



ISSN Print: 2394-7489
ISSN Online: 2394-7497
IJADS 2018; 4(2): 318-319
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www.oraljournal.com
Received: 15-02-2018
Accepted: 19-03-2018

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Low levels of vitamin D and periodontal disease: A review

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Abstract

Vitamin D has important role in regulation of bone metabolism. Various inflammatory diseases are related to Vitamin D deficiency because of its anti-inflammatory properties. Vitamin D also possess antimicrobial properties. Periodontal disease is induced by plaque biofilm. In periodontitis, there is loss of supporting alveolar bone. Due to role of vitamin D in bone metabolism, vitamin D deficiency in presence of periodontitis may lead to exacerbated bone resorption. In this review, studies conducted to reveal association between levels of vitamin D and periodontal disease are discussed.

Keywords: Vitamin D, periodontitis; periodontal disease

Introduction

Vitamin D enters circulation from skin or diet. Within several hours, it accumulates in liver where it undergoes hydroxylation to form 25 hydroxy vitamin D [25(OH) D] (calcidiol). This form of vitamin D is fairly stable in the body and is good indicator of vitamin D deficiency or toxicity. In kidneys, 1, 25 di-hydroxy vitamin D [1, 25(OH)₂D] (calcitriol) is formed, whose major function is to maintain normal serum calcium and phosphorus concentrations, by controlling absorption in small intestine^[2]. When serum calcium levels drop below body needs, parathyroid hormone (PTH) increases synthesis of 1,25(OH)₂D, which increases absorption of calcium from intestine.

Link between Vitamin D and periodontitis

Vitamin D has important role in suppressing cytokine production^[3]. Vitamin D has anti-microbial^[4] and anti-inflammatory action^[5]. *Porphyromonas gingivalis* infected human gingival and periodontal cells had lower expression of inflammatory cytokines and higher expression of β defensins on treatment with vitamin D^[6]. Low serum calcium levels due to low calcium and vitamin D intake, stimulates parathyroid gland to produce PTH, which results in osteoclastogenesis. Production of pro-inflammatory cytokines in periodontitis also results in osteoclastogenesis. It is suggested that alveolar bone in patients with periodontal disease and low levels of vitamin D and calcium would be under greater osteoclastic load than other bones such as femur and spine.

Association between vitamin D Levels and periodontitis

In third National Health and National Examination survey (NHANES III), Dietrich *et al* analyzed gingiva of individuals aged 13 to > 90 years of age⁵. Subjects in lowest quantile of serum calcidiol have 20% more bleeding sites than subjects in highest quantile⁵ representing anti-inflammatory effects of vitamin D. In NHANES III survey, serum calcidiol concentrations are significantly and inversely associated with attachment loss in patients above 49 years of age, whereas no association is reported below 50 years of age^[7]. Vitamin D intake also retards periodontal disease progression in older individuals^[8]. There is higher risk of tooth loss in individuals with lowest quantile of plasma calcidiol concentrations as compared to individuals with highest quantile of calcidiol^[9]. Serum vitamin D levels also influence outcome of surgery, with less gain in clinical attachment level and less reduction in probing depth in patients deficient of vitamin D^[10].

Studies also reported no association between serum calcidiol levels and periodontal condition^[11] or presence of association only in current smokers^[12].

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- Post-menopausal women: Calcidiol status is inversely associated with gingival bleeding and probing depth whereas there is no association between calcidiol levels and measures of periodontitis, i.e. alveolar crest height and tooth loss ^[13]. No association is reported between plasma calcidiol levels and pathogenic oral microbial species ^[14].
- Pregnant females: Association is reported between plasma calcidiol insufficiency and periodontal disease during pregnancy ^[15].
- Diabetic individuals: Significant association is reported between low serum level of calcitriol and periodontitis. Increase in calcitriol levels is found after periodontal therapy ^[16].

Conclusion

Studies reported no association to positive association between low levels of vitamin D and clinical parameters of gingival inflammation and periodontal breakdown. However, to establish cause effect relationship between low levels of vitamin D and periodontal disease, further randomized controlled trials need to be conducted.

References

1. Holick MF. Photobiology, metabolism, mechanism of action, and clinical application. In: Favus M, ed. *Primer on the Metabolic Bone Diseases and Disorders of Mineral Metabolism*, 3rd ed. Philadelphia: Lippincott-Raven. 1996:92-98.
2. DeLuca HF. The Vitamin D story: A collaborative effort of basic science and clinical medicine. *FASEB J*. 1988; 2:224-236.
3. Zittermann A. Vitamin D in preventive medicine: Are we ignoring the evidence? *Br J Nutr*. 2003; 89:552-572.
4. Liu PT, Stenger S, Li H *et al*. Toll-like receptor triggering of a Vitamin D-mediated human antimicrobial response. *Science*. 2006; 311:1770-1773.
5. Dietrich T, Nunn M, Dawson-Hughes B, Bischoff-Ferrari HA. Association between serum concentrations of 25-hydroxy Vitamin D and gingival inflammation. *Am J Clin Nutr*. 2005; 82:575-580.
6. De Filippis A, Fiorentino M, Guida L, Annunziata M, Nastri L, Rizzo A. Vitamin D reduces the inflammatory response by *Porphyromonas gingivalis* infection by modulating human β -defensin-3 in human gingival epithelium and periodontal ligament cells. *Int Immunopharmacol*. 2017; 47:106-117.
7. Dietrich T, Joshipura KJ, Dawson-Hughes B, Bischoff Ferrari HA. Association between serum concentrations of 25-hydroxy Vitamin D3 and periodontal disease in the US population. *Am J Clin Nutr*. 2004; 80:108-113.
8. Alshouibi EN, Kaye EK, Cabral HJ, Leone CW, Garcia RI. Vitamin D and periodontal health in older men. *J Dent Res*. 2013; 92:689-693.
9. Jimenez M, Giovannucci E, Krall Kaye E, Joshipura KJ, Dietrich T. Predicted Vitamin D status and incidence of tooth loss and periodontitis. *Public Health Nutr*. 2014; 17:844-852.
10. Bashutski JD, Eber RM, Kinney JS, Benavides E, Maitra S, Braun TM, Giannobile WV, McCauley LK. The impact of Vitamin D status on periodontal surgery outcomes. *J Dent Res*. 2011; 90:1007-1012.
11. Antonoglou GN, Suominen AL, Knuutila M, Ylöstalo P, Ojala M, Männistö S, Marniemi J, Lundqvist A, Tervonen T. Associations between serum 25-hydroxy Vitamin D and periodontal pocketing and gingival bleeding: results of a study in a non-smoking population in Finland. *J Periodontol* 2015; 86:755-765.
12. Lee HJ, Je DI, Won SJ, Paik DI, Bae KH. Association between Vitamin D deficiency and periodontal status in current smokers. *Community Dent Oral Epidemiol*. 2015; 43:471-478.
13. Millen AE, Hovey KM, LaMonte MJ, Swanson M, Andrews CA, Kluczynski MA, Genco RJ, Wactawski-Wende J. Plasma 25-hydroxy Vitamin D concentrations and periodontal disease in postmenopausal women. *J Periodontol*. 2013; 84:1243-1256.
14. Sahli MW, Wactawski-Wende J, Ram PK, LaMonte MJ, Hovey KM, Genco RJ, Andrews CA, Millen AE. Association of plasma 25-hydroxy Vitamin D concentrations and pathogenic oral bacteria in postmenopausal females. *J Periodontol*. 2014; 85:944-955.
15. Boggess KA, Espinola JA, Moss K, Beck J, Offenbacher S, Camargo CA Jr. Vitamin D status and periodontal disease among pregnant women. *J Periodontol*. 2011; 82:195-200.
16. Antonoglou G, Knuutila M, Niemelä O, Hiltunen L, Raunio T, Karttunen R, Vainio O, Ylöstalo P, Tervonen T. Serum 1,25(OH)D level increases after elimination of periodontal inflammation in T1DM subjects. *J Clin Endocrinol Metab*. 2013; 98:3999-4005.