



4Bruxism, and vitamin D level related factors in periodontal disease in Duhok city

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Abstract

Background and objective: Periodontal disease is a highly prevalent and persistent, inflammatory condition that affects the gums and supporting tissues of the teeth. This study investigates the relationship between bruxism, vitamin D levels, and periodontal health in the Duhok city.

Methods: This cross-sectional study of 400 individuals conducted from December 2022 to December 2023 in the Duhok city. The teeth Plaque Index, Gingival Index and Clinical Attachment Level were comprised in (47.5%) females and (52.5%) males across various age groups were bruxism and non-bruxism disease participants. The values of serum calcium and phosphate were measured by colorimetric method, the former with Arsenazo III and the latter with the molybdate method.

Results: Forty percent of participants were found to have been diagnosed with bruxism. 40% of participants indicated mean Periodontal Disease severity of patients with bruxism was clearly higher than that of patients without bruxism (7.5 vs 5.0) p. value less than 0.05. Regarding the levels of vitamin D among respondents, 12.5% were deficient, 50% were sufficient, and 37.5% had optimal levels. Periodontal Disease severity was significant in patients than in control group.

Conclusion: There is a significant link between bruxism, periodontal status and vitamin D levels, indicating that higher levels of Vitamin D correlated with other periodontal outcomes, and the presence of bruxism is seen to worsen periodontal diseases. This stresses the importance of assessing nutritional and behavioral factors in the management of periodontal health.

Keywords: Bruxism, Demographic distribution, Periodontal disease indicators, Vitamin D

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Introduction

Periodontal disease is a highly prevalent and persistent infection of inflammatory disease that affects the gums and supporting tissues of the teeth. It is initiated from a plaque biofilm of bacteria which, if untreated can advance from gingivitis into the more severe periodontitis disease that can result in tooth loss and several systemic diseases.¹ This disease is of significant global importance, affecting a large percentage of the adult population worldwide. Understanding periodontal disease is important for public health interventions the local perspective of different population cities such as Duhok is critical.² This disease arises from the complex interaction of environmental, genetic, and acquired risk factors with correlation of Vitamin D levels with severity of periodontal disease.³ Tobacco smokers, are deficient in oral hygiene, abuse alcohol, and consume an exceedingly unbalanced diet are likely to come down with periodontal disease as a result of their lifestyle choices. Likewise, periodontal disease can be influenced highly by hereditary attributes.⁴ The severity of periodontal disease can amplify depending on any health conditions or factors, like diabetes, some medications causing dry mouth, hormone changes and occlusal trauma.⁵ There is one etiologic factor that is very significant and it is bruxism whereas habitual grinding or clenching of the teeth.⁶ The article also looks at the important role that Vitamin D plays in overall health. Vitamin D is obtained from both sun exposure and dietary sources. Without it, many sleep disorders can occur.⁷ It can also play a role in the oral health such as sleep bruxism. Vitamin D alone did disappoint a straight effect on gum tissue illness yet became part of a multifactorial impact when integrated with anxiety, bad rest behaviors as well as bruxism on gum health and wellness. Vitamin D is very important for the strength of your bones, specifically in regards to the

gingival tissue. Having an adequate amount of Vitamin D can help reduce some of the symptoms of periodontal disease.⁸ The primary objective of this article is to critically examine the multifactorial association between bruxism, Vitamin D deficiency and periodontal disease and decipher the relationship between these factors and the influence they collectively have on oral health.^{9,10}

Patients and methods

We conducted a cross-sectional study in the Periodontics Department at the College of Dentistry, University of Duhok (UOD), and the Duhok Dental Training Center in the Kurdistan region of Iraq from December 2022 to December 2023.

Through specific and detailed questions, this research identified potential bruxism cases among residents of Duhok city. Each participant taken part in an interview lasting 20 minutes. Either positive or negative information is identified on bruxism activity, we produce two groups: participants with bruxism and those without. Both groups were listed. 80% of the participants in each group was selected randomly using a random number generator. These participants were then taking part in a general periodontal examination. Specifically, the gain or loss of periodontal attachment using the Ramjford index. This needed a sample of 60 people as a pilot test (30 cases and 30 controls). The greatest difference in periodontal status highlighted, and 10 cases and 10 controls taken part in the clinical periodontal tests. A sample of blood was needed from these individuals for the largest study. The vitamin D dependent variable requires measuring the serum concentration of 25(OH)D. The sample for this study consisted of 202 freshly diagnosed, localized or generalized severe chronic periodontitis patients, aged 30-45. This group include 88 females and 114 males. According to the American Academy of





Periodontology 1999, chronic periodontitis was defined as the presence of at least 2 interproximal sites with clinical attachment loss (CAL), 6 mm in depth, and at least one interproximal site with probing depth (PD) of 5 mm or greater. All patients were informed about the nature of the study and agreed to participate by signing an informed consent form approved by the scientific and ethical committee. A control group of 198 apparently healthy subjects (93 females and 105 males) were included in the study.

Interviews and clinical examination were conducted on the study group, which consisted of 400 individuals. The control group consisted of 200 individuals who only participated in the clinical examination. Pre-examination procedures included providing each subject with an envelope containing a demographic form regarding age, the DMFT index, degree of education, parafunctional habit status (jaw clenching, bruxism, lip or cheek biting), and stress status. The subjects were asked to fill out these forms, which were collected immediately after completion by the participants. The levels of 25-hydroxyvitamin D (25(OH)D) and creatinine in serum were analyzed using chemiluminescent immunoassay and enzyme-linked immunosorbent assay, respectively. High-performance liquid chromatography was used to measure the levels of 1,25 dihydroxy vitamin D (1,25(OH)₂D). The values of serum calcium and phosphate were measured by colorimetric method, the former with Arsenazo III and the latter with the molybdate method. All biochemical assays were done by SRL Inc. (Hachioji, Tokyo). The measurements of these clinical parameters were conducted synchronously with microbiological, immunological analyses, and assessment of alveolar bone loss, which would be reported in another article. For participant selection, the criteria were centered around individuals aged 30-45,

as this demographic is at heightened risk for periodontal issues, Vitamin D deficiencies, and the effects of bruxism. Only those showing potential signs or symptoms relevant to the study's objectives were approached, and explicit consent for inclusion was required from every participant. The study's criteria rationale and implications further defined the inclusion and exclusion parameters. The inclusion criterion targeted the age range of 30-45 years, focusing on a group clinically relevant due to its susceptibility to the studied variables. The exclusion criteria removed smokers and alcoholics from the study to eliminate the confounding effects of tobacco and alcohol on periodontal health. This approach allowed the research to more accurately assess the direct impacts of bruxism and Vitamin D levels on periodontal health, noting that smokers typically exhibit more bone loss and reduced gum attachment compared to non-smokers. The collected data were entered in the computer using SPSS (Statistical Package for Social Science; SPSS Inc., Chicago, IL, USA) version 17.0. Firstly, distributions were analyzed for normality using the Kolmogorov-Smirnov test. Mann-Whitney U test was used to analyze differences in age, consumption of sugar per day, vitamin D level and duration of sunlight exposure between periodontitis and healthy subjects hence the 4 variables are not normally distributed, approval from the ethical committee of Duhok Directorate of Health.

Results

Four hundred individuals were involved in the study, with 210 being males (52.5%) and 190 being females (47.5%), as indicated in Table (1). The subjects' ages were evenly spread across different ranges: thirty to thirty-five with 150 individuals (37.5%), thirty-six to forty with 125 individuals (31.25%), and forty-one to forty-five with another 125 individuals (31.25%). This study offers a



comprehensive representation of the adult population concerning demographic factors as illustrated in Figure (1).

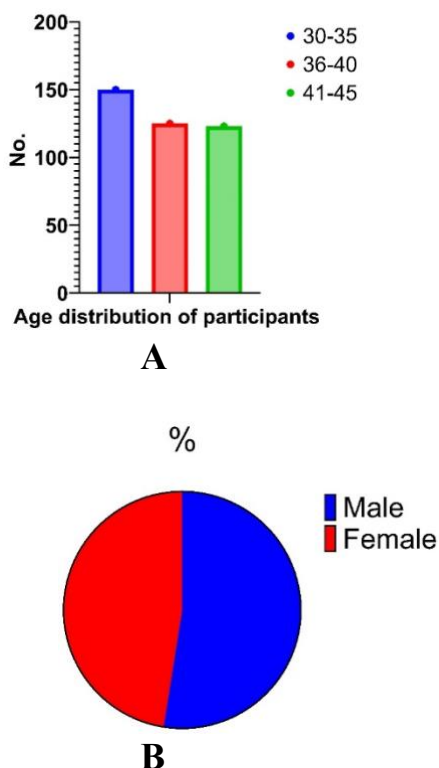


Figure (1): demographics A) numbers and groups of ages. B) percentages of participants according to the gender.

The data in Figure (2) shows that out of the 400 individuals surveyed, 30% were identified with bruxism, while the remaining 70% (120 people) did not report experiencing bruxism. Among these participants, the majority, 365 individuals (91.25%), were healthy, while the rest, 35 individuals (8.75%), had an illness. According to Figure (2), the incidence of bruxism among the participants is reported to be 40%.

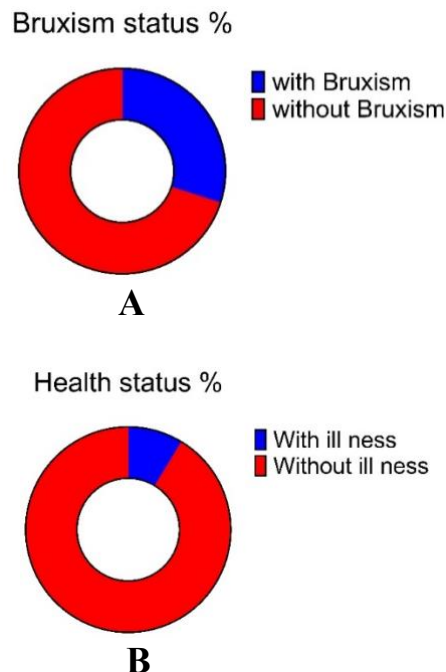


Figure (2): A) prevalence of bruxism is 40% among the participants. B) health status.

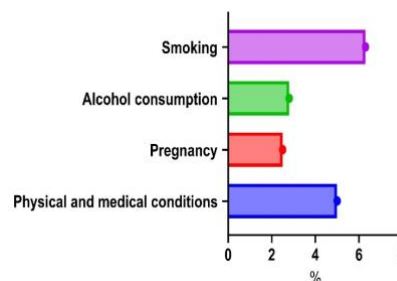


Figure (3): Participants were also checked for several other factors including pregnancy, Levite weight, drinkers and smoking cigarettes

Subjects were also screened for various other variables such as pregnancy, body mass index, alcohol consumption, and cigarette smoking. The exclusion rate due to pregnancy was 5%, for BMI it was 2.5%, for alcohol use it was 3.75%, and for smoking it was 6.25%. This information is detailed in Figure (3). The research conducted revealed a significant link between serum Vitamin D



concentrations and the seriousness of periodontal disease, as demonstrated in figure (4). For instance, individuals diagnosed with Bruxism had an average periodontal disease severity of 7.5, whereas those without the diagnosis had an average severity of 5.0, as depicted in figure 4. Among all participants, serum Vitamin D levels ranged from a minimum of 10 ng/mL to a maximum of 90 ng/mL, with a mean level of 45 ng/mL as illustrated in figure 4. The distribution of Vitamin D levels varied widely among participants: 12.5% were deficient, 50% had sufficient levels, and 37.5% had optimal levels according to Figure (4).

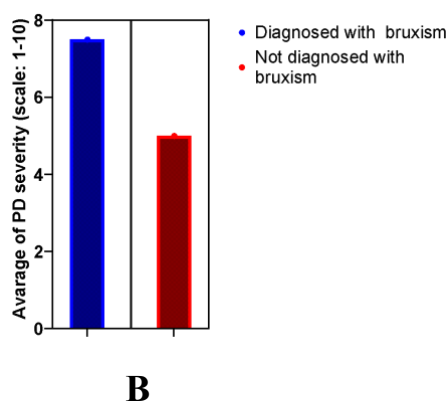
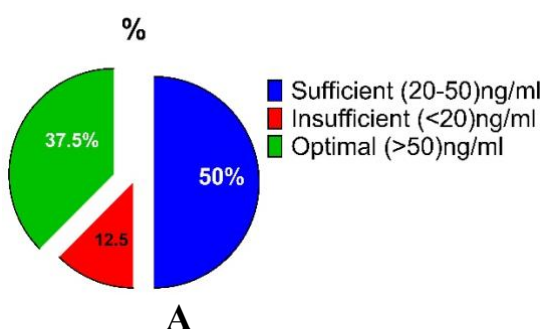


Figure (4): The prevalence of the Vitamin D level was extremely varied for all the participants.

In studying periodontal markers at different Vitamin D levels, the mean values for plaque

index, gingival index, clinical attachment level (CaL), and bleeding on probing (BoP) all rose as Vitamin D3 levels decreased. The group labeled as 'low' in Vitamin D3 showed the highest mean scores across these markers, with averages of 1.69 for plaque index, 2.15 for gingival index, 3.44 for clinical attachment level (CaL), and 65.08 for bleeding on probing (BoP). As each Vitamin D3 level increased, there was a corresponding decrease in the average scores of these indicators (Brushing, 2013) as shown in figure (5). However, upon closer examination of the relationship between vitamin D levels and bruxism, it was found that having both low 25(OH)D concentration and bruxism resulted in the highest average values for PI, GI, and CAL, indicating the poorest periodontal health statistically. Gender and age played a role in the correlation with periodontal health. Men exhibited a slightly elevated mean value on measures of periodontal disease compared to women. Likewise, older age groups tended to show a rise in the severity of periodontal disease in comparison to younger age categories as shown in Table (1), (2) and figure (5), (6).

Table (1): Gender-Based Periodontal Disease Indicators

Gender	Average PI	Average GI	Average CAL
Male	2.1	2.0	3.2
Female	1.9	1.8	2.9

Table (2): Gender-Based Periodontal Disease Indicators

Age Group	Average PI	Average GI	Average CAL
30-35	1.8	1.7	2.7
36-40	2.0	1.9	3.0
41-45	2.3	2.2	3.5



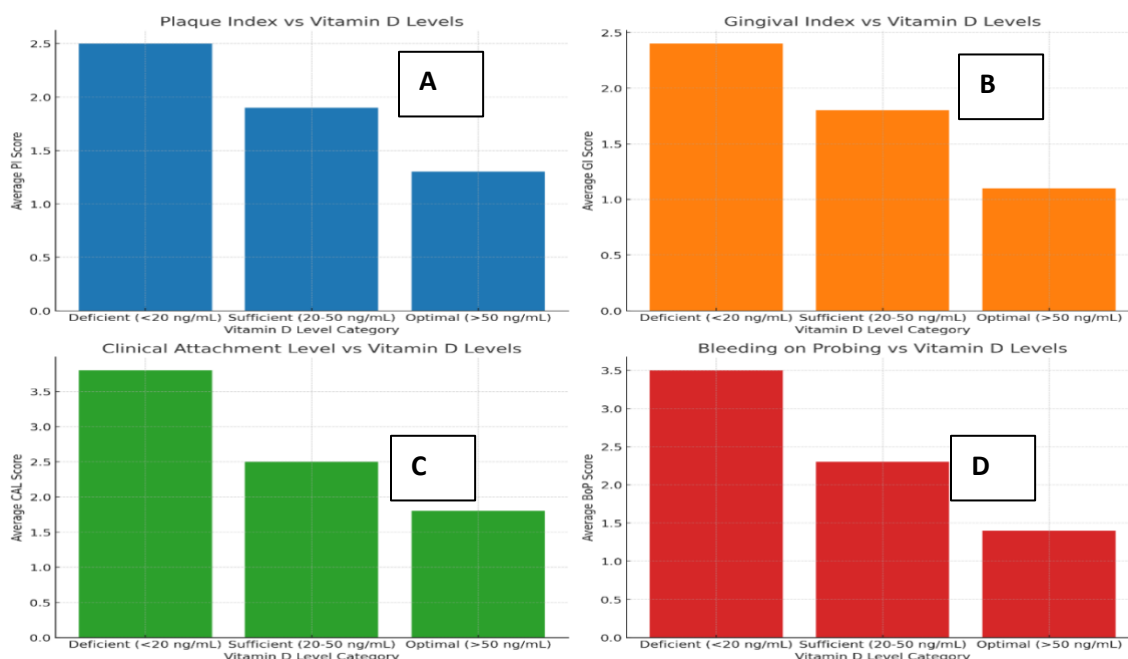


Figure (5): detailed analysis revealed the combined effect of Vitamin D levels and bruxism on periodontal health. A) Plaque vs vitamin D, B) Gingival vs vitamin D. C) clinical attachment levels vs vitamin D. D) bleeding on probing vs Vitamin D.

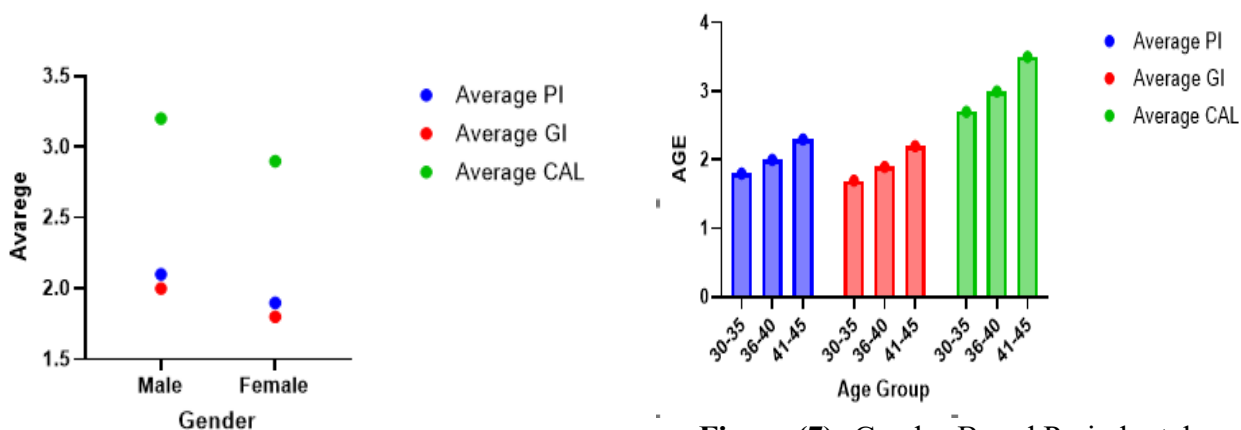


Figure (6): Gender-Based Periodontal Disease Indicators

In this context, the relationship between age groups and periodontal health is shown using three indices, namely the Plaque Index (PI), the Gingival Index (GI) and Clinical Attachment Level (CAL). Each index is colored differently and displayed by different bars for three age groups: 30-35, 36-40 and 41-45. Average PI is represented by blue bars while red bars represent Average GI & green bars show average CAL, Figure (7).

Figure (7): Gender-Based Periodontal Disease Indicators

A and D are shown in Figure (8) Plaque Index (PI) scores distribution in relation to systemic health status grouped into three categories as follows; healthy systemic health, at-risk systemic health and ill systemic health as illustrated by box plot A while box plot D describes how these same PI scores would look like when seen against smoking status which contrasts non-smokers with smokers determining whether or not they are



associated with state of systemic wellbeing's influence on tooth plaque levels. B and E are depicted in Figure (8) Distribution of Gingival Index (GI) Scores Box plots B is a comparison between GI scores in different systemic health categories whereas box plot E shows differences between smokers and non-smokers based on their GI scores; it measures generalization abilities about gingiva soundness under conditions systematized by principal component analysis whereof each bar signifies such normal indices distribution type clusters' mean values along it could also suggest ways whereby other factors such as heart disease or lifestyle choices might impact upon gum inflammation especially those relating

smoking habits. Finally, C and F appear in Figure (8) Clinical Attachment Level (CAL) Scores Box plot C determines CAL scores versus systemic health condition whilst box plot F compares CAL against cigarette smoking status that is assessed because Systemic relationship exists directly implying here being visualization between periodontal destructions calculated using its visual appearances as they represent corresponding body parts whose grouping patterns reveal common underlying trends within their adjacent parts except those in category B where similar shapes are connected only by similarly characterized groups demonstrated through t-tests.

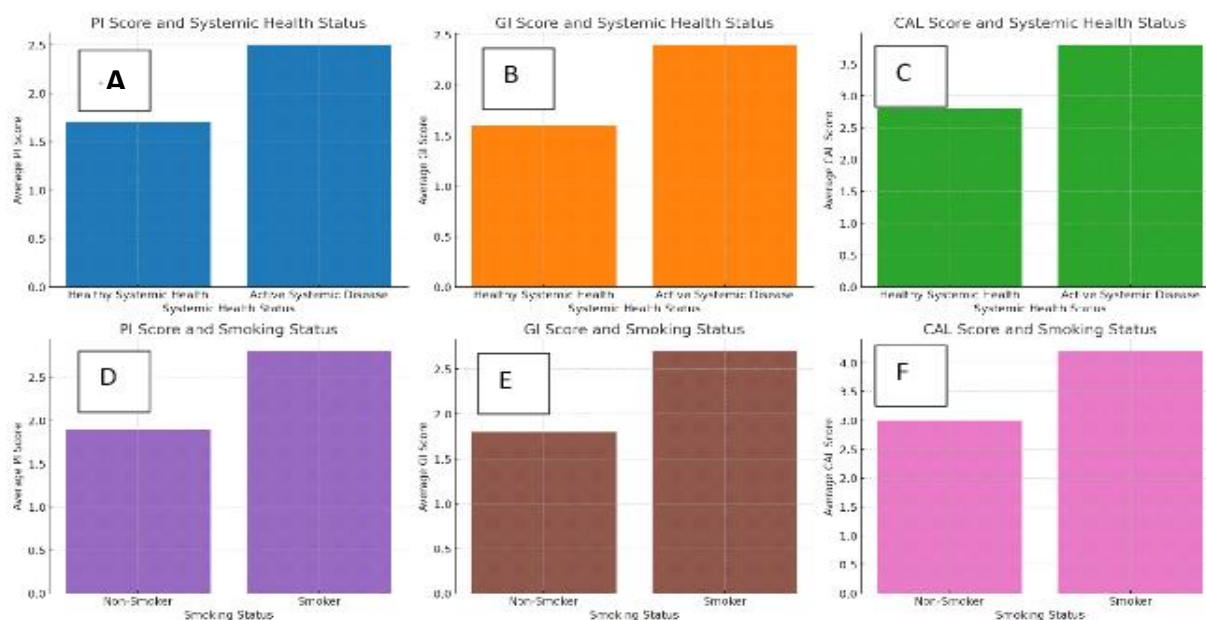


Figure (8): A) PI score and systemic health status. B) GI score and systemic health status. C) CAL score and systemic health status. D) PI score and smoking status. E) GI score and smoking status. F) CAL score and smoking status.

Discussion

The research study likewise exposed a connection in between bruxism as well as gotten worse gum tissue wellness, in addition to way of life aspects like wide spread illness as well as cigarette smoking impacting gum

wellness signs. Vitamin D alone did disappoint a straight effect on gum tissue illness yet became part of a multifactorial impact when integrated with anxiety, bad rest behaviors as well as bruxism on gum health and wellness.¹¹ The sterilizing in between





both sexes as well as the age varieties of 30-45 likewise added to research these problems to find their effects on dental wellness. Bruxism medical diagnosis existed in 30% of our individuals along with 91.25% were healthy and balanced.¹² This indicates that a big quantity of information was unrepresented therefore showing the requirement for much deeper understanding concerning what function does bruxism keep in dental health and wellness.¹³ This meant that the study had a high degree of control over extraneous, confounding variables and so our results were both valid and reliable.^{14,15} A vital discovery in our research was the correlation of Vitamin D levels with severity of periodontal disease. Participants who had insufficient levels of Vitamin D were found to have higher averages of plaque index, marginal gingival index, clinical attachment level, and Bleeding on Probing (BoP) score which clearly showed that Vitamin D takes role in oral health.¹⁶ In addition, the impact of bruxism on periodontal health was another significant finding. looking into periodontal health we also found strategic influence from lifestyle section.¹⁷ Additionally, vitamins d does not appear to exert a direct effect on periodontal disease. A recent investigation explored the combined influence of vitamin D, bruxism, stress and poor sleep together on periodontal health, finding a wide range of results from different groups, indicating periodontal disease is a multifactorial disease.¹⁸ Our findings show that the health of gums is affected by a combination of different behavioral, dietary, and lifestyle elements. Noteworthy are the strong connections found between indicators of gum disease and Vitamin D levels, smoking habits, teeth grinding, and overall health status.¹⁹ These results underline the importance for dental and medical experts to consider all contributing factors when evaluating and treating gum health in a comprehensive manner.²⁰

Conclusion

The study found a significant link between bruxism, periodontal status and vitamin D levels, indicating that higher levels of Vitamin D correlated with other periodontal outcomes, and the presence of bruxism is seen to worsen periodontal diseases. This stresses the importance of assessing nutritional and behavioral factors in the management of periodontal health.

Conflict of interest

Authors declare no conflict of interest

References

1. An Ibraheem M, Nahidh M. Diet and orthodontics-A review. *J Baghdad Coll Dent*. 2021;33(3):30-8.
2. Acipinar S, Karsiyaka Hendek M, Olgun E, Kisa U. Evaluation of FGF-23 and 25 (OH) D3 levels in peri-implant sulcus fluid in peri-implant health and diseases. *Clin Implant Dent Relat Res*. 2019;21(5):1106-12.
3. Al-Hindi M, Al-Fotawi R, Al-Tamimi A, Khalil O, Al-Osaimi N, Al-Ghamdi K, et al. Effect of hypothyroidism's medication (T4) on implant osteointegration: A case series and literature search. *Int J Surg Case Rep* 2021; 79:255-62.
4. AL-Nuaimy KM. Lactating Women and Oral Health. *J Coast Life Med*. 2022; 10:48-52.
5. Arango J, Darena Z, Morales V, Catalina L, Juliana V, Mayra A et al. Relationship of obstructive sleep apnea with periodontal condition and its local and systemic risk factors. *Clin Oral Investing*. 2023;27(6):2823-32.
6. Alsadi W, AbouSulaiman A, AlSabbagh MM. Association of dental implants success in bone density classification of postmenopausal women with osteoporosis-a clinical and radiographic prospective study. *J Indian Acad Oral Med Radiol*. 2021;33(4):428-34.



7. Amalia R, Arifin R, Sari GD. The relationship between anxiety and bruxism in adults. *Dentin*. 2023;7(1). <https://ppjp.ulm.ac.id/journals/index.php/dnt/article/view/8329/>
8. Blufstein A, Behm C, Kubin B, Gahn J, Rausch-Fan X, Moritz A, et al. Effect of vitamin D3 on the osteogenic differentiation of human periodontal ligament stromal cells under inflammatory conditions. *J. Periodontal Res.*, (2021). 56(3), 579-588.
9. Arora G, Freeman R. Oral health and addiction: Consequences of substance use. In: *Textbook of Addiction Treatment*: Springer, Cham: Int. Perspect. 2021. p. 1061-76.
10. Auffret M, Meuric V, Boyer E, Bonnaure-Mallet M, Vérin M. Oral health disorders in Parkinson's disease: more than meets the eye. *J Parkinsons Dis*. 2021;11(4):1507-35.
11. Ayele S, Sharo N, Chrcanovic BR. Marginal bone loss around dental implants: comparison between diabetic and non-diabetic patients—a retrospective clinical study. *Clin Oral Investig*. 2023;1-9.
12. Çelik B, Arslan Z. Fractal analysis and radiomorphometric indices: comparison of mandibular bone structure changes on digital panoramic radiographs of smokers. *Pamukkale Med. J.*, (2024). 17(1), 117-128.
13. Kim J, Lee S, Moodley Y, Yagnik L, Birnie D, Dwivedi G. The role of the host-microbiome and metabolomics in sarcoidosis. *Am J Physiol Cell Physiol*. 2023;325(5):C1336-C53.
14. Medina-Martínez J, Saus-Ortega C, Sánchez-Lorente MM, Sosa-Palanca EM, García-Martínez P, Mármol-López MI. Health inequities in LGBT people and nursing interventions to reduce them: A systematic review. *Int J Environ Res Public Health*. 2021;18(22):11801. doi: 10.3390/ijerph182211801. PMID: 34831556; PMCID: PMC8624572.
15. Grant WB, van Amerongen BM, Boucher BJ. Periodontal Disease and Other Adverse Health Outcomes Share Risk Factors, including Dietary Factors and Vitamin D Status. *Nutrients*. 2023;15(12):2787.
16. Bingham K, Gutmann JL. Historical and contemporary reflections on evolutionary concepts that challenge the classification of endo-perio lesions. *Endodontology*. 2023;35(1):3-8.
17. Ray RR. Periodontitis: An oral disease with severe consequences. *Appl Biochem Biotechnol*. 2023;195(1):17-32.
18. Shah M, Poojari M, Nadig P, Kakkad D, Dutta SB, Sinha S, et al. Vitamin D and Periodontal Health: A Systematic Review. *Cureus*. 2023 Oct;15(10):e47773. doi: 10.7759/cureus.47773. PMID: 37899906; PMCID: PMC10612541.
19. Paiva GLA, de Campos WG, Rocha AC, Júnior CA, Migliorati CA, dos Santos Silva AR. Can the prophylactic use of pentoxifylline and tocopherol before dental extractions prevent osteoradionecrosis A systematic review. *Oral Surg Oral Med Oral Pathol Oral Radiol*. 2023;136(1):33-41.
20. Alkhatatbeh MJ, Hmoud ZL, Abdul-Razzak KK, Alem EM. Self-reported sleep bruxism is associated with vitamin D deficiency and low dietary calcium intake: a case-control study. *BMC oral health*. 2021; 21:1-10.

