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RESEARCH ARTICLE

Oral Health Status and Treatment Needs Among Adolescent Football Players at Inter-SAI Football Tournament: A Cross-sectional Study

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Abstract

Background: Oral health is a vital component of systemic health and a primary determinant of athletic performance; however, this domain remains critically underexplored among youth athletes, particularly within emerging and developing sports infrastructures. **Aim:** Our primary objective was to assess the comprehensive oral health status, specific treatment needs, and the prevalence of sports-related orofacial trauma within a cohort of elite youth football players. **Methods:** A descriptive observational cross-sectional study was conducted among elite Under-17 and Under-19 footballers. Clinical assessments utilised a standardised protocol incorporating DMFT and ICDAS indices alongside WHO criteria to record periodontal status, symptoms of temporomandibular disorders (TMD), and historical orofacial trauma. **Results:** The investigation revealed a significant prevalence of dental caries and gingival inflammation, coupled with a notable history of sports-related trauma. Analysis demonstrated that a substantial proportion of athletes required restorative and preventive interventions, while symptoms suggestive of TMD were observed among the participants. **Conclusion:** Elite youth football players exhibit a high burden of untreated oral pathology and trauma, highlighting a profound deficiency in existing athlete healthcare systems. These findings support the urgent integration of standardised sports dentistry screening and preventive protocols into the development programs of youth footballers.

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1. INTRODUCTION

Oral health is a fundamental component of overall health and a recognised determinant of systemic well-being[1]. In elite athletes, poor oral health has been consistently associated with impaired quality of life, pain, and potential reductions in athletic performance[1,2]. Systematic reviews have reported a high prevalence of dental caries, erosion, and periodontal disease among athletes, suggesting that oral health remains a neglected aspect of sports medicine[2,3].

Beyond disease burden, oral health data play a critical role in informing preventive strategies and resource allocation within healthcare systems[4]. In football, the risk of orofacial trauma is particularly high due to the contact nature of the sport, with younger athletes showing increased susceptibility[5]. Common injuries include lip lacerations, dental fractures, and maxillofacial trauma, often influenced by player position and gameplay dynamics[5,6].

Recent studies among professional football players have demonstrated substantial prevalence of oral diseases and Temporomandibular Disorders (TMD), alongside significant exposure to sports-related trauma[3]. Despite this, evidence from Asian populations remains limited, particularly among youth athletes. In India, organised youth football platforms such as the Inter-SAI Football Tournament serve as critical pathways for elite athlete development. However, structured oral health assessment is not routinely integrated into athlete screening protocols. This gap necessitates focused investigation. Therefore, this study aims to assess oral health status, treatment needs, and prevalence of sports-related orofacial trauma among elite youth football players, while exploring implications for integrating sports dentistry into athlete care systems.

2. AIM AND OBJECTIVE

We aimed to assess the oral health status, treatment needs, and prevalence of sports-related dental trauma among football players participating in the National Sub-Junior Football Tournament using the PCDA screening protocol.

Based on the clinical examination findings, treatment needs were categorised into preventive care, restorative treatment, endodontic therapy, extraction, periodontal treatment, trauma management, and urgent referral. Preventive care included oral hygiene instruction and fluoride therapy. Restorative treatment was indicated for cavitated carious lesions without pulpal involvement. Endodontic treatment was recommended for teeth with pulpal pathology.

Extraction was indicated for non-restorable teeth. Periodontal treatment was advised for participants with calculus or periodontal pockets based on BPE scores. Participants presenting with acute pain, infection, or significant trauma were categorised under urgent referral.

2.1 Primary Objective

Prevalence and severity of dental caries (DMFT; mean and % with DMFT>0); periodontal status (BPE distribution); TMD Screening using the 3Q/TMD Questionnaire.

2.2 Secondary Objective

Prevalence of orofacial trauma history, mouthguard awareness/usage, TMD symptoms, evaluation of headache and treatment needs.

2.3 Exploratory Objective

Associations with age group (U-17/U-19), sex, years of play, diet (energy drinks/sugary and aerated drinks)

2.4 Treatment Needs and Urgency Assessment

Dental treatment needs were determined based on the clinical findings recorded during oral examination. Participants were categorised according to the primary treatment required into preventive care, restorative treatment, endodontic therapy, extraction, periodontal treatment, trauma management, and urgent referral.

In addition, treatment urgency was classified as immediate treatment (requiring urgent care within 24–48 hours), early treatment (conditions requiring dental care in the near future but not urgent), and routine or preventive care.

3. MATERIALS AND METHODS

3.1 Study Design

This descriptive observational cross-sectional study was conducted during the All India Inter-SAI Football Tournament for Boys and Girls 2025 held at the Sports Authority of India (SAI) STC Jalpaiguri in November 2025.

Before conducting this study, formal permission was obtained from the person in charge of the Sports Authority of India, Jalpaiguri centre. The concerned authority subsequently informed the coaches and team officials of all participating teams about the proposed dental screening program. During the tournament, players from teams whose officials expressed interest and provided consent were referred for clinical assessment. Participation was voluntary, and only those athletes who were willing underwent examination. This study was initiated with approval from the Indian Academy of Sports Dentistry (IASD-2025-R-010).

3.2 Inclusion Criteria

(i) Age: 12 - 19 years.

(ii) Gender: Male and Female.

(iii) Athletes whose coaches consented to oral examination.

(iv) Athletes who voluntarily showed up for the assessment.

3.3 Exclusion Criteria

(i) Athletes absent during screening.

(ii) Incomplete records.

(iii) Age >19 years and <12 years

(iv) Teams that didn't consent to this.

3.4 Armamentarium

(i) Mouth mirror

(ii) Torch

(iii) Face mask

(iv) Sanitiser

(v) Gloves

3.5 Procedure

A structured Pre–Competitions Dental Assessment (PCDA) protocol was used to record the following data on the ScanO Lite App, developed for sports dentistry screening; adapted from the Universal Dental Examination in Sports protocol based on the guidelines provided by EA4SD, ASD and FDI. In the app, data for each athlete can be recorded under 7 sections, out of which the 6th section was specifically for the Paralympics. 1st section recorded general information, 2nd section covered past dental history, questionnaire regarding mouthguard and the history of pain in the jaw. The 3rd and 4th sections included an initial dental exam and periodontal screening, the 6th section included a detailed questionnaire and observations on TMJ, and finally, the 7th section was the protocol outcome and eligibility to play.

The oral examinations were carried out by two dental surgeons. One examiner was a Fellow of the Indian Academy of Sports Dentistry (IASD). To ensure consistency and standardisation, the second member of the team received a training session on the day before the study. This session covered the purpose of the study, detailed data collection methods, the research protocol, and a demonstration of the ScanO Lite App. This was followed by a pilot assessment of five athletes on the day of the study. Inter-examiner reliability between the two dental surgeons was assessed using the Kappa statistic, yielding a Kappa score of 0.82, which indicates almost perfect agreement.

3.6 Data Recorded

3.6.1 General Information

Demographic data, including age, sex, years of sports

participation, and exposure level, were recorded for all participants.

3.6.2 Past Dental History

Participants were interviewed regarding their dental service utilisation in the previous year, including the number of visits, reasons for consultation, and treatment received. Additional information on medical history, medication intolerance, dietary habits (including sugar intake), and tobacco or alcohol use was recorded.

3.6.3 History of Orofacial Injuries

Participants were assessed for a history of orofacial trauma involving teeth and associated hard and soft tissues. Common injuries recorded included fractures, subluxations, avulsions, intrusions, and extrusions.

3.6.4 Mouthguard Awareness and Usage

Participants were questioned regarding awareness, usage, and perceived importance of mouthguards in football.

The following parameters were recorded:

(i) Use of mouthguard (yes/no)

(ii) Type (custom-made/prefabricated/boil-and-bite)

(iii) Frequency of use (training/match/both)

(iv) Barriers to use (comfort, cost, coach encouragement, availability)

(v) Use of occlusal splints

3.7 Dental Caries Assessment

Dental caries was assessed using the Decayed, Missing, and Filled Teeth (DMFT) index as recommended by the World Health Organisation[7]. Additionally, ICDAS criteria (D3 threshold) were used for identifying cavitated lesions[8]. Each tooth was scored as decayed, missing, or filled, with total scores ranging from 0 to 28 (excluding third molars). Clinical examination was performed using visual inspection with a mouth mirror and torch illumination. It is acknowledged that early-stage and interproximal lesions may have been underestimated due to the absence of radiographic evaluation.

3.8 Periodontal Screening

Periodontal status was evaluated using the Gingival Index (GI) and Bleeding On Probing (BOP). GI was assessed on six index teeth (16, 12, 24, 36, 32, 44) across four surfaces (facial, lingual, mesial, distal) to determine gingival inflammation. Bleeding on probing was used as an indicator of disease activity. Based on clinical findings, participants were categorised as having gingivitis or periodontitis.

3.9 TMJ and Musculoskeletal Screening

Oral health-related quality of life was assessed using the OHIP-5 questionnaire[9], which evaluates the impact of oral conditions on functional limitation, pain, psychological discomfort, and daily activities. Temporomandibular Disorder (TMD) screening was conducted using the 3Q/TMD questionnaire[9]. Participants were asked:

(i) Presence of pain in the temple, face, or jaw

(ii) Pain during chewing or mouth opening

(iii) Episodes of jaw locking

Participants reporting symptoms were clinically evaluated for:

3.9.1 Myofascial Pain

Manual palpation of masticatory muscles (temporalis, masseter, digastric) and associated neck muscles (sternocleidomastoid, trapezius) was performed bilaterally.

3.9.2 TMJ Signs

TMJ sounds (clicking, snapping, crepitation) were assessed via digital palpation during mandibular movement.

3.9.3 Parafunctional Habits

Bruxism was assessed based on self-reported clenching or grinding habits and clinical signs such as tooth wear.

3.10 History of Headache

Participants were asked about the presence, frequency, duration, and timing of headaches, along with associated triggers and parafunctional habits.

3.11 Statistical Analysis

Data was entered into Microsoft Excel (Microsoft Corporation, Redmond, WA, USA) for analysis. Descriptive statistics were used to summarise the findings. Continuous variables (e.g., DMFT scores) were expressed as mean ± standard deviation (SD), calculated using Microsoft Excel functions. Categorical variables (e.g., prevalence of dental caries, orofacial trauma, and TMD symptoms) were presented as frequencies and percentages, with prevalence calculated manually. No inferential statistical tests were performed.

4. RESULTS

4.1 Study Population

A total of 18 teams were invited, of which 10 teams had consented. Each team consisted of 13 players, making a total of 130 eligible for the study and amongst them, 70 players were examined. Among them, 52% were male, and 48% were female, with a mean age of 15.17 ± 1.5 years. The participants were categorised into U-16 (n = 39) and U-19 (n = 31) groups (Table 1).

Table 1. Study population characteristics

Variable	Value
Total participants	70
Mean age (years)	15.17 ± 1.5
Gender distribution	Male: 52%, Female: 48%
Groups	U-16 (n = 39), U-19 (n = 31)

4.2 Oral Health Status (Primary Outcomes)

4.2.1 Dental Caries (DMFT)

The mean DMFT score among participants was 1.96 ± 1.51. Overall, 35.7% of athletes had DMFT ≥1, indicating the presence of dental caries. The decayed component constituted the major proportion of the DMFT score (Table 2, Figure 1).

4.2.2 Periodontal Status (GI)

Periodontal assessment revealed that 28.5% had gingivitis, while 4.2% showed signs of periodontitis. Based on BPE scores, the majority of participants fell into Code 1/2, indicating the presence of bleeding and calculus (Table 2, Figure 1).

Table 2. Oral health status

Parameter	Value
Mean DMFT	1.96 ± 1.51
Caries Prevalence	35.7% (n = 25)
Gingivitis	28.5% (n = 20)
Periodontitis	4.2% (n = 3)

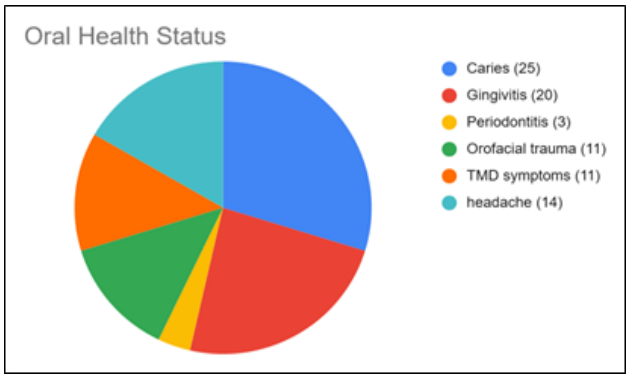


Figure 1. Oral health status: shows the number of athletes with different oral health problems.

4.3 Orofacial Trauma (Secondary Outcome)

A history of sports-related orofacial trauma was reported in 15.7% of athletes. The most common injuries included tooth fractures, lip lacerations, and avulsions (Table 3, Figure 1).

Table 3. Orofacial trauma and TMD

Parameter	Value
Orofacial trauma	15.7% (n = 11)
TMD symptoms	15.7% (n = 11)
Headache	20% (n = 14)

4.4 TMD and Symptoms

Based on the 3Q/TMD screening, 15.7% of athletes reported symptoms suggestive of TMD, including pain during chewing and jaw locking. However, 20% of athletes complained of headache occurring at different times of day, like in the morning, during practice or nocturnal, some even complained about headache due to stress before a match or after the practice due to a constant clenching habit (Table 3).

4.5 Mouthguard Awareness and Usage

While 14% (n = 10) of participants were aware of the use of mouthguards in Football, none reported actual usage. The most commonly reported barriers were Unaware of its use in football (86%) and lack of coach encouragement (14 %) (Table 4).

Table 4. Mouthguard awareness and usage

Parameter	Value
Awareness	14.3% (n = 10)
Usage	0%
Main barriers	Unaware (86%), No coach encouragement (14%)

4.6 Treatment Needs and Urgency

The most common treatment need was restorative care (n = 21, 30%), followed by preventive care (n = 28, 40%) and periodontal treatment (n = 23, 32.8%). Additional treatment requirements included endodontic therapy (n = 5, 7.1%), extraction (n = 2, 2.8%), and trauma management (n = 2, 2.8%) (Table 5, Figure 2).

Table 5. Treatment needs

Treatment Need	n (%)
Preventive care	28 (40%)
Restorative care	21 (30%)
Periodontal treatment	23 (32.8%)
Endodontic therapy	5 (7.1%)
Extraction	2 (2.8%)
Trauma management	2 (2.8%)

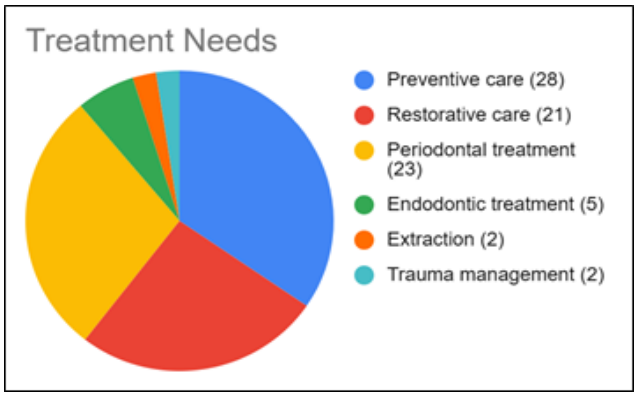


Figure 2. Treatment needs: number of athletes with special treatment needs.

Regarding urgency of care, 4 participants (5.7%) required immediate treatment, 42 (60%) required early intervention, and 24 (34.3%) required routine care (Table 6, Figure 3).

Table 6. Treatment urgency

Urgency Category	n (%)
Immediate (24–48 hours)	4 (5.7%)
Early intervention	42 (60%)
Routine / Preventive care	24 (34.3%)

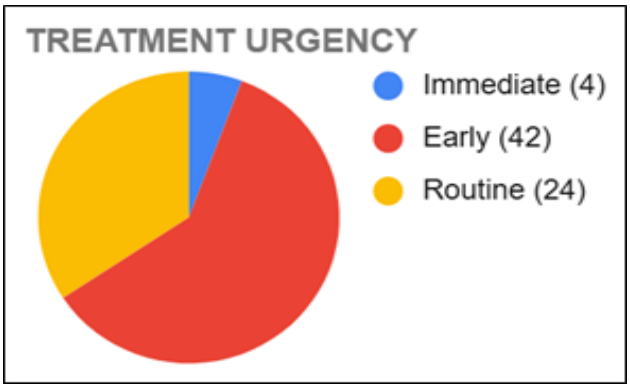


Figure 3. Treatment urgency: shows how quickly their conditions need attention.

4.7 Group Comparisons

U-16: A total of 39 players ranging from the ages of 13 to 15 years old, with 20 male and 19 female players.

U-19: A total of 31 players ranging from the ages of 16 to 19 years old, with 17 male and 14 female players.

The mean DMFT score among participants in the U-16 was 2.07 ± 1.64, whereas the U-19 category had a mean DMFT of 1.88 ± 1.4. Overall, 35% of athletes in both U-16 and U-19 categories had DMFT ≥1.

In both groups, the prevalence of periodontal findings was found to be 32%.

The prevalence of orofacial trauma was found to be significantly higher in the U16 (23%) category as compared to the U19 (9%). The occurrence of TMJ-related issues was similar in both groups, but the prevalence of headache was higher in the U16 at 28% as compared to the U19 category at 9% (Table 7, Figure 4).

Table 7. Group comparison of oral condition between the Under-16 and Under-19 categories

Parameter	U-16 Category (n = 39)	U-19 Category (n = 31)
Mean DMFT Score	2.07 ± 1.64	1.88 ± 1.4
Periodontal Findings	32%	32%
Orofacial Trauma History	23%	9%
Headache Prevalence	28%	9%

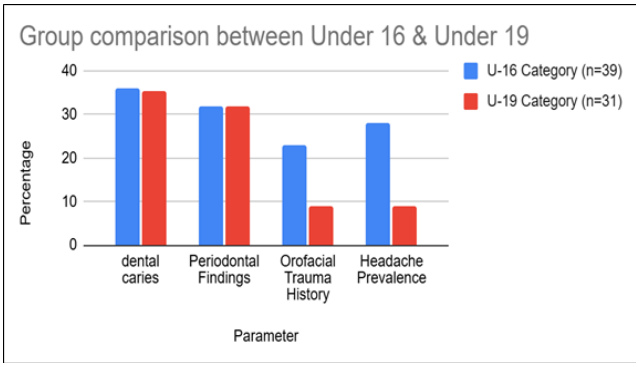


Figure 4. Group comparison of dental problems between Under-16 and Under-19.

5. DISCUSSION

By integrating these primary findings with established systematic reviews and contemporary research from diverse geographical cohorts, this evaluation elucidates the systemic challenges and preventive opportunities within the Indian sports context.

The reported caries prevalence in Indian youth footballers (35.7%) is relatively lower compared to some international cohorts, such as elite players in the Asian Football Cup 2023, where dental caries was present in 85.7% of participants[3]. This discrepancy may be attributed to the younger age range of the sub-junior tournament participants, as the cumulative nature of the DMFT index typically results in higher scores as athletes progress into senior professional levels. However, the consistent finding across studies is the significant treatment need. Supporting this, research on Olympic contestants has shown that a high percentage of athletes have untreated caries that can negatively impact performance through pain or infection[4].

A history of sports-related orofacial trauma was reported by 15.7% of the examined Indian athletes. While this figure is within the lower range of international prevalence (14% to 47%), it still represents a substantial risk given the potential for lifelong consequences[1]. The most common injuries reported in this cohort included tooth fractures, lip lacerations, and dental avulsions. In the context of Brazilian club athletes, children under 20 years of age represent almost 80% of dental trauma cases, with 64.3% having a history of such injuries[5]. This suggests that as the level of competition and physical intensity increases, the risk of orofacial trauma rises significantly.

The primary mechanism of injury in football involves mechanical impacts resulting from collisions between players, specifically head-to-head or limb-to-face contacts. Fractures, subluxations, and avulsions are categorised as major public health concerns due to their physical, social, and psychological consequences[6]. Interestingly, the prevalence of trauma was significantly higher in the U-16 category (23%) than in the U-19 category (9%), suggesting that younger, less experienced

players may be at higher risk for accidental collisions during skill development. These findings highlight the urgency of implementing protective measures such as mouthguards.

The systematic review by Ashley *et al.*, indicates that while a large proportion of athletes experience dental trauma, only a subset is directly related to sport[1]. This distinction is relevant in the Indian context, where trauma may also occur outside structured sporting environments.

A profound discrepancy exists between mouthguard awareness and actual usage among Indian youth footballers. While 14% of participants were aware of the role of mouthguards in football, none reported actual usage. This is concerning, particularly as mouthguards are well-established in preventing orofacial injuries in contact sports[10]. In international contexts, uptake rates are significantly higher in sports such as rugby, reflecting better integration of preventive strategies. The barriers to mouthguard usage in the Indian context were clearly identified: lack of awareness and inadequate encouragement from coaches. This highlights a cultural gap where mouthguards are perceived as necessary for combat sports but not for field sports like football. However, existing evidence suggests that orofacial trauma is common in football players, particularly among high-contact positions[5,6]. The absence of even stock mouthguards among the examined players indicates a gap in preventive infrastructure. Future interventions should prioritize education of coaches and parents, as their attitudes significantly influence compliance with protective measures.

Based on the 3Q/TMD screening protocol, 15.7% of the athletes reported symptoms suggestive of Temporomandibular Disorders (TMD). This prevalence is slightly higher than the 10% reported in elite German athletes[6]. TMD is a multifactorial condition affecting the temporomandibular joint and associated musculature, often presenting with pain and functional limitations[10-12]. The relationship between sports and TMD is complex. Repetitive microtrauma from clenching during intense activity (awake bruxism) can initiate neuromuscular tension and contribute to chronic pain cycles. Previous research highlights that repeated trauma to the TMJ structures can perpetuate both peripheral and central pain mechanisms. While the present study reports a 15.7% prevalence, studies in American football players demonstrate a significantly higher burden of TMD-related symptoms[13]. This difference may be attributed to variations in sport mechanics. American football involves transmission of high-impact forces through the mandible, whereas football (soccer) involves comparatively less direct mandibular loading.

Supporting the present findings, Ünver and Yıldız reported significantly higher TMD scores in athletes experiencing stress and parafunctional habits such as clenching[12]. Similarly, gender-based differences in TMD prevalence have been reported, with higher rates observed in female athletes[14].

5.1 Comparative Evaluation of U-16 and U-19 Player Categories

The comparison between the Under-16 and Under-19 categories provides insight into the progression of oral health issues during adolescence. The mean DMFT score was slightly higher in the U-16 category, suggesting early initiation of caries was likely influenced by dietary patterns.

A significant difference was observed in trauma prevalence, with U-16 players demonstrating higher rates compared to U-19 players. This may reflect reduced technical maturity and increased accidental collisions among younger athletes.

The higher prevalence of headaches in U-16 players suggests a possible association between trauma exposure and neurological symptoms. Given the documented relationship between head injuries and TMD, this finding warrants closer interdisciplinary monitoring.

The occurrence of TMD symptoms was similar across both groups, indicating that baseline risk may be established early in athletic development. Previous studies have shown that the sporting environment itself contributes to TMD risk, regardless of specific discipline or level[12].

6. LIMITATIONS

Several limitations must be considered when interpreting the findings of this clinical evaluation.

First, the study utilised convenience sampling, as participants were selected from teams whose officials expressed interest and provided consent. This may introduce selection bias, as teams with better organisational support or athletes with more noticeable oral health concerns might have been more likely to participate. Second, the sample size of 70 players represents only a portion of the 130 eligible athletes at the tournament, which may limit the generalizability of the findings to all elite Indian youth footballers. Third, the clinical oral examination was limited to visual inspection using a mouth mirror and torch illumination without the aid of radiographs, which likely resulted in an underestimation of early-stage or interproximal carious lesions. Finally, data regarding orofacial trauma history and TMD symptoms were based on self-reported questionnaires, which are susceptible to recall bias and may not always correlate perfectly with objective clinical markers.

7. FUTURE PREVENTIVE OUTLOOK

Future studies should focus on longitudinal designs and evaluate the impact of preventive sports dentistry interventions on performance outcomes.

7.1 Mandating Orofacial Injury Prevention

Instituting a mandatory policy for the consistent use of custom or professionally fitted mouthguards by all youth footballers to immediately address the 0% usage rate and mitigate the substantial risk of orofacial trauma (15.7% overall, 23% in the U-16 cohort).

7.2 Targeted Restorative and Dietary Interventions

Implementing immediate restorative care protocols and comprehensive dietary counselling to effectively manage the high prevalence of dental caries (35.7%) and the significant accumulated disease burden indicated by the mean DMFT of 1.96.

7.3 Integrating Neuromuscular and Neurological Screening

Incorporating advanced screening for Temporomandibular Disorders (TMD) and associated symptoms, such as headaches, to monitor the 15.7% TMD prevalence and the concerning 28% headache rate observed in the U-16 players, ensuring the stability of the stomatognathic system.

7.4 Establishing a Follow-up Treatment Infrastructure

Creating a systematic and mandatory treatment referral infrastructure to ensure that initial screenings (like the PCDA) are followed by necessary care, thereby addressing the profound gap of untreated disease (70% restorative and 32.8% periodontal needs). (Table 8).

Table 8. Recommended Preventive measures and the supporting data

Recommendation	Clinical Basis	Supporting Evidence
Mandate Mouthguards	15.7% Trauma / 0% usage	ADA estimates 200k prevented injuries from the use of mouthguard[10]
Routine PCDA Screening	70% Restorative need	Ashley *et al.* SR confirms poor OH[1]
Targeted TMD Screening	15.7% Symptoms / 28% U-16 headache	Eli *et al.* link concussions to TMD[13]
Dietary Counseling	High DMFT / sugary snack with travel patterns	Aishely P *et al.* have reported prevalence of dental caries ranging from 15% to 75& in elite athletes[1]

8. CONCLUSION

The examination of Indian youth footballers reveals a substantial prevalence of untreated dental caries

and gingival inflammation, coupled with a complete absence of protective mouthguard usage despite a history of orofacial trauma. The U-16 category appears particularly vulnerable to trauma-related symptoms, including headaches, which may have long-term neurological and dental implications. While the 15.7% TMD prevalence is comparable to that of international elite athletes, the much higher rates reported in helmeted contact sports suggest that soccer players may be under-reporting or under-diagnosing these conditions. The high requirement for early dental treatment (60%) indicates that without systematic intervention, the oral health of these athletes will deteriorate, potentially impairing their future professional careers. The integration of standardised digital screening and professional dental care into youth training programs is essential to mitigate these risks and support the holistic development of Indian Footballers.

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