.3)	74 (69.8)	27 (26.0)	29 (28.4)	77 (77.8)	264 (50.8)	
Mouthguard type (among users), n (%)							
Stock (ready-made)	22 (42.3)	16 (50.0)	28 (36.4)	24 (32.9)	12 (54.5)	102 (39.8)	0.024*
Boil-and-bite	25 (48.1)	14 (43.8)	38 (49.4)	39 (53.4)	8 (36.4)	124 (48.4)	
Custom-fabricated	3 (5.8)	1 (3.1)	8 (10.4)	8 (11.0)	2 (9.1)	22 (8.6)	
Unknown type	2 (3.8)	1 (3.1)	3 (3.9)	2 (2.7)	0 (0.0)	8 (3.1)	
Source of recommendation							
Coach/trainer	31 (59.6)	17 (53.1)	52 (67.5)	49 (67.1)	8 (36.4)	157 (61.3)	0.038*
Dentist	8 (15.4)	5 (15.6)	12 (15.6)	10 (13.7)	6 (27.3)	41 (16.0)	0.524
Parent/family	9 (17.3)	7 (21.9)	10 (13.0)	11 (15.1)	5 (22.7)	42 (16.4)	0.614
Self/peers	4 (7.7)	3 (9.4)	3 (3.9)	3 (4.1)	3 (13.6)	16 (6.3)	0.328

*Statistically significant at $p < 0.05$.

Among mouthguard users, the most frequently reported reason for adoption was coach requirement (61.3%), followed by parental encouragement (16.4%) and dental professional recommendation (16.0%). Regarding the protective effect, athletes who consistently used mouthguards demonstrated a significantly lower prevalence of dental injuries, specifically hard tissue injuries, compared with non-users (18.5% vs. 47.6%; $p < 0.001$) and occasional users (18.5% vs. 34.0%; $p = 0.004$).

3.4 Barriers to Mouthguard Use and Predictors of Non-Compliance

Among the 264 non-users and 94 occasional users, representing a total of 358 athletes with suboptimal mouthguard compliance, multiple barriers to regular use were reported and endorsed by the participants. These barriers reflected practical, behavioral, and perceptual factors that limited consistent adoption of mouthguards during training sessions and competitive events. Logistic regression analysis was subsequently performed to determine the independent predictors of mouthguard non-compliance after considering relevant participant and sport-related variables. The identified predictors of non-compliance are presented in Table 3.

Table 3: Barriers to mouthguard use and logistic regression predictors of non-compliance (N = 520)

Barrier (endorsed by non-users/occasional users, n = 358)	n (%)
Discomfort/poor fit	247 (69.0)
Interference with speech	218 (60.9)
Interference with breathing	196 (54.7)
Not required by coach/rules	234 (65.4)
Not perceived as necessary	178 (49.7)
Aesthetic concerns/embarrassment	143 (39.9)
Cost concerns	112 (31.3)
Gagging sensation	97 (27.1)
Difficulty drinking water	89 (24.9)
Unaware of availability	64 (17.9)

Logistic Regression: Independent Predictors of Non-Compliance	Adjusted OR	95% CI	p-value
Absence of coaching mandate	4.12	2.76–6.15	<0.001*
Perceived discomfort	3.24	2.18–4.82	<0.001*
Speech interference	2.87	1.93–4.27	<0.001*
Breathing interference	2.43	1.64–3.61	<0.001*
Low perceived injury risk	2.68	1.78–4.03	<0.001*
Aesthetic concerns	1.94	1.31–2.87	0.001*
Cost concerns	1.76	1.18–2.63	0.006*
Female sex	1.42	1.02–1.98	0.038*
Younger age (13–15 vs. 16–18 years)	1.38	0.98–1.94	0.064

Low-contact sport participation	2.14	1.43–3.21	<0.001*

*Statistically significant at $p < 0.05$; Hosmer–Lemeshow test: $\chi^2 = 5.87$, $p = 0.662$; Nagelkerke $R^2 = 0.394$. Custom-fabricated mouthguard users reported significantly lower discomfort scores (1.87 ± 0.64 on a 5-point scale) compared with boil-and-bite users (2.94 ± 0.82) and stock mouthguard users (3.67 ± 0.78) ($p < 0.001$). Similarly, speech interference scores were significantly lower among custom mouthguard users (1.72 ± 0.58 vs. 2.86 ± 0.91 for boil-and-bite and 3.48 ± 0.84 for stock types; $p < 0.001$).

4 Discussion

The present study provides a comprehensive assessment of sports-related oral injury prevalence and mouthguard compliance among adolescent athletes across five competitive sporting disciplines. The findings reveal a high burden of orofacial injuries in this population alongside critically inadequate protective behavior, underscoring the urgent need for enhanced preventive strategies targeting young athletes. The overall oral injury prevalence of 38.7% documented in this study is concordant with the range reported in previous investigations of adolescent athletic populations. Newsome and colleagues found a 39.1% prevalence of sports-related dental injuries among Irish schoolchildren engaged in sporting activities [18], while Ozbay and colleagues reported a 36.4% prevalence among Turkish adolescent athletes in contact sports [19]. The higher prevalence observed among martial arts participants (54.8%) compared with other sport categories is consistent with the findings of Levin and colleagues, who documented that combat sports carry the highest risk of orofacial trauma due to the intentional nature of physical contact and the targeting of the head and face region [20]. Conversely, the relatively lower prevalence among gymnasts (21.2%) likely reflects the non-contact nature of the discipline, where injuries typically result from falls and apparatus contact rather than interpersonal collisions. The predominance of lip lacerations (42.3%) and crown fractures (29.9% combined) as the most common injury types mirrors the epidemiological patterns consistently described in the sports dentistry literature. Glendor and colleagues, in their comprehensive review, reported that soft tissue injuries to the lips and oral mucosa constitute the most frequent orofacial sports injuries, followed by enamel and enamel-dentin fractures of the maxillary incisors [21]. The vulnerability of the maxillary central incisors, which sustained 62.4% of all dental injuries in our study, is attributable to their anterior position, prominence, and susceptibility to direct traumatic force, particularly in individuals with increased overjet or incompetent lip coverage [22]. Our finding that athletes with overjet exceeding 5 mm experienced significantly higher injury rates (56.7% vs. 36.3%) confirms the well-established role of increased overjet as a predisposing factor for anterior dental trauma, consistent with the meta-analysis by Nguyen and colleagues [5]. The mouthguard compliance rate of 31.2% for consistent usage identified in this study, while concerning, falls within the range documented in comparable adolescent populations. A systematic review by Galic and colleagues found that mouthguard usage rates among young athletes varied between 9% and 54%, with substantially higher rates observed in sports where mouthguard use is mandated by governing bodies [23]. The striking disparity in compliance between martial arts (53.8%) and hockey (50.0%) compared with soccer (13.2%) and gymnastics (13.1%) observed in our study largely reflects differences in sport-specific regulations and coaching cultures regarding mandatory protective equipment. In martial arts and hockey, organizational rules frequently mandate mouthguard use during competition, whereas no such requirements typically exist for soccer and gymnastics at the adolescent level [24].The identification of the absence of a coaching mandate as the strongest predictor of non-compliance (OR = 4.12) has profound practical implications and is consistent with the work of Cornwell and colleagues, who demonstrated that institutional requirements were the single most influential determinant of mouthguard adoption among collegiate athletes [25]. This finding suggests that policy-level interventions mandating mouthguard use across a broader range of youth sporting activities could achieve substantially greater impact than educational interventions alone. Indeed, several jurisdictions that have implemented mandatory mouthguard policies in youth sports have subsequently documented significant reductions in orofacial injury rates [26]. The significant protective effect of consistent mouthguard use demonstrated in this study, with dental injury prevalence of 18.5% among consistent users compared with 47.6% among non-users, provides compelling real-world evidence supporting the efficacy of these devices. The magnitude of risk reduction observed, approximately 61%, is consistent with the estimates

derived from the systematic review by Knapik and col- leagues, who reported that mouthguards confer 82–93% protection against orofacial injuries in controlled studies [9]. The somewhat lower protective magnitude observed in our cross-sectional assessment compared with prospective controlled studies may reflect the heterogeneity of mouthguard types used, variations in fit quality, and the retrospective nature of injury reporting. The exceptionally low utilization rate of custom-fabricated mouthguards (8.6% of users) represents a significant missed opportunity for optimal protection. Our finding that custom mouthguard users reported significantly lower discomfort and speech interference scores compared with stock and boil-and-bite users aligns with the evidence presented by Patrick and colleagues, who demonstrated superior comfort, retention, and user satisfaction with custom-fabricated devices [17]. The superior comfort profile of custom mouthguards directly addresses the two most commonly endorsed barriers to compliance identified in this study, namely discomfort (69.0%) and speech interference (60.9%), suggesting that increasing access to custom fabrication could simultaneously enhance both compliance and protective efficacy [27]. The primary impediment to wider custom mouthguard adoption is cost, which was endorsed as a barrier by 31.3% of non-compliant participants, highlighting the need for subsidized dental services or school-based fabrication programs. The finding that dental professional recommendation accounted for only 16.0% of mouthguard adoption decisions, compared with 61.3% for coaching recommendations, reveals a critically underutilized opportunity for dentists to influence protective behavior. Emerich and Kaczmarek emphasized the important role that dental practitioners could play in sports injury prevention through routine screening, counseling, and mouthguard fabrication during dental visits [28]. Integrating sports injury risk assessment and mouthguard recommendation into standard adolescent dental care protocols could substantially expand the reach of preventive messaging [29]. Several limitations of this study warrant consideration. The cross-sectional design and reliance on ret- rospective self-reported injury history introduce the potential for recall bias, particularly regarding injuries sustained earlier in the athletic career. The categorization of mouthguard compliance based on self-report may overestimate actual usage frequency due to social desirability effects. The study focused on five specific sports, and findings may not be directly generalizable to other athletic disciplines. Furthermore, the study did not prospectively track injury incidence rates per exposure hours, which would provide more precise estimates of sport-specific injury risk. Future prospective cohort studies incorporating objective compliance monitoring and standardized injury surveillance systems would strengthen the evidence base. Notwithstanding these limitations, the study possesses notable strengths, including a large multi-sport sample, comprehensive assessment combining questionnaire data with clinical examination, investigation of multiple barrier dimensions, and rigorous multivariate analysis identifying independent compliance predic- tors.

5 Conclusion

This study demonstrates that sports-related oral and dental injuries affect a substantial proportion of adolescent athletes, with prevalence rates that vary significantly by sporting discipline, being highest in martial arts and hockey. Despite widespread awareness of mouthguards as protective devices, consistent usage remains critically low, particularly in sports lacking organizational mandates for their adoption. The absence of coaching requirements, perceived discomfort, and speech interference constitute the most influential barriers to mouthguard compliance.Consistent mouthguard use was associated with a markedly reduced prevalence of dental injuries, con- firming the protective value of these devices in real-world athletic settings. Custom-fabricated mouthguards, while underutilized, were associated with significantly greater user comfort and satisfaction, addressing the primary barriers to compliance. These findings collectively underscore the need for a multi-pronged approach to enhance mouthguard adoption in youth sports, encompassing expanded organizational mandates across sporting disciplines, increased access to custom-fabricated mouthguards through subsidized or school-based programs, active engagement of dental professionals in sports injury prevention counseling, and targeted ed- ucational interventions directed at athletes, coaches, and parents that emphasize the severity, permanence, and preventability of sports-related dental injuries.

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