FACULDADE SETE LAGOAS – FACSETE

Rebeka Ribeiro Gomes

INFLUÊNCIA DA VITAMINA D NA DOENÇA PERIODONTAL - REVISÃO DE LITERATURA

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- REVISÃO DE LITERATURA

Artigo Científico apresentado ao Curso de Especialização Lato Sensu do CPGO, como requisito parcial para a conclusão do Curso de Especialização de Periodontia

Área de Concentração: Periodontia
Orientador: Cácio Lopes Mendes

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FACSETE – FACULDADE SETE LAGOAS

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Monografia intitulada Influência da Vitamina D na Doença Periodontal – Revisão de Literatura, de autoria da aluna Rebeka Ribeiro Gomes, aprovada pela banca examinadora constituída pelos seguintes professores:



Cácio Lopes Mendes – Professor do Curso de Especialização em Periodontia do CPGO – Orientador

Nome do Examinador – instituição

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ABSTRACT

Periodontitis is an inflammatory disease that affects the gums, and it is the major cause of tooth loss in adult population. Even though specific bacteria from the oral biofilm have a special role in the onset of the disease, its severity and progression are both dictated by the host's immune system. Smoking, obesity, diabetes, and poor nutrition are associated with an increased risk of the disease. The aim of this review is to show an association between vitamin D and periodontal health, and how its deficiency would affect the development of periodontal diseases. Vitamin D, besides its classical role in the regulation of the calcium-phosphate balance, can also impact the development of periodontitis through its immunomodulating and antiinfectious effects. Some studies showed that vitamin D may be a complementary tool in periodontal therapy, but some authors failed to confirm that association. We suggested further studies to evaluate whether a universal supplementation of deficient vitamin D levels should be given to improve the periodontal status, and which is the best goal level of vitamin to achieve.

KEYWORDS: periodontitis, vitamin D

INTRODUCTION

Periodontitis is an inflammatory disease that affects the gums, causing periodontal ligament and bone loss. If left unchecked, it will destroy the tissues supporting the teeth, which will eventually be lost (Neville *et al.*, 2009). Even though specific bacteria from the oral biofilm have a special role in the onset of the disease, its severity and progression are both dictated by the host's immune system (Antonoglou *et al.*, 2014).

Periodontitis is the major cause of tooth loss in adult population, and its prevalence increases with age. Smoking, obesity, diabetes, and poor nutrition are associated with an increased risk of the disease (Tonetti *et al.*, 2017).

Dietary factors may affect oral health in general, via systemic or local effects (Adegboye *et al.,* 2015). Vitamin D comprehends a group of molecules called calciferols. Its main forms are cholecalciferol (vitamin D3) and ergocalciferol (vitamin D2) (Bendik *et al.*, 2014). Although vitamin D can be obtained from the diet (oily fish like salmon, mackerel and herring, for example), the main source of this nutrient still is sunlight exposure (Holick, 2017).

Vitamin D, besides its classical role in the regulation of the calcium-phosphate balance, can also impact the development of periodontitis through its immunomodulating and antiinfectious effects (Ślebioda *et al.*, 2016).

The aim of this review was to show an association between vitamin D and periodontal health, and how its deficiency would affect the development of periodontal diseases.

REVIEW OF LITERATURE

Severe peridontitis was the sixth-most prevalent condition worldwide in 2010 (Kassebaum *et al.*, 2014).

Vitamin D is already known for having many roles in the human body, among them immunomodulatory and antimicrobial properties being particularly important for oral health (Lee, Je, Won, Paik, & Bae, 2015).

25-hydroxyvitamin D (25(OH)D) is the circulating form of the nutrient produced by the liver, and its levels are measured to determine the vitamin D status in an individual. The actual hormone, 1,25-dihydroxyvitamin D ($1,25(OH)_2D$), is synthesized in the kidney, and accomplishes its functions by binding to the vitamin D receptor (VDR) located in the periodontal ligament cells (Bendik, Friedel, Roos, Weber, & Eggersdorfer, 2014).

While the Institute of Medicine indicates the serum level of 25(OH)D of at least 50nmol/L as adequate, and the Endocrine Society recommends a minimum of 75nmol/L (Holick, 2017), there is evidence that the best concentration for periodontal health is 90-100nmol/L (Bischoff-ferrari, Giovannucci, Willett, Dietrich, & Dawson-hughes, 2006).

An IL1 β-stimulated human periodontal ligament cell culture treated with vitamin D demonstrated a significant inhibition of IL-6 and IL-8 production. This finding shows that vitamin D has an anti-inflammatory role on gingival cells (Hosokawa, Hosokawa, Shindo, Ozaki, & Matsuo, 2015).

Xu *et al.* (2016) demonstrated that, *in vitro*, $1,25(OH)_2D$ enhanced the expression of IL-10, a cytokine with anti-inflammatory properties.

Grenier *et al.* (2016), using a cell culture of *Porphyromonas gingivalis,* determined that the three strains used were susceptible to $1,25(OH)_2D$, and if using it together with metronidazole, they could have a partial synergistic effect.

Another study using cultures of human periodontal ligament fibroblasts, primary human periodontal ligament cells, and *P. gingivalis* stimulated with 25(OH)D and $1,25(OH)_2D$ showed that both forms of vitamin D hinder the production of pro-inflammatory cytokines by the cells (Andrukhov *et al.*, 2014).

Sahli *et al.* (2014), in a study with 855 postmenopausal women, found that high concentrations of 25(OH)D were inversely associated with presence of pathogenic oral bacteria. They hypothesized this would be due to poor hygiene habits, and they did observed an inverse, although not statistically significant association related to less frequent flossing.

However, in another study with 655 postmenopausal women no association was found between vitamin D status and chronic periodontitis measures at baseline and in the 5-year follow-up. (Millen *et al.*, 2014)

In a study by Alshouibi *et al.* (2013), data from 562 adult male participants from the Veterans Affairs Dental Longitudinal Study, ranging from 1986 to 1998 were examined and evidence was found of a protective role of the vitamin D on the periodontitis. Men using vitamin D supplements tended to have less periodontal disease, and those that underwent periodontal surgery had better improvements in attachment loss and pocket depth.

On the other hand, a Danish study (Adegboye *et al.*, 2014) with 4402 subjects showed no correlation between periodontal disease and vitamin D intake.

A population-based study data in Germany was used by Zhan *et al.* (2014) and it was found no significant association between 25(OH)D and incidence of changes of clinical attachment loss (CAL) ≥ 3mm on tooth level.

Lee *et al.* (2015), in a study with a little over 6000 subjects, found that there was no association between vitamin D levels and a higher Community Periodontal Index (CPI) in noncurrent smokers.

Antonoglu *et al.* (2014) noted in their study with 92 subjects that serum levels of 25(OH)D would vary according the season, but $1,25(OH)_2D$ levels would remain constant throughout the year. Those subjects with lower $1,25(OH)_2D$ levels were more likely to belong to the periodontitis group than the control group. There was a positive association between $1,25(OH)_2D$ and periodontal health.

A sample of 38 Puerto Rican participants (19 controls and 19 cases of moderate/severe periodontitis) was analyzed, and it was found that those with periodontal disease had significant lower levels of serum 25(OH)D. Moreover, the chances of developing moderate/severe periodontitis was reduced by 12% for every unit increase of 25(OH)D (Abreu *et al.*, 2016).

Dietrich *et al.* (2005) measured 25(OH)D serum concentrations and periodontal data from 6700 never smoker subjects, and found an inverse association between chronic gingivitis and serum 25(OH)D.

Nevertheless, using data of 1205 individuals from a Finnish Health Survey, Antonoglou *et al.* (2015) noticed no correlation between serum 25(OH)D levels and periodontal condition (either gingival bleeding or periodontal pockets >4mm). Still, a

small protective effect was apparent when vitamin D levels were higher in individual with good oral hygiene.

DISCUSSION

The main source of vitamin D to humans still is sunlight exposure (Andrukhov *et al.*, 2014; G. N. Antonoglou *et al.*, 2014; Bendik *et al.*, 2014), and therefore intoxication is rare, since excess of vitamin D is destroyed by the sun (Holick, 2017).

Vitamin D has several roles in the human body, among them enhancement of innate immunity (Uwitonze *et al.*, 2018), as it is shown by inhibition of IL-6 and IL-8 production (Andrukhov *et al.*, 2014; Hosokawa *et al.*, 2015), and enhancement of IL-10 (Xu *et al.,* 2016).

The antimicrobial and anti-inflammatory effects of vitamin D has also been demonstrated by a diminished risk of developing periodontal diseases, as presented by Abreu *et al.*, 2016; Alshouibi *et al.*, 2013; Antonoglou *et al.*, 2014; Dietrich *et al.,*2005; Grenier *et al.*, 2016; Sahli *et al.*, 2014.

Despite those findings, some authors (Adegboye *et al.*, 2014; Antonoglou *et al.*, 2015; Lee *et al.*, 2015; Millen *et al.*, 2014; Zhan *et al.*, 2014) failed to find any association between vitamin D and periodontal health status. The same authors hypothesize the reasons as short-term study, half-mouth examinations, cross-sectional study design, or uncontrolled intake of vitamin D.

There is some evidence linking a good oral hygiene and a high vitamin D level being associated with a lesser risk of periodontal disease (Antonoglou *et al.*, 2015; Sahli *et al.*, 2014).

As a result, vitamin D shows a potential role as a complementary tool not only in periodontal therapy, but also in prevention and maintenance of oral health status.

Measurement of serum 25(OH)D levels may support a preventive approach when associated with good oral hygiene habits.

It was not well elucidated whether a regular and universal supplementation of deficient vitamin D levels should be given nor the goal level of vitamin D to achieve, in order to improve the periodontal status or to prevent severe periodontitis. Further studies are necessary.

CONCLUSION

Vitamin D has a classical role in the regulation of the calcium-phosphate balance, and can also impact the development of periodontitis through its immunomodulating and antiinfectious effects, with a reduced risk of developing periodontal diseases.

Some studies showed that vitamin D may be a complementary tool in periodontal therapy, and in prevention and maintenance of oral health status. Some authors failed to confirm that association, probably due to a short-term study, half-mouth examinations, cross-sectional study design, or uncontrolled intake of vitamin D

Measurement of serum 25(OH)D levels may support a preventive approach when associated with good oral hygiene habits. We suggest further studies to evaluate whether a universal supplementation of deficient vitamin D levels should be given to improve the periodontal status, and which is the best goal level of vitamin to achieve.

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