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# Introductory Chapter: The Importance of Gingival Treatment and Prevention

*Alaa Eddin Omar Al Ostwani*

## 1. Introduction

Gingiva, with its unique texture and coral pink color [1], is the most delicate tissue in the oral cavity and the first essential component of the periodontium (**Figure 1**).

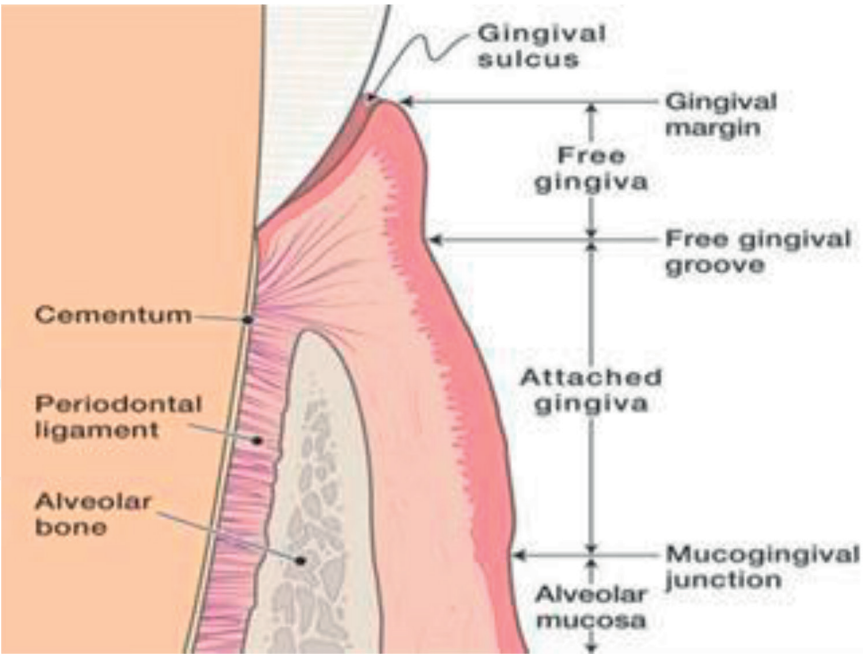
*Why is it too much important to confirm a healthy gingiva before proceeding to dental treatment?*

Nowadays, the importance of gingiva is increasing because of its interrelationship with the general health and the direct esthetic effect on most dental treatments.

The teeth are supported and held in position within the alveolar bone by means of the periodontium. The latter consists of gingiva, periodontal ligament, alveolar bone, and cementum (**Figure 1**). The gingiva, which covers the alveolar bone, is classified as a masticatory portion of oral mucosa. Anatomically, there are three demarcated parts of gingiva. First, the marginal gingiva, which is the free end of gingiva with a smooth surface, enclosing the neck of the teeth as a collar shape to define the gingival sulcus. The second part is the attached gingiva which is stippled, firm, and strongly attached to the alveolar bone and to the cervical area of the tooth by means of junctional epithelium located in the floor of gingival sulcus. The conjunction between the free and attached gingiva is a shallow linear depression called gingival groove. The attached gingiva extends apically to the oral mucosa, from which it is demarcated by mucogingival junction (**Figure 2**). The third part is the interdental zone of gingiva, which is non-keratinized and located in the area between the two adjacent teeth beneath the contact point [2].

The biological width or the supracrestal tissue attachment is a natural protective layer, which seals and preserves the periodontium from bacterial invasion, located in the deeper part of gingival sulcus and measuring 2.04 mm in depth, which is the sum of junctional epithelium 0.97 mm and supracrestal connective tissue attachment 1.07 mm (**Figure 3**).

These delicate anatomical structures of the periodontium should be respected and well considered by the dentist while planning and managing oral and dental diseases. Furthermore, any changes detected in the normal appearance or texture of gingiva as well as periodontal attachment might guide the dentist to a further investigation of oral or systemic disturbances.

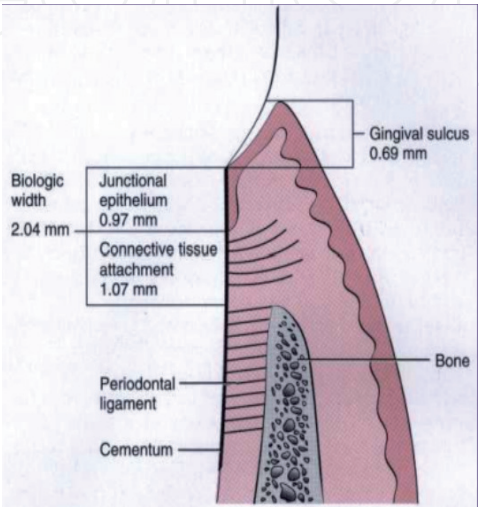


**Figure 1.**  
*The periodontium components.*



The stippled surface of the attached gingiva

**Figure 2.**  
*The free and attached gingiva.*



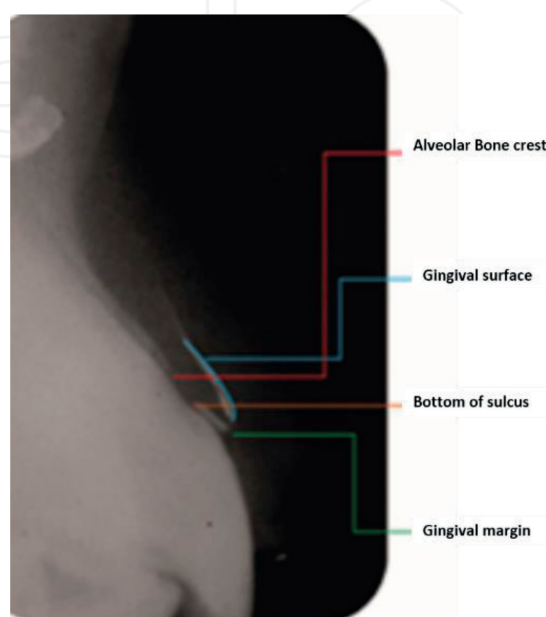
**Figure 3.**  
*The biological width.*

## 2. How an esthetic result and successful dental treatment can be achieved without insulting the periodontium?

The dental procedure is considered safe to the periodontium, providing there is no intervention in the biological width and specifically the epithelium junction. Therefore, care should be taken during tooth preparation, impression, retraction cords, temporary and permanent crowns, restorations, and also bleaching, in order not to invade the biological width and periodontium. Many dentists, before the revolution of esthetic dentistry, tended to set the margins of the crown or restoration too long beneath the gingiva, just to mask the interface between the tooth and crown edges. As a result, there will be more plaque accumulation, which is very difficult to be cleaned subgingivally. This might sometimes cause iatrogenic gingival and periodontal disease and unsightly exposed margins of the crown due to gingival recession. It has been further explained by investigators that subgingival edges of the restorations or crowns will change the subgingival flora to higher scores of gingival and plaque indexes with increasing the depth of gingival sulcus. Nevertheless, when the margins of the crown or restoration should be placed subgingivally in few special cases, the sulcus depth and the level of epithelium junction along with the alveolar bone crest must be precisely determined, by cautiously using either gingival probe or radiographs, such as Bitewing X rays or the innovative parallel profile radiograph technique (PPR) (**Figure 4**). Furthermore, care should be taken not to injure the marginal gingiva when the alveolar bone crest is lower than normal and the free gingiva is not well supported by enough depth of epithelium junction, because this will result in a high incidence of gingival recession [3].

Endocrown is a new biomimetic design to restore the teeth after endodontic treatment. The tooth is prepared with circular butt-joint margins and central cavity inside the pulp chamber (**Figure 5**). This type of restoration will save the tooth structure as well as the periodontium [4].

Another new conservative concept is the biologically oriented preparation technique used for both tooth and implant prosthodontics. It is also mentioned as vertical tooth preparation, meaning to prepare the tooth without a finishing line as a featheredge located 0.5 mm beyond the gingival margins, which in turn will cautiously induce gingival bleeding. The formed coagulate is preserved by using interim splinted acrylic resin prosthesis for nearly 6 weeks in order to enhance



**Figure 4.**  
*The innovative parallel profile radiograph technique to determine the biological width.*



gingival healing according to the new emergence profile (**Figure 6**).

This innovative method will preserve the tooth structure and increase the thickness of gingiva as well. Moreover, the final finishing line will be determined by the technician depending on gingival formation caused by tissue remodeling, and the emergence profile can also be modulated [5]. Actually, the dentist had better select whether to prepare the tooth with horizontal or vertical finishing line depending on his diagnosis, esthetic requirements, gingival health, and patient cooperation. Similarly, a conical implant can be used without a finishing line in order to set the gingival margins on the prosthetic crown rather than the abutment. Therefore, the restoration-abutment interface will mimic the cement-enamel junction and the natural tooth emergence as well. Subsequently, the peri-implant gingiva will be thicker, more stable, and well-adapted to the new prosthetic shape [6].

The well-organized treatment plan is the gold standard for successful dental therapy. The dentist should prioritize his goals of the dental procedures in order to meet the patient's expectations with long-term success. Unfortunately, the gingiva is not as much important as dental caries from the viewpoint of many patients, whereas it is the first priority of the dentist in order to ensure that the teeth, to be treated and rehabilitated, are well supported by a strong healthy periodontium. Therefore, any gingival or periodontal inflammation should be treated ahead of prosthodontic procedures, and seriously considered during and after dental treatment. The traumatic occlusal forces, either primary or secondary, should be



**Figure 5.**  
*The endocrown. (A) Tooth preparation. (B) endocrown. (C) After cementation.*



**Figure 6.**  
*The biologically oriented preparation technique. (A) Before treatment, (B) after vertical preparation, (C) the interim splinted acrylic resin prosthesis, and (D) the attached gingiva after treatment.*

considered in the treatment plan of gingival diseases. However, there is no clear evidence that these traumatic forces will aggravate periodontitis [7, 8]. Rarely, the gingival inflammation could not be controlled by normal hygiene methods and might be induced by hypersensitivity of dental materials. Other factors to be investigated while planning gingival treatment are excessive orthodontic forces out of the adaptive capacity of periodontium, thickness of gingiva, and smoking [9, 10].

### **3. Is the correlation between gingival diseases and systemic health considered one or two way?**

Gingivitis is defined as an inflammation induced by plaque accumulation and accompanied with redness, bleeding, and edema, and sometimes it might be painless as a silent chronic disease. If this inflammatory process is left untreated, it may turn into a dangerous progressive disease, with continuous bone and attachment loss, referred to as periodontitis [11].

There are two directions regarding the relationship between the gingiva and systemic diseases; the first one explains the impact of systemic disturbances and illnesses on the gingiva and periodontium, while the second one describes the possible effects of gingival and periodontal diseases on the general health.

#### **3.1 The first direction was classified by Al-Bandar et al.**

##### **1. Systemic disturbances which influence the periodontal inflammation and have a considerable impact on the periodontal attachment:**

- Genetic abnormalities.
  - Diseases correlated with immunologic disorders, such as Down syndrome and leukocyte adhesion deficiency syndromes.
  - Diseases which affect the oral mucosa and gingival tissue. For example, dystrophic epidermolysis bullosa and epidermolysis bullosa.
  - Diseases with negative effects on the connective tissues, like Ehlers-Danlos syndromes.
  - Metabolic and endocrine disturbances, namely hypophosphatasia.
- Acquired immunodeficiency diseases as seen in HIV infection.
- Inflammatory diseases. Epidermolysis bullosa acquisita for example.

##### **2. Other systemic disorders influencing the pathogenesis of periodontal diseases out of which are osteoporosis particularly related to postmenopausal [12], rheumatoid arthritis, osteoarthritis [13], and obesity which might affect periodontitis through hyperglycemia [14]. In addition, diabetes mellitus is also considered as a modifying factor of periodontitis by means of hyperglycemia resulted from type I or II diabetes [15]. Furthermore, the medications typically used for the treatment of malignancies, malnutrition, vitamins deficiency [16], nicotine dependence and psychological stress are also exacerbating factors of periodontal diseases.**

### 3. Systemic disturbances which can cause loss of periodontal tissues independent of periodontitis

- Neoplasms, such as odontogenic tumors
- Other disorders that may affect the periodontal tissues. For example hyperparathyroidism.

*What is the impact of immune system disorders on the gingival and periodontal attachments?*

It has been shown that many systemic disturbances can induce inflammation in the gingival tissue by affecting the host immune system, such as diabetes mellitus and obesity, through impairment of the immune defenses and elevating proinflammatory cytokines, which in turn will increase the risk of periodontitis and loss of periodontal attachment. Furthermore, there are many cytokines mediated in the immune response in the case of gingivitis or periodontitis, [17] and one of the most important and not well-studied mediator is the macrophage migration inhibitory factor MIF.

The dentist after navigating the impact of systemic disturbances on the periodontium will definitely find that usual scaling and root planning is only a relief but not a cure in many cases. Therefore, it is mandatory to detect and uncover the systemic disorders which aggravate gingival inflammation in order to provide a comprehensive and definite treatment [18]. In addition, when the dentist investigates the gingival and periodontal diseases as the first manifestation of many systemic disorders, great numbers of serious illnesses will be early diagnosed. This will ultimately prevent the patient from any possible consequences of both oral and systemic diseases, optimize the treatment, and improve the quality of life as well [17].

### **3.2 The second direction is to explain the impact of gingivitis or periodontitis on the systemic health**

A lot of research took place in order to answer this question:

*“To what extent might gingivitis affect systemic health?”*

Plaque-induced gingival disease is a chronic inflammatory process which causes elevation in the levels of serum inflammatory mediators, such as C-reactive protein CRP, TNF-alpha, IL-6, and IL-1B. Subsequently, the endothelial tissues might be affected by this elevation, which in turn will cause peripheral artery disease [19] and lead to a significant increase in cardiovascular illnesses [20]. This conclusion is found to be more prominent if the loss of periodontal attachment is more than 4 mm in at least 30% of six different sites in the oral cavity [21]. On the other hand, the proper treatment of periodontitis can improve endothelial function and may prevent the incidence of cardiovascular diseases [22] and other systemic disorders as well [23]. Interestingly, the same etiology of periodontitis, with high levels of pro-inflammatory serum mediators, will worsen the neurodegenerative diseases such as Alzheimer disease causing memory impairment and cognitive dysfunction [24]. Furthermore, the immune-inflammatory response toward periodontitis may initiate or exacerbate many systemic diseases including diabetes mellitus [15], osteoporosis, cancer [25], rheumatoid arthritis, and systemic lupus erythematosus [26]. In addition, pregnancy, which is the most delicate and important stage in a person's life, will be highly affected by any systemic disturbances or inflammation represented in the pregnant [27].

#### **4. What is the purpose of the dentist, to cure or control gingival diseases?**

Actually, it depends on the type of inflammation, whether it is localized and induced by bacterial invasion, or correlated with a special systemic condition. Interestingly, this is the first standard of treatment plan when investigating far away from the oral cavity in order for any hidden reason of gingival diseases to subside. Therefore, the long-term healing success will depend on eliminating the exacerbating factors, eradicating the possible causes and motivating the patient to maintain a high level of oral hygiene, in addition to regular dental visits to avoid relapse. One of the recurrent and challenging oral diseases is gingival enlargement which strongly affects the esthetic appearance and has a great impact on most dental treatment. Recently, many herbal medicines have been used to enhance the therapy of gingivitis or periodontitis, out of which are the very effective antioxidants.

The dentist had better refer the patient with recurrent gingivitis, periodontitis, or complex medical history to a periodontal specialist in order to provide a professional gingival treatment with the most advanced periodontal therapy [28]. However, the aim of the periodontist in a few complicated cases correlated to chronic systemic diseases is to relieve the symptoms, control the inflammatory process, and extend the life span of the teeth in the case of periodontitis. Otherwise, extraction of the involved teeth with severe infection and attachment loss in order to improve the health situation of a deteriorating patient will sometimes become inevitable. This will depend on the judicious decision of both the periodontist and the physician along with the consent of the patient.

#### **5. How to prevent gingival diseases?**

Maintaining good oral hygiene by controlling plaque accumulation, especially in the interdental spaces, is the most essential factor to prevent the incidence of gingivitis and periodontitis. Indeed, home dental care is not always sufficient for prevention, even though it is perfect, and many patients are complaining of gingival problems in spite of following and practicing oral hygiene instructions. This will motivate the dentist to do a comprehensive assessment in collaboration with other medical specialists in case of suspecting any systemic disturbances. Furthermore, the patient should be instructed to eat healthier food in order to maintain good levels of vitamins and nutrients [16, 29], and keep his weight within the normal ranges by doing exercises in order to decrease psychological stress and enhance his immune system as well. Moreover, the dentist should also encourage the patient to control or quit, if possible, any bad habits, such as smoking [30]. Furthermore, the patient with an allergic history had better be acquainted with the correlation between gingival diseases and the long-term reaction of his immune system caused by chronic exposure to allergens at home or work place.

#### **6. Conclusion**

The successful prevention and treatment of gingival diseases will not only save the patient's teeth, but also prevent the dangerous consequences on the general health. Subsequently, this will pave the way to a premium physical and mental health along with better quality of life.



## **Conflict of interest**

The author declared that he has no conflict of interest.

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## References

- [1] Ho DK, Ghinea R, Herrera LJ, Angelov N, Paravina RD. Color range and color distribution of healthy human gingiva: A prospective clinical study. *Scientific Reports*. 2015;5:18498. DOI: 10.1038/srep18498
- [2] Shirmohammadi A, Faramarzie M, Lafzi A. A clinical evaluation of anatomic features of gingiva in dental students in Tabriz, Iran. *Journal of Dental Research, Dental Clinics, Dental Prospects*. 2008;2(3):90-94. DOI: 10.5681/joddd.2008.019
- [3] Nugala B, Santosh Kumar B, Sahitya S, Krishna P. Biologic width and its importance in periodontal and restorative dentistry. *Journal of Conservative Dentistry*. 2012;15(1):12-17. DOI: 10.4103/0972-0707.92599
- [4] Alomran W. Endocrowns: A review article. *Scholars Journal of Dental Sciences*. 2018;5(5):305-309. DOI: 10.21276/sjds.2018.5.5.10
- [5] Imburgia M, Canale A, Cortellini D, Maneschi M, Martucci C, Valenti M. Minimally invasive vertical preparation design for ceramic veneers. *The International Journal of Esthetic Dentistry*. 2016;11(4):460-471
- [6] Solá-Ruiz MF, Río J, Labaig Rueda C, Agustín-Panadero R. Biologically oriented preparation technique (BOPT) for implant supported fixed prostheses. *Journal of Clinical and Experimental Dentistry*. 2017;9(4):E603-E607. DOI: 10.4317/jced.53703
- [7] Harrel SK, Nunn ME. The effect of occlusal discrepancies on gingival width. *Journal of Periodontology*. 2004;75(1):98-105. DOI: 10.1902/jop.2004.75.1.98
- [8] Jepsen S, Caton JG, Albandar JM, Bissada NF, Bouchard P, Cortellini P, et al. Periodontal manifestations of systemic diseases and developmental and acquired conditions: Consensus report of workgroup 3 of the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions. *Journal of Clinical Periodontology*. 2018;45(Suppl 20):S219-SS29. DOI: 10.1111/jcpe.12951
- [9] Tonetti MS, Greenwell H, Kornman KS. Staging and grading of periodontitis: Framework and proposal of a new classification and case definition. *Journal of Periodontology*. 2018;89(Suppl 1):S159-SS72. DOI: 10.1002/JPER.18-0006
- [10] Warnakulasuriya S, Dietrich T, Bornstein MM, Casals Peidró E, Preshaw PM, Walter C, et al. Oral health risks of tobacco use and effects of cessation. *International Dental Journal*. 2010;60(1):7-30
- [11] Trombelli L, Farina R, Silva CO, Tatakis DN. Plaque-induced gingivitis: Case definition and diagnostic considerations. *Journal of Periodontology*. 2018;89(S1):S46-S73. DOI: 10.1002/JPER.17-0576
- [12] Penoni DC, Fidalgo TKS, Torres SR, Varela VM, Masterson D, Leão ATT, et al. Bone density and clinical periodontal attachment in postmenopausal women: A systematic review and meta-analysis. *Journal of Dental Research*. 2017;96(3):261-269. DOI: 10.1177/0022034516682017
- [13] Fuggle NR, Smith TO, Kaul A, Sofat N. Hand to mouth: A systematic review and meta-analysis of the association between rheumatoid arthritis and periodontitis. *Frontiers in Immunology*. 2016;7:80. DOI: 10.3389/fimmu.2016.00080
- [14] Gaio EJ, Haas AN, Rösing CK, Oppermann RV, Albandar JM, Susin C. Effect of obesity on periodontal

attachment loss progression: A 5-year population-based prospective study. *Journal of Clinical Periodontology*. 2016;**43**(7):557-565. DOI: 10.1111/jcpe.12544

[15] Sanz M, Ceriello A, Buysschaert M, Chapple I, Demmer RT, Graziani F, et al. Scientific evidence on the links between periodontal diseases and diabetes: Consensus report and guidelines of the joint workshop on periodontal diseases and diabetes by the International diabetes Federation and the European Federation of Periodontology. *Diabetes Research and Clinical Practice*. 2018;**137**:231-241. DOI: 10.1016/j.diabres.2017.12.001

[16] Najeeb S, Zafar MS, Khurshid Z, Zohaib S, Almas K. The role of nutrition in periodontal health: An update. *Nutrients*. 2016;**8**(9):530. DOI: 10.3390/nu8090530

[17] Albandar JM, Susin C, Hughes FJ. Manifestations of systemic diseases and conditions that affect the periodontal attachment apparatus: Case definitions and diagnostic considerations. 2018;**89**(Suppl 1):S183-S203. DOI: 10.1002/jper.16-0480

[18] Iwasaki M, Taylor GW, Sato M, Minagawa K, Ansai T, Yoshihara A. Effect of chronic kidney disease on progression of clinical attachment loss in older adults: A 4-year cohort study. *Journal of Periodontology*. 2019. DOI: 10.1002/jper.18-0464

[19] Jimenez M, Krall EA, Garcia RI, Vokonas PS, Dietrich T. Periodontitis and incidence of cerebrovascular disease in men. *Annals of Neurology*. 2009;**66**(4):505-512. DOI: 10.1002/ana.21742

[20] Yang S, Zhao LS, Cai C, Shi Q, Wen N, Xu J. Association between periodontitis and peripheral artery disease: A systematic review and meta-analysis. *BMC Cardiovascular*

*Disorders* 2018;**18**(1):141. DOI: 10.1186/s12872-018-0879-0

[21] Aoyama N, Suzuki J-I, Kobayashi N, Hanatani T, Ashigaki N, Yoshida A, et al. Periodontitis deteriorates peripheral arterial disease in Japanese population via enhanced systemic inflammation. *Heart and Vessels*. 2017;**32**(11):1314-1319. DOI: 10.1007/s00380-017-1003-6

[22] Blum A, Kryuger K, Mashiach Eizenberg M, Tatour S, Vigder F, Laster Z, et al. Periodontal care may improve endothelial function. *European Journal of Internal Medicine*. 2007;**18**(4): 295-298. DOI: 10.1016/j.ejim.2006.12.003

[23] Sakurai SI, Yamada SI, Karasawa I, Sakurai A, Kurita H. A longitudinal study on the relationship between dental health and metabolic syndrome in Japan. *Journal of Periodontology*. 2019. DOI: 10.1002/jper.18-0523

[24] Teixeira FB, Saito MT, Matheus FC, Prediger RD, Yamada ES, CSF M, et al. Periodontitis and Alzheimer's disease: A possible comorbidity between oral chronic inflammatory condition and neuroinflammation. *Frontiers in Aging Neuroscience*. 2017;**9**:327. DOI: 10.3389/fnagi.2017.00327

[25] Martelli ML, Brandi ML, Martelli M, Nobili P, Medico E, Martelli F. Periodontal disease and women's health. *Current Medical Research and Opinion*. 2017;**33**(6):1005-1015. DOI: 10.1080/03007995.2017.1297928

[26] Cardoso EM, Reis C, Manzanares-Céspedes MC. Chronic periodontitis, inflammatory cytokines, and interrelationship with other chronic diseases. *Postgraduate Medicine*. 2018;**130**(1):98-104. DOI: 10.1080/00325481.2018.1396876

[27] Erchick DJ, Rai B, Agrawal NK, Khatry SK, Katz J, LeClerq SC, et al.

Oral hygiene, prevalence of gingivitis, and associated risk factors among pregnant women in Sarlahi District, Nepal. BMC Oral Health. 2019;**19**(1):2. DOI: 10.1186/s12903-018-0681-5

[28] Kraatz J, Hoang H, Ivanovski S, Ware RS, Crocombe LA. Non-clinical factors associated with referral to periodontal specialists. Journal of Periodontology. 2019. DOI: 10.1002/jper.18-0642

[29] Jagelavičienė E, Vaitkevičienė I, Šilingaitė D, Šinkūnaitė E, Daugėlaitė G. The relationship between vitamin D and periodontal pathology. Medicina (Kaunas, Lithuania). 2018;**54**(3):45. DOI: 10.3390/medicina54030045

[30] Costa FO, Cota LOM. Cumulative smoking exposure and cessation associated with the recurrence of periodontitis in periodontal maintenance therapy: A 6-year follow-up. Journal of Periodontology. 2019. DOI: 10.1002/jper.18-0635