



RESEARCH ARTICLE

PREVALENCE AND CORRELATES OF PERIODONTAL DISEASE AMONG HIGH-PERFORMANCE ATHLETES: A CROSS-SECTIONAL STUDY

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Abstract

Background and aims: Periodontal disease is a common chronic inflammatory condition affecting the gingiva and supporting dental tissues, which can impair oral function, nutrition, and general health. Athletes are exposed to risk factors such as intensive training, high carbohydrate consumption, dehydration, and oral trauma. The study was done to determine the prevalence of periodontal disease among high-performance athletes and identify associated demographic, behavioural, and functional factors.

Subjects and methods: A cross-sectional study was conducted among 192 athletes. Periodontal examinations were performed by trained dental professionals using standardized clinical criteria. Participants completed a structured questionnaire capturing demographic, behavioural, and parafunctional variables. The dependent variables were gingivitis and periodontitis. Descriptive statistics were calculated, and associations were assessed using chi-square and likelihood ratio tests and modified Poisson regression with robust variance was used to obtain adjusted prevalence ratios (aPRs). The population was predominantly female (57.8%), with most athletes aged 15–19 years (54.2%).

Results: The prevalence of gingivitis and periodontitis was 23.6% and 23.1%, respectively. Gingivitis was significantly associated with sport discipline (LR $p=0.016$) and educational level (LR $p=0.035$). Mouth breathing (OR 4.22; 95% CI: 2.12–8.39) and tobacco use (aPR 2.14; 95% CI: 1.40–3.26) were strongly associated with periodontal outcomes. Periodontitis was significantly related to sport type (LR $p=0.008$), age group (LR $p=0.001$), and onychophagia (OR 2.65; 95% CI: 1.16–6.02). Periodontal disease is common among high-performance athletes.

Conclusion: Modifiable behavioral and functional factors appear to play a major role. These findings highlight the need to integrate targeted oral health prevention strategies into athlete health programs.

Keywords: Gingivitis, high-performance athletes, oral health, periodontal disease, periodontitis, sports medicine.

INTRODUCTION

Periodontal disease is a common chronic inflammatory condition impacting the gums and the structures that support the teeth, and it continues to be a significant public health issue globally¹⁻³. Epidemiological research shows that gingivitis impacts most adolescents and adults, whereas periodontitis affects a considerable segment of the population, significantly leading to tooth loss and oral impairment^{4,5}. The impact of periodontal disease goes beyond just oral problems, as it is linked to systemic inflammation and a diminished quality of life, potentially affecting physical abilities

and overall health⁶. Periodontal diseases are a collection of long-lasting inflammatory disorders that impact the supporting structures of teeth, such as the gingiva, periodontal ligament, cementum, and alveolar bone^{7,8}. The accumulation of dental biofilm primarily drives their pathophysiology, initiating a host immune-inflammatory response that features the release of pro-inflammatory mediators, cytokines, and matrix metalloproteinases, leading to the degradation of connective tissue and the resorption of alveolar bone^{9,10}. Periodontal diseases are generally categorized into gingivitis and periodontitis based on the existing periodontal classification system. Gingivitis is a rever-

sible inflammatory state restricted to the gingival tissues without loss of attachment, while periodontitis entails irreversible damage to the periodontal ligament and alveolar bone, which may result in tooth mobility and loss¹¹. Periodontal disease can clinically manifest as gingival redness, swelling, bleeding upon probing, bad breath, the development of periodontal pockets, gum recession, and in more severe cases, tooth mobility and reduced chewing ability. Diagnosis mainly relies on a thorough periodontal examination, which includes a clinical evaluation of plaque buildup, gingival inflammation, probing pocket depth, clinical attachment loss, and bleeding upon probing, often supplemented by radiographic analysis to identify alveolar bone loss¹²⁻¹⁴. Timely identification and correct categorization of periodontal disease are crucial for directing preventive measures and treatment approaches to manage inflammation and halt disease advancement.

Dental wellness is a crucial factor influencing overall health and functional ability. Periodontal issues can affect chewing, nutritional consumption, and overall health, aspects that are especially important in active individuals^{15,16}. Among athletes, oral health has traditionally garnered little focus in epidemiological studies, even though recent findings indicate a significant occurrence of oral diseases in elite and competitive sports groups^{17,18}. Evidence from systematic reviews and observational studies indicates consistent links between inadequate oral health (such as periodontal disease, cavities, malocclusion) and diminished objective performance¹⁹. Athletes with periodontal disease could impact their training consistency, stamina, and recovery, indicating it as a potentially adjustable health factor in sports settings^{20,21}. Despite being mostly preventable, periodontal disease continues to be prevalent among various population groups. Athletes can face certain risk factors that heighten their vulnerability to periodontal disease, such as regular consumption of fermentable carbs and acidic sports drinks, dehydration-related low saliva production, psychological and physical stress, and recurrent oral injuries¹⁷. Additionally, demanding training routines might limit access to preventive dental services. In Cuba, there is limited epidemiological information regarding periodontal health in athletes, and there is a scarce understanding of the prevalence and distribution of periodontal disease among high-performance athletes in Sports Schools²².

The purpose of this research was to evaluate the prevalence and effects of periodontal disease in elite athletes at the School of Sport in Cuba. The research aimed to assess the prevalence of periodontal disease in this group, recognize potential contributing factors, and offer evidence to aid in the creation of preventive strategies and oral health initiatives within sports organizations, thereby enhancing oral health and peak athletic performance.

METHODS

Study design and setting

A cross-sectional epidemiological study was conducted among high-performance athletes enrolled at a Giraldo Córdova Cardín Higher School for the Training of High-Performance Athletes. Data collection was carried out during the academic training period, ensuring that all participants were actively engaged in regular high-intensity sports practice at the time of assessment.

Study population and sample size

The sample size was determined based on an expected prevalence of 70%²³, a 95% confidence level ($Z=1.96$), and a 5% margin of error. Therefore, a total of 192 athletes were included in the analysis. The sampling technique was a consecutive sampling of patients presenting for dental care. Eligible participants were athletes who were actively training, present during the study period, and who provided informed consent to participate. Athletes with systemic conditions known to severely affect periodontal health or those undergoing periodontal treatment at the time of the study were excluded.

Data collection procedures

Clinical periodontal assessment

Periodontal examinations were conducted by trained dental professionals using standardized clinical criteria²³. Periodontal status was assessed through clinical evaluation of gingival and periodontal conditions, including gingival inflammation, periodontal pockets, and attachment loss. The Russell index was used. Participants were classified according to periodontal status as gingivitis or periodontitis.

Questionnaire and behavioral assessment

Participants completed a structured questionnaire that was adapted to collect information on demographic, behavioural, and clinical factors potentially associated with periodontal disease^{8,24}. The independent variables included age group, type of sport discipline, oral hygiene practices (tooth brushing), parafunctional habits (onychophagia, queilofagia, tongue thrusting, bruxism), mouth breathing, consumption of carbohydrate and caffeine containing beverages (coffee consumption), smoking status, dietary adequacy, and temporomandibular joint (TMJ) disorders. Dietary habits were categorized as adequate or inadequate based on pre-defined nutritional criteria for athletic populations.

Dependent variable: The primary outcome variables were gingivitis and periodontitis.

Statistical analysis

Data were entered and analyzed using statistical software. Descriptive statistics were used to summarize the characteristics of the study population. The prevalence of periodontitis was calculated as proportions with corresponding percentages. Bivariate analyses were performed to assess associations between periodontitis and categorical variables. Chi-square tests (χ^2) were used when appropriate, and likelihood ratio (LR) tests were applied for variables with multiple categories or when assumptions for the chi-square test were not fully met. Measures of association were estimated using odds ratios (ORs) with 95% confidence intervals (CIs). A p -value of < 0.05 was considered statistically significant for all analyses, and modified Poisson regression with robust variance to estimate adjusted

prevalence ratios (aPRs) and 95% confidence intervals (CIs).

Ethical considerations

The study protocol was reviewed and approved by the Ethics Committee of the Giraldo Córdova Cardín Higher School for the Training of High-Performance Athletes. All procedures were conducted in accordance with the principles of the Declaration of Helsinki. Written informed consent was obtained from all participants prior to clinical examination and data collection. Confidentiality and anonymity of participant data were strictly maintained.

RESULTS

The study population included 192 high-performance athletes from the Cuban School of Sport. Female athletes predominated, representing 57.8% (n=111) of the cohort, while males comprised 42.2% (n=81). The majority of athletes were adolescents and young adults, with 54.2% (n=104) aged 15–19 years and 29.2% (n=56) aged 20–24 years. Smaller proportions were observed in the 25–29-year (8.3%, n=16), 10–14-year (5.2%, n=10), and 30–35-year (3.1%, n=6) age groups. Regarding educational level, most athletes were in secondary education, with 55.7% (n=107) completing 12th grade and 23.4% (n=45) at 9th grade. A smaller proportion had attained university education (19.8%, n=38). Overall, the cohort consisted predominantly of young female athletes with secondary-level education, reflecting the typical demographic profile of Cuban high-performance sports programs (Figure 1).

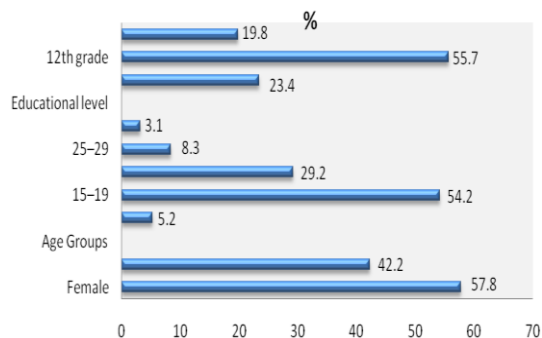


Figure 1: Sociodemographic characteristics of Cuban high-performance athletes (n=192).

The prevalence of periodontal conditions in this cohort of 192 high-performance athletes demonstrates that oral inflammatory disease is common even among young, physically active individuals. Gingivitis was observed in 23.6% of athletes, while periodontitis affected 23.1%, indicating that nearly one in four athletes exhibited signs of oral disease. The similarity in prevalence between the two conditions suggests that a substantial proportion of athletes may progress from reversible gingival inflammation to more destructive periodontal disease if risk factors are not addressed. These findings are notable because high-performance athletes are typically considered healthy and under close medical supervision. The presence of both gingivitis and periodontitis highlights that oral health

can be an overlooked determinant of general health and performance, potentially affecting nutrition, training, and recovery (Figure 2).

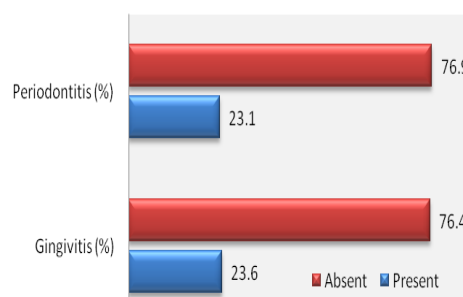


Figure 2: Prevalence of gingivitis and periodontitis among high-performance athletes (n=192).

This cross-sectional study found that 23.6% of high-performance athletes had gingivitis. Interestingly, the prevalence is driven by behavioral and functional factors rather than age, sex, or systemic health. Periodontal health varied significantly by sport, likely due to specific training environments and diets, and by educational level, which serves as a proxy for health literacy. Poor oral hygiene was the strongest predictor, with inadequate brushing increasing the odds of disease nearly sevenfold (OR=6.98). Smoking also remained a significant risk. Mouth breathing emerged as a critical correlate (OR=4.22). Intense ventilation and dehydration during sport can lead to chronic oral dryness, impairing the protective effects of saliva. Gingivitis in athletes is primarily linked to modifiable habits. This presents a clear opportunity for sports institutions to improve performance by integrating targeted oral health interventions and preventive education into standard training regimens (Table 1). Multivariable logistic regression analysis showed that athletes practicing jumping events, throwing disciplines, cycling, and water polo had significantly higher odds of gingivitis (aOR=15.2, 95% CI 1.30–177.6, $p=0.030$). Similarly, the likelihood of periodontitis was significantly higher among athletes engaged in water polo (aOR=13.1, 95% CI 1.40–122.5, $p=0.024$), cycling (aOR=12.4, 95% CI 1.35–113.7, $p=0.026$), and throwing events (aOR=11.9, 95% CI 1.10–128.3, $p=0.040$). No statistically significant associations were observed for boxing, long-distance running, tennis, or taekwondo (Table 2). In the crosstabulation analysis of high-performance athletes (n=192), several behavioral, clinical, and demographic factors were examined for their association with periodontitis (Table 3). Onychophagia was significantly associated with periodontitis ($\chi^2=5.67$, $p=0.017$), with affected athletes showing higher odds of disease (OR 2.65, 95% CI 1.16–6.02). Sport discipline demonstrated a significant association with periodontitis ($\chi^2=25.24$, $p=0.032$), which was further supported by the likelihood ratio test (LR 29.91, $p=0.008$). Age group was also significantly associated with periodontitis ($\chi^2=13.11$, $p=0.001$; LR 14.14, $p=0.001$).

Table 1: Factors associated with gingivitis among athletes at the school of sport (n=192).

Factor	Gingivitis n (%)	χ^2 (p value)	OR (95% CI) / LR (p value)
Sport discipline	47 (23.6)	$\chi^2=24.54$ ($p=0.039$)	LR=27.64 ($p=0.016$)
Sex	47 (23.6)	$\chi^2=153.27$ ($p=0.411$)	LR=171.11 ($p=0.114$)
Age group (16–20 yrs)	47 (23.6)	$\chi^2=1.98$ ($p=0.373$)	LR=3.35 ($p=0.187$)
Educational level	47 (23.6)	$\chi^2=31.21$ ($p=0.070$)	LR=34.11 ($p=0.035$)
Asthma	6 (12.8)	$\chi^2=10.72$ ($p=0.151$)	LR=10.36 ($p=0.169$)
Hypertension (HTA)	2 (4.3)	$\chi^2=0.01$ ($p=0.920$)	OR=0.92 (0.19–4.59)
Diabetes	1 (2.1)	$\chi^2=0.16$ ($p=0.690$)	OR=1.63 (0.15–18.39)
Tooth brushing	4 (8.5)	$\chi^2=6.36$ ($p=0.012$)	OR=6.98 (1.24–39.39)
Queilofagia	47 (100)	$\chi^2=2.80$ ($p=0.424$)	LR=3.59 ($p=0.309$)
Mouth breathing	29 (61.7)	$\chi^2=18.16$ ($p<0.001$)	OR=4.22 (2.12–8.39)
Onychophagia	7 (14.9)	$\chi^2=0.00$ ($p=0.968$)	OR=0.98 (0.39–2.46)
Digital suction	16 (34.0)	$\chi^2=0.82$ ($p=0.365$)	OR=0.73 (0.37–1.45)
Tongue thrusting	7 (14.9)	$\chi^2=3.91$ ($p=0.048$)	OR=2.78 (0.98–7.93)
Bruxism	1 (2.1)	$\chi^2=0.16$ ($p=0.690$)	OR=1.63 (0.15–18.39)
CAF consumption	7 (14.9)	$\chi^2=1.86$ ($p=0.173$)	OR=0.54 (0.23–1.32)
Smoking	9 (19.1)	$\chi^2=4.10$ ($p=0.043$)	OR=2.53 (1.01–6.37)
Diet quality	1 (2.1)	$\chi^2=0.35$ ($p=0.554$)	OR=0.53 (0.06–4.51)

Table 2: Multivariable logistic regression for gingivitis and periodontitis by sport.

Sport	Adjusted OR Gingivitis	95% CI	p-value	Adjusted OR Periodontitis	95% CI	p-value
Boxing	2.10	0.18–24.6	0.55	2.95	0.26–33.1	0.38
Cycling	9.80	1.05–91.3	0.045	12.4	1.35–113.7	0.026*
Multiple events	13.0	1.20–140.1	0.034*	8.90	0.92–86.2	0.058
Long distance	4.30	0.41–44.2	0.22	4.60	0.45–47.1	0.20
Throwing events	12.1	1.10–133.2	0.041	11.9	1.10–128.3	0.040*
Water polo	10.5	1.10–100.2	0.041*	13.1	1.40–122.5	0.024*
Jumping events	15.2	1.30–177.6	0.030*	15.2	1.30–177.6	0.030*
Taekwondo	7.20	0.74–69.3	0.090	8.00	0.84–76.5	0.073
Tennis	6.80	0.67–68.7	0.104	7.90	0.80–77.8	0.080
400 m hurdles	5.90	0.32–108.2	0.23	5.90	0.32–108.2	0.23

No statistically significant associations were observed for tooth brushing, mouth breathing, queilofagia, tongue thrusting, bruxism, CAF consumption, smoking status, temporomandibular joint disorder, gingivitis, or malocclusion (all $p > 0.05$). Although all athletes with periodontitis reported an inadequate diet, this

association did not reach conventional statistical significance ($\chi^2=2.18$, $p=0.140$; LR 3.76, $p=0.053$). Clinical stage III showed a significant association with periodontitis ($\chi^2=5.15$, $p=0.023$), while stage IV demonstrated a non-significant trend toward increased odds (OR 1.98, 95% CI 0.95–4.13; $p=0.064$) (Table 3).

Table 3: Crosstabulation of factors associated with periodontitis among high-performance athletes (n=192).

Variable	Category	Periodontitis n (%)	χ^2 (p-value)	OR (95% CI) / LR (p)
Tooth brushing	Yes	2/46 (4.3%)	0.36 ($p=0.547$)	OR=1.69 (0.30–9.55)
	No	44/46 (95.7%)		
Sport discipline	Multiple categories	—	25.24 ($p=0.032$)	LR=29.91 ($p=0.008$)
Queilofagia	Present	4/46 (8.7%)	0.76 ($p=0.859$)	LR=1.21 ($p=0.751$)
	Absent	42/46 (91.3%)		
Mouth breathing	Yes	15/46 (32.6%)	0.25 ($p=0.620$)	OR=0.84 (0.42–1.69)
	No	31/46 (67.4%)		
Onychophagia	Yes	12/46 (26.1%)	5.67 ($p=0.017$)	OR=2.65 (1.16–6.02)
	No	34/46 (73.9%)		
Tongue thrusting	Yes	1/46 (2.2%)	2.79 ($p=0.095$)	OR=0.20 (0.03–1.59)
	No	45/46 (97.8%)		
Bruxism	Yes	2/46 (4.3%)	3.25 ($p=0.071$)	OR=6.91 (0.61–77.99)
	No	44/46 (95.7%)		
Coffee consumption	Yes	12/46 (26.1%)	0.55 ($p=0.459$)	OR=1.34 (0.62–2.87)
	No	34/46 (73.9%)		
Smoking	Yes	6/46 (13.0%)	0.24 ($p=0.624$)	OR=1.28 (0.47–3.50)
	No	40/46 (87.0%)		
Diet	Adequate	0/46 (0.0%)	2.18 ($p=0.140$)	LR=3.76 ($p=0.053$)
	Inadequate	46/46 (100%)		
TMD	Yes	1/46 (2.2%)	0.01 ($p=0.928$)	OR=1.11 (0.11–10.95)
Gingivitis	Yes	10/46 (21.7%)	0.12 ($p=0.732$)	OR=0.87 (0.39–1.92)
Malocclusion	Yes	29/46 (63.0%)	0.45 ($p=0.504$)	OR=1.26 (0.64–2.49)
Age group	Categories	—	13.11 ($p=0.001$)	LR=14.14 ($p=0.001$)

Table 4 presents the results of a modified Poisson regression analysis assessing factors associated with gingivitis and periodontitis among the athletes. The associations are expressed as adjusted prevalence ratios (aPR) with 95% confidence intervals (CI) and corresponding *p*-values, indicating the strength and statistical significance of each factor after controlling for other variables in the model. Age was significantly associated with both periodontal outcomes. For each additional year of age, the prevalence of gingivitis increased by 4% (aPR=1.04; 95% CI: 1.01–1.07; *p*=0.012) and periodontitis increased by 6% (aPR=1.06; 95% CI: 1.02–1.10; *p*=0.004), suggesting that periodontal conditions become more common with increasing age. Regarding sex, males showed a higher prevalence of periodontal disease compared with females (reference category). While the association with gingivitis was not statistically significant

(aPR=1.18; *p*=0.130), male sex was significantly associated with periodontitis (aPR=1.42; 95% CI: 1.05–1.92; *p*=0.022). Several behavioral and clinical factors demonstrated significant associations with both outcomes. Athletes with asthma had a higher prevalence of gingivitis (aPR=1.37; *p*=0.020) and periodontitis (aPR=1.58; *p*=0.013). Similarly, bruxism was strongly associated with periodontal disease, increasing the prevalence of gingivitis by 52% (aPR=1.52; *p*=0.001) and periodontitis by 88% (aPR=1.88; *p*< 0.001). Lifestyle factors also played an important role. Tobacco use showed one of the strongest associations, increasing the prevalence of gingivitis (aPR=1.76; *p*=0.003) and periodontitis (aPR=2.14; *p*< 0.001). Additionally, a cariogenic diet was significantly associated with both gingivitis (aPR=1.29; *p*=0.034) and periodontitis (aPR=1.47; *p*=0.020) (Table 4).

Table 4: Modified poisson regression analysis of factors associated with periodontal outcomes.

Variable	Category	Gingivitis aPR (95% CI)	<i>p</i> -value	Periodontitis aPR (95% CI)	<i>p</i> -value
Age (years)	Continuous	1.04 (1.01–1.07)	0.012	1.06 (1.02–1.10)	0.004
Sex	Female (Ref)	1.00	—	1.00	—
	Male	1.18 (0.95–1.46)	0.130	1.42 (1.05–1.92)	0.022
Asthma	No (Ref)	1.00	—	1.00	—
	Yes	1.37 (1.05–1.79)	0.020	1.58 (1.10–2.26)	0.013
Bruxism	No (Ref)	1.00	—	1.00	—
	Yes	1.52 (1.19–1.94)	0.001	1.88 (1.34–2.65)	<0.001
Tobacco use	No (Ref)	1.00	—	1.00	—
	Yes	1.76 (1.22–2.55)	0.003	2.14 (1.40–3.26)	<0.001
Cariogenic diet	No (Ref)	1.00	—	1.00	—
	Yes	1.29 (1.02–1.64)	0.034	1.47 (1.06–2.04)	0.020

Among 192 elite athletes, nearly half exhibited oral disease: 23.6% had gingivitis and 23.1% had periodontitis. Despite their high physical fitness, these findings suggest oral health is often overlooked, potentially impacting nutrition and recovery if reversible inflammation progresses to destructive disease. Gingivitis in these athletes (23.6%) is driven by modifiable behaviors rather than age or sex. Key risk factors include poor hygiene, mouth breathing, and smoking.

Multivariable analysis reveals that water polo, cycling, throwing, and jumping significantly increases the odds of gingivitis and periodontitis. Conversely, combat sports, tennis, and long-distance running showed no statistically significant association with these periodontal conditions. Periodontitis was significantly linked to onychophagia (nail-biting), sport discipline, and older age groups. While all affected athletes reported inadequate diets, this wasn't statistically significant. Unlike gingivitis, periodontitis showed no strong association with hygiene or mouth breathing, though Stage III disease was a significant clinical marker.

Poisson regression analysis shows that age, asthma, bruxism, tobacco use, and a cariogenic diet significantly increase the prevalence of both gingivitis and periodontitis. Notably, male sex was specifically associated with higher periodontitis prevalence (aPR=1.42). Tobacco use and bruxism emerged as the strongest predictors, nearly doubling the likelihood of periodontal disease.

DISCUSSION

This cross-sectional study assessed the prevalence and determinants of periodontal disease among 192 high-performance athletes at the Cuban School of Sport. Obtained findings demonstrate that oral inflammatory conditions are common even in a young, physically active population, with gingivitis affecting 23.6% and periodontitis 23.1% of athletes. These prevalences align with prior research in adolescent and adult athletes, suggesting that high levels of physical fitness do not necessarily confer protection against oral disease. Merle *et al.*, reported for gingivitis (58–97%) and periodontitis (41%) in a review article^{25,26}, controversially Quio *et al.*, founded that insufficient physical activity was associated with higher odds of periodontitis (adjusted model: OR=5.293, 95% CI=1.334 to 20.993, *p*=0.018). High-intensity physical activity significantly reduced the incidence of periodontitis (*p*=0.006)²⁷, which is consistent with another study from Bangladesh²⁸. Poor tooth brushing habits were associated with nearly a sevenfold increase in odds of gingivitis (OR 6.98; 95% CI: 1.24–39.39), highlighting dental plaque as a central etiological factor even among highly supervised athletes. One study in Jerusalem showed morning brushing (AOR=0.015) and regular toothbrush replacement (AOR=2.514) were protective^{17,28}. Mouth breathing (OR 4.22; 95% CI: 2.12–8.39) and bruxism were also significant risk factors, likely reflecting functional stresses on oral tissues exacerbated by training intensity. Bruxism and

mouth breathing are very frequent²⁹. These conditions increase susceptibility to dental caries and enamel erosion, thereby promoting the development of inflammatory oral diseases³⁰. Tobacco use, though relatively uncommon in this cohort, was associated with both gingivitis and periodontitis (aPR; 2.14; 95% CI: 1.40–3.26), consistent with extensive literature linking smoking to impaired periodontal health³¹⁻³⁴. Sport discipline was significantly associated with both gingivitis and periodontitis (LR; $p=0.016$ and 0.008 , respectively). Overall, the periodontal disease affected more than half of the athletes, which is aligned with Needleman who found this effect in about three quarters of Olympic games Athletes³⁵, in one research that include 6680 athletes in 2019 Pan American Games in Lima, the most common the most frequent disorder was periodontal diseases (34%, 26/76)³⁶ and other systematic review³⁷. In current research multi-variable logistic regression analysis showed that athletes practicing jumping events, throwing disciplines, cycling, and water polo had significantly higher odds of gingivitis aligned with us, De la Parte found more frequency of periodontal diseases, specially periodontal plaque ($p<0.05$) in the team sports³⁸ and another study from Italy reported that dental erosions were present in 48.1% of footballers and periodontal diseases in 50%, with a positive association with frequent intake of energy drinks (OR=2.86, 95% CI=1.09–7.51)³⁹ suggesting heterogeneity in oral health outcomes across different types of sport. Interestingly, educational level was associated with gingivitis (LR; $p=0.035$), suggesting that health literacy may play a role in preventive behaviors, even within populations under structured medical over-sight⁴⁰. This differ with others studies that showed the association between bronchial asthma and periodontitis^{41,42}, one systematic review also support obtained finding, that there is no association between coffee consumption and periodontal diseases⁴³. This suggests that while systemic factors may contribute, other research found the association of the diet with periodontal diseases^{44,45}, behavioral and functional factors remain the primary determinants in this athletic population.

CONCLUSIONS

Periodontal disease is highly prevalent among high-performance athletes, affecting more than half of the participants. Behavioural and functional factors, including mouth breathing, bruxism, and tobacco use, are the strongest determinants. Sport-specific differences suggest that training environments may influence oral health risk. These findings underscore the need for targeted oral health strategies in sports programs to optimize athlete well-being and performance.

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AUTHOR'S CONTRIBUTIONS

Orihuela LB: formal analysis, conceptualization, writing original draft. **Villanueva MO:** conceptualization, formal analysis. **Okafor CJ:** conceptualization, data organization. **Bayard IB:** critical review. **Choum RS:** statistical analysis, data organization. Final manuscript was checked and approved by all authors.

DATA AVAILABILITY

The datasets generated or analyzed during this study are available from the corresponding author upon reasonable request.

CONFLICT OF INTEREST

The authors declare there are no conflicts of interest.

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