

Individuals' quality of life in periodontal maintenance therapy - critical literature review.

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Abstract: Oral health is an integral part of an individual's general health, interfering with all dimensions of life: functional, aesthetic, psychological, social, physical, nutritional, and even psychosocial. Hence oral health is directly related to quality of life. Periodontitis is one of the most prevalent oral diseases and one of the major causes of tooth loss, impacting negatively on self-reported individuals' quality of life. Periodontal maintenance therapy aims to effectively minimize the recurrence of periodontal disease, as well as the incidence of tooth loss. In periodontal literature, studies associated with quality of life indicators, presented in the form of questionnaires aimed at measuring the impact of periodontitis and tooth loss on self-reported individual's quality of life, highlight the "Oral Impacts on Daily Performance" (OIDP) and "Oral Health Impact Profile" (OHIP). As such, this study presents a critical review of the literature and describes the impact of periodontal disease and tooth loss on the quality of life of patients undergoing periodontal maintenance therapy.

Keywords: quality of life; tooth loss; periodontitis; periodontal maintenance therapy.

INTRODUCTION.

Chronic periodontitis is defined as gingival inflammation that extends to the tooth supporting tissues and is characterized by clinical insertion loss due to the destruction of the periodontal ligament and loss of adjacent supporting bone tissue.¹

Periodontitis can be successfully treated by mechanical non-surgical or surgical therapy, accompanied by adequate dental biofilm control and periodontal maintenance therapy (PMT),^{2,3} also known as supportive periodontal therapy.⁴

It is known that periodontal disease (PD) negatively impacts the well-being and daily activities of adults, and a correlation among its extension and severity and low quality of life has been demonstrated.⁵⁻⁹ The World Health Organization (WHO) defines health as "a complete state of physical, mental, social well-being and not just the absence of disease".¹⁰ This concept incorporates related symptoms, physical and emotional functioning and social well-being into health. Thus, quality of life is recognized as a valid parameter for evaluating individuals in the medical field, as well as with regard to oral and systemic health. The evaluation of the impact on an individual's quality of life, performed through questionnaires, has been shown to

be effective in obtaining individuals' reports, mainly in determining which activities are most affected by periodontitis and which periodontal treatment has the greatest positive or negative effect.⁵

The Oral Health Impact Profile (OHIP)^{11,12} and Oral Impacts on Daily Performance (OIDP)^{13,14} are the most widely-used questionnaires for assessing the impact of oral health on adults' quality of life.

This review describes the impact of periodontitis and tooth loss on the quality of life of individuals submitted to PMT using OIDP and OHIP-14 instruments.

MATERIALS AND METHODS

Periodontal disease

The term periodontal disease refers primarily to two conditions: gingivitis and periodontitis. Periodontitis is preceded by gingivitis and requires microbial colonization of the dental biofilm by specific pathogens and affects only part of the population. Hence demonstrating that not all cases of gingivitis progress to periodontitis. Periodontitis is the result of a complex interaction between biofilm, microorganisms and host defense mechanisms and can be modified by biological, social and environmental factors.¹⁵ Elimination, alteration or control of the main factors that contribute to chronic periodontitis should be done as part of periodontal therapy.¹

The objectives of periodontal therapy are to alter or minimize microbial action and risk factors that contribute to periodontitis in order to prevent disease progression and preserve the dentition in a healthy, comfortable and functional state, as well as providing adequate esthetics.

Thus, in the initial therapy, the instruction, reinforcement and evaluation of the patient's control of the dental biofilm should be done in addition to supra and subgingival scaling and root planing in order to remove the dental biofilm and calculus¹. Moreover, the quality of the treatment, the patients' attitude and socioeconomic background toward health care, and compliance and motivation differ between clinics. These factors, which should not be ignored, can be associated with the prevalence of periodontitis and treatment outcomes.¹⁶

Periodontal Maintenance Therapy (PMT)

The therapeutic goals of PMT are the following: minimizing the recurrence of PD in individuals who have previously been treated for gingivitis and periodontitis; reducing the incidence of tooth loss (TL) by monitoring the dentition and prosthetic replacement when necessary; and increasing the probability of detecting and treating periodically other diseases or conditions found in the oral cavity.¹⁷

Individuals who routinely receive PMT tend to maintain their teeth for a longer period of time and enjoy greater periodontal health than those who do not receive such care.¹⁸ Recent reports show that the absence of maintenance following periodontal treatment is significantly associated with higher rates of progression of periodontitis and TL.¹⁹⁻²⁰ TMP is a critical factor in successfully controlling PD and maintaining a functional dentition during life.²¹

A classic problem faced during PMT is patients compliance.²² Studies have shown low rates of regular compliance and adherence to PMT,^{23,24} however, the individual risk of recurrence of PD should be assessed to establish these maintenance intervals.²⁴ Several studies have confirmed that individual risk factors and disease severity are a determinant in establishing the time interval among the PMT recalls.^{24,25} Although the ideal time interval remains controversial, for most patients a 3-month interval is believed to be effective in maintaining established gingival health.¹⁷

Thus, the influence and presence of different risk factors have been proposed as determinants of the adhesion pattern during PMT.²⁴ In this sense, PMT programs should make efforts to stabilize the periodontal tissues and minimize the occurrence of additional TL over time. Nevertheless, there is a shortage of prospective studies addressing the direct influence of cooperation and adherence to PMT and its real contribution to stopping periodontitis progression, hence minimizing TL, especially in periodontally susceptible individuals.²¹

Low dental mortality rate following active treatment combined with the PMT program has been demonstrated.^{19,26} In addition, it has been shown that uncooperative individuals are at 5 to 6 times higher risk

of TL than regular patients.

After 19.1 years (range: 15 to 25; SD-2.8) of maintenance therapy, a recent study²⁷ reassessed 219 compliant patients (92 males and 129 females) undergoing periodontal maintenance therapy. All the 219 patients correspond to a total of 4,192 maintenance years. As a result: 184 patients underwent periodontal retreatment; 145 patients were described as stable (losing 0 to 3 teeth); 54 worsened (losing 4 to 6 teeth); and 21 were described as having declined extremely (losing >6 teeth). Therefore, the rate of tooth loss for patients who leave the periodontal maintenance program is high and in agreement with previous reports^{19,20,28}

It has been confirmed that active periodontal therapy (APT) without PMT may predispose individuals to lose more teeth compared to those who undergo PMT.²¹ In addition to that, periodontal maintenance programs in academic and private practices has been proved to stabilize the periodontal condition obtained after APT. Moreover, it has been demonstrated that PMT can control and/or minimize the action of risk predictors for the progression of periodontitis, reinforcing that PMT is of great importance since it prevents the progression of PD and preserves the dentition of treated individuals.^{22,29}

A systematic review has shown that patients treated for periodontitis can maintain their dentition with limited variations in periodontal parameters when regularly complying with a PMT regimen based on a mechanical routine and professional plaque removal.³⁰ Not only does the appointment compliance of a patient reflect the PMT frequency, but it is also associated with many clinical parameters, including residual deep probing depth, bleeding on probing, and plaque index. In another systematic review,²⁶ it has argued that several studies have demonstrated that relatively more compliant patients had a lower plaque index, which is a main parameter when evaluating a patient's compliance with oral hygiene instruction.

Patients who regularly comply may be more aware of the importance of oral hygiene and periodontal health than those who erratically comply. Therefore, the periodontal condition in compliant patients is well controlled by themselves and dentists. In other words,

the PMT compliance effect on preventing tooth loss could benefit from both the treatment efficacy and the established self-discipline in maintaining oral hygiene.^{4,26}

Tooth Loss

TL is one of the most visible results of PD evolution, physiologically and psychologically impacting the individuals. As previously reported, longitudinal studies have proved the effectiveness of periodontal therapy and PMT in preventing the recurrence of PD, maintaining gingival health and preventing TL.^{3,21,23,24,31}

Periodontitis has been identified as one of the main causes of dental mortality after 45 years of age and is also related to strong negative impacts on the quality of life of periodontally susceptible individuals.²³

A study² to determine the prevalence of TL and dental diseases associated with tooth loss during APT and PMT has shown that 46% of the individuals received tooth extractions as part of APT and 41% during PMT. Tooth loss was the only condition observed in 57% of the extracted teeth, concluding that the treatment provided was effective in the long-term maintenance of those individuals dentition, and also that advanced periodontitis was the main cause of TL in that population. Alternative studies^{21,32,33} corroborate such finding, indicating that the major reason for TL in the PMT program was PD. Furthermore, it has been concluded²¹ that the chances of TL are five times greater in individuals whose 10% of the sites reached probing depth of 4-6mm.

Patients who regular cooperate with PMT have been proved²⁴ to have significantly lower rates of TL compared to irregular cooperators. Consequently, the number of teeth lost due to periodontal reasons was significantly higher than due to other reasons in all subjects. A more recent systematic review evaluating TL in retrospective observational studies conducted in periodontal maintenance patients³⁵ has reported a low prevalence of TL in compliant individuals (9.5% of a total of 41,404 teeth). Additionally, it identified periodontitis recurrence as the main reason for tooth loss during a follow-up, with 2,488 from 3,919 teeth (63.5%) being lost as a consequence of periodontal issues during PMT.

Furthermore, it has been concluded that TL is one of

the most visible results of the evolution of periodontitis, causing psychological and physiological impacts on an individual's life.³⁴

A recent review of the literature regarding the relationship between retention of teeth and oral health-related quality of life (OHRQoL) and the extent to which tooth retention can ensure OHRQoL among adults, investigated studies that assessed the relationship between number of teeth and OHRQoL. The main findings included that a significant association between number of teeth and OHRQoL was shown in most of the reviewed studies; the number of occluding pairs and the location of remaining teeth have great impacts on OHRQoL; having fewer anterior occluding pairs had a greater negative impact on aesthetics and thus affected OHRQoL. As a conclusion, the review found evidence that retention of teeth is associated with better OHRQoL, which is in agreement with the negative impact tooth loss has on OHRQoL.³⁶

Quality of life

Decades ago, studies into the impact of periodontitis and conditions of other oral diseases were characterized only by the use of clinical parameters. None of the studies encompassed social indicators to assess the impact of oral diseases on individual's QoL. Thus, the use of social indicators in studies has been proposed, contemplating the incorporation of the consequences from oral conditions on individuals and the functional, psychological and social impacts of these.³⁷

The WHO concept of health embraces biopsychosocial factors.¹⁰ In this way, such concept is recognized as a valid and desired parameter for the evaluation of the individual in the medical field, oral health included.

Oral diseases such as periodontitis and subjective mouth symptoms (pain and dental mobility) may have a negative effect on an individual's well-being and on their QoL. Studies have shown a significant association between oral health and its relationship with quality of life, especially in patients with periodontitis.^{7,8}

A recent systematic review aimed to verify whether oral conditions (tooth loss, periodontal disease, dental caries) are negatively associated with health-related quality of life (HRQoL) in adults. HRQoL was investigated as the outcome, and tooth loss, periodontal

diseases, and dental caries were exposures considered. Twenty-one studies were included (20 studies were cross-sectional designs, while one was a case-control study). Case definitions of the exposures were different across the studies. Ten of 16 studies reported a negative impact of tooth loss on HRQoL. Four of seven studies reported that periodontal disease impairs HRQoL, and one study showed that periodontal disease is positively associated with HRQoL. All studies that assessed dental caries reported a negative association between this condition and HRQoL. Despite the different definitions and measures of tooth loss and dental caries, the majority of the available evidence reported a negative impact of these conditions on HRQoL. Mixed and inconclusive findings were observed for the association between periodontal disease and HRQoL.³⁸

In a recent cross-sectional study, conducted with 512 pregnant women in Shanghai, China, the participants were clinically examined in terms of tooth loss, periodontal health status, and OHRQoL (assessed using the Chinese version of the short form of OHIP-14). As a result, pregnant women at different trimesters of pregnancy experienced a similar impact of oral disease on their OHRQoL. The negative oral impacts experienced by women were mainly regarding functional limitation and physical pain. However, this study showed no impact of OHRQoL by their periodontal health status, in the fully adjusted models. Their OHRQoL was associated with early pregnancy, utilization of dental services, age and tooth loss.³⁹

The impact of oral health on the QoL of a group of individuals undergoing periodontal treatment has been assessed.⁵ The oral health has a considerable effect on QoL and several individuals experienced drawbacks in physical, social and psychological aspects of QoL showing that periodontal conditions negatively affect QoL, which has also been shown by other studies.^{6,7}

Additionally, a study found⁴ that lower QoL indexes are correlated with the number of teeth with probing depth of 5mm or more, concluding that individuals in APT had worse QoL related to oral health in comparison with the PMT group. Yet showing this relationship between periodontitis and quality of life, another study has found a statistically significant

association between the degree of periodontitis and QoL indexes. It also concluded that lower levels of QoL were more prevalent in individuals with severe chronic periodontitis, a fact that illustrates the patients' self-perception of oral health.

The oral health effects among cooperating (C) and non-cooperating individuals (NC) in PMT and their correlations with personality traits using the OIDP instrument and the Revised NEO Five Factors Personality Inventory (NEO FFI-R), respectively, has been assessed.³⁷ The neuroticism factor refers to the chronic level of emotional adjustment and instability. High neuroticism identifies individuals prone to psychological suffering and those who may present high levels of anxiety, depression, hostility, vulnerability, self-criticism, and impulsivity.⁴⁰

As a result, the periodontal status of Cs was significantly better than that of NCs. NCs had higher OIDP scores compared to Cs. Higher scores of neuroticism and conscientiousness were associated with higher OIDP scores among Cs, whereas for NCs, lower neuroticism scores, greater openness and extraversion were associated with higher OIDP scores. Thus, it was concluded that personality traits, mainly neuroticism, showed a significant influence on OIDP in PMT patients.

As a result, personal characteristics assessment may be important to predict the behavior of an individual and may influence the choice and adherence to specific treatment. Psychological factors and personality traits may play an important role in the limit of QoL related to dental treatment^{31,33} and therefore should be considered.

Instruments that measure the quality of life

Most QoL indicators have the form of questionnaires composed of questions aimed at assessing, through organized responses, how health conditions affect psychological, social and physical aspects of people's lives.⁴³

The evaluation of this impact has been effective in obtaining the individuals' reports, and, mainly, in determining which activities are the most affected by periodontitis, as well as in which of these activities the periodontal treatment has the greatest positive or negative effect.⁵ The subjective assessment of OHRQoL reflects how people feel when eating, sleeping and engaging in social

interactions, their self-esteem, and their satisfaction with their oral health".⁴⁴ The questionnaires' analysis allows a shift in the assessment criteria (from the traditional to a new one) and in the care that focuses on social, emotional, functional and physical experience, helping to determine the appropriate treatment's goals and outcomes.⁴¹

The evaluation of OHRQoL is done through several instruments. However, the most widely used instruments to assess the impact of oral health and dental loss on adult's quality of life, are the OHIP^{11,12} and the OIDP.^{13,14}

A recent cross-sectional study recruited 264 patients attending two dental clinics, aiming to compare the psychometric properties of the OHIP-14 and OIDP measures in adult patients in Nigeria. As a result, the majority (61.0%) rated their oral health status poorly and 203 (76.9%) perceived a need for treatment. Also, both instruments showed a high index of validity and reliability; both had similar face and content validity, however, OIDP had better criterion validity while OHIP-14 had better construct validity and internal consistency.

The authors concluded that both OHIP-14 and OIDP are precise, valid and reliable for evaluation of OHRQoL where dental care is treatment-need driven. They are able to discriminate between groups according to their perception of oral health status, but with OIDP detecting fewer impacts on daily activities.⁴⁵

OHIP instrument

The Oral Health Impact Profile (OHIP) has been developed as an indicator of a perceived need to improve the understanding of some behaviors toward oral health, measuring discomfort, dysfunction and the noticeable impact of oral diseases on the individuals' daily activities, as a complement to traditional epidemiological indicators.¹¹

The OHIP-14, developed from the original OHIP, consists of a reduced questionnaire with 14 questions, containing 49 items.⁴⁶ Such questionnaire is effective in determining clinical and sociodemographic variation patterns equal to those observed using the 49 questions.

The OHIP-14 has been used in several studies⁴⁶⁻⁴⁹ with the purpose of evaluating whether PD compromises QoL⁴⁷ in order to evaluate the impact of TL on quality of life⁴⁸ and the effect of periodontitis on the masticatory performance of individuals with PD.⁴⁹

As result, it concluded as follows: diabetics with

mild, moderate and advanced periodontitis have their QoL considerably more impacted than those who are periodontally healthy or only have gingivitis,⁴⁶ TL implies negative impacts on quality of life⁴⁷ and loss of periodontal support structures has negative effects on masticatory performance and QoL, especially with regard to physical pain, psychological discomfort and physical incapacity.^{48,49}

The OHRQoL, following the OHIP-14 framework, has also been applied to an elderly population with general health-related pain problems.⁴⁹ Such study has demonstrated that elderly people with pain issues have considerable low general and oral health-related quality of life. In addition, it showed that health professionals should be aware that oral health problems can contribute to low QoL and a greater emphasis should be placed on the provision of oral care.

OIDP instrument

The Oral Impact on Daily Performance (OIDP) instrument is based on the International Classification of Functioning, Disability and Health as proposed by the WHO refers to functional, psychological and social performance.⁵⁰ Measuring behavioral impacts on daily performance with ease, measuring the individual's well-being, and being an objective instrument easy to understand and apply to the individual's interview,⁵⁰ are the major advantages of the OIDP. The oral problems and the symptoms experienced as the drivers of impact are questioned in the OIDP, and thus related to the clinical condition, which makes it more consistent to be used in the assessment of dental treatment needs.⁵⁰

The relationship among QoL, oral health and clinical measures in an elderly population has been investigated,⁵¹ concluding that the clinical indicators of oral health status are significantly related to OHRQoL measurements.

Estimations of the oral impact prevalence in daily performance during pregnancy has documented how the periodontal condition, TL and reported periodontal problems relates to oral impact.⁵² It was also been concluded

that a substantial proportion of pregnant women had oral impacts due to TL in addition to periodontal problems. Moreover, the OIDP demonstrated discriminant validity for identifying women with clinical evidence of TL and that self-reported symptoms of periodontitis showed a significant relationship with the OIDP. Having established the relationship between the aspects related to the number of teeth present within the buccal cavity and its impact on daily performance, 16% of the respondents had at least one daily activity affected,⁵² and about 59% of adults were unsatisfied with their oral health.⁵³

In addition, it has been demonstrated⁵⁴ that the individuals treated for both planing and root scaling per quadrant and full-mouth disinfection, showed improvement in all periodontal clinical parameters and oral health with regard to quality of life, without significant differences between the treatment groups.

CONCLUSION.

This narrative review concluded that: (1) periodontitis is one of the main causes for tooth loss; (2) both periodontitis and tooth loss generate negative impacts on the self-reported oral quality of life of adults; (3) MPT is crucial to avoid the evolution of periodontal diseases and tooth loss as well as reducing its negative impact on self-reported quality of life; (4) among the various quality of life research instruments, OHIP-14 and OIDP have proved to be adequate to measure and validate the impacts of tooth loss and periodontal diseases on individuals' quality of life, however (5) specific instruments for such kinds of measurements in periodontics are still needed; (6) finally, not only is the study and comprehension of the oral health impact on quality of life important for dental surgeons to better understand the social and emotional aspects of oral health, but it is also important for these professionals to be more attentive and aware of the population's needs by individualizing the treatment according to equity principles aimed at, a better quality of life.

REFERENCES.

1. American Academy of Periodontology.(AAP). Parameter on chronic periodontitis with slight to moderate loss of periodontal support. American Academy of Periodontology. J Periodontol. 2000;71(5 Suppl):853-5.
2. Tonetti MS, Steffen P, Muller-Campanile V, Suvan J, Lang

- NP. Initial extractions and tooth loss during supportive care in a periodontal population seeking comprehensive care. J Clin Periodontol. 2000;27(11):824-31.
3. Axelsson P, Nyström B, Lindhe J. The long-term effect of a plaque control program on tooth mortality, caries and periodontal

- disease in adults. Results after 30 years of maintenance. *J Clin Periodontol.* 2004;31(9):749–57.
4. Manresa C, Sanz-Miralles EC, Twigg J, Bravo M. Supportive periodontal therapy (SPT) for maintaining the dentition in adults treated for periodontitis. *Cochrane Database Syst Rev.* 2018;1(1):CD009376.
 5. Needleman I, McGrath C, Floyd P, Biddle A. Impact of oral health on the life quality of periodontal patients. *J Clin Periodontol.* 2004;31(6):454–7.
 6. Cunha-Cruz J, Hujuel PP, Kressin NR. Oral health-related quality of life of periodontal patients. *J Periodontol Res.* 2007;42(2):169–76.
 7. Lopes MWF, Gusmão ES, Alves RV, Cimões R. The impact of chronic periodontitis on quality of life in Brazilian subjects. *Acta Stomatol Croat.* 2009;43(2):89–98.
 8. Ferreira MC, Dias-Pereira AC, Branco-de-Almeida LS, Martins CC, Paiva SM. Impact of periodontal disease on quality of life: a systematic review. *J Periodontol Res.* 2017;52(4):651–65.
 9. Cortelli SC, Costa FO, Gargioni-Filho A, Aquino DR, Cota LOM, Scherma AP, Miranda TB, Cortelli JR. Impact of gingivitis treatment for diabetic patients on quality of life related to periodontal objective parameters: A randomized controlled clinical trial. *Arch Oral Biol.* 2018;86:80–6.
 10. World Health Organization. Constitution of the World Health Organization -Basic Documents- Forty-fifth edition, Supplement; October 2006; United Nations.
 11. Slade GD, Spencer AJ. Development and evaluation of the Oral Health Impact Profile. *Community Dent Health.* 1994;11(1):3–11.
 12. Oliveira BH, Nadanovsky P. Psychometric properties of the Brazilian version of the Oral Health Impact Profile-short form. *Community Dent Oral Epidemiol.* 2005;33(4):307–14.
 13. Melas F, Marcenis W, Wright PS. Oral health impact on daily performance in patients with implant-stabilized overdentures and patients with conventional complete dentures. *Int J Oral Maxillofac Implants.* 2001;16(5):700–12.
 14. Tsakos G, Bernabé E, D' Aiuto F, Pikhart H, Tonetti M, Sheiham A, Donos N. Assessing the minimally important difference in the oral impact on daily performances index in patients treated for periodontitis. *J Clin Periodontol.* 2010;37(10):903–9.
 15. Fisher S, Kells L, Picard JP, Gelskey SC, Singer DL, Lix L, Scott DA. Progression of periodontal disease in a maintenance population of smokers and non-smokers: a 3-year longitudinal study. *J Periodontol.* 2008;79(3):461–8.
 16. Borrell LN, Burt BA, Warren RC, Neighbors HW. The role of individual and neighborhood social factors on periodontitis: the third National Health and Nutrition Examination Survey. *J Periodontol.* 2006;77(3):444–53.
 17. American Academy of Periodontology. Parameter on periodontal maintenance. *J Periodontol.* 2000;71(5 Suppl):849–50.
 18. Wilson TG Jr, Hale S, Temple R. The results of efforts to improve compliance with supportive periodontal treatment in a private practice. *J Periodontol.* 1993;64(4):311–4.
 19. Checchi L, Montevecchi M, Gatto MR, Trombelli L. Retrospective study of tooth loss in 92 treated periodontal patients. *J Clin Periodontol.* 2002;29(7):651–6.
 20. Ng MC, Ong MM, Lim LP, Koh CG, Chan YH. Tooth loss in compliant and non-compliant periodontally treated patients: 7 years after active periodontal therapy. *J Clin Periodontol.* 2011;38(5):499–508.
 21. Lorentz TC, Cota LO, Cortelli JR, Vargas AM, Costa FO. Prospective study of complier individuals under periodontal maintenance therapy: analysis of clinical periodontal parameters, risk predictors and the progression of periodontitis. *J Clin Periodontol.* 2009;36(1):58–67.
 22. Shah R, Thomas R, Bhandari S, Mehta DS. Influence of various factors on patient compliance after periodontal therapy: A pilot study. *J Indian Soc Periodontol.* 2017;21(1):50–4.
 23. Costa FO, Cota LO, Lages EJ, Lima Oliveira AP, Cortelli SC, Cortelli JR, Lorentz TC, Costa JE. Periodontal risk assessment model in a sample of regular and irregular compliers under maintenance therapy: a 3-year prospective study. *J Periodontol.* 2012;83(3):292–300.
 24. Lorentz TC, Cota LO, Cortelli JR, Vargas AM, Costa FO. Tooth loss in individuals under periodontal maintenance therapy: prospective study. *Braz Oral Res.* 2010;24(2):231–7.
 25. Costa FO, Lages EJ, Cota LO, Lorentz TC, Soares RV, Cortelli JR. Tooth loss in individuals under periodontal maintenance therapy: 5-year prospective study. *J Periodontol Res.* 2014;49(1):121–8.
 26. Lee CT, Huang HY, Sun TC, Karimbux N. Impact of Patient Compliance on Tooth Loss during Supportive Periodontal Therapy: A Systematic Review and Meta-analysis. *J Dent Res.* 2015;94(6):777–86.
 27. Fardal Ø, Fardal P, Persson GR. Periodontal and general health in long-term periodontal maintenance patients treated in a Norwegian private practice: a descriptive report from a compliant and partially compliant survivor population. *J Periodontol.* 2013;84(10):1374–81.
 28. Fardal Ø, Grytten J. Applying quality assurance in real time to compliant long-term periodontal maintenance patients utilizing cost-effectiveness and cost utility. *J Clin Periodontol.* 2014;41(6):604–11.
 29. Costa FO, Santuchi CC, Lages EJ, Cota LO, Cortelli SC, Cortelli JR, Lorentz TC, Costa JE. Prospective study in periodontal maintenance therapy: comparative analysis between academic and private practices. *J Periodontol.* 2012;83(3):301–11.
 30. Trombelli L, Franceschetti G, Farina R. Effect of professional mechanical plaque removal performed on a long-term, routine basis in the secondary prevention of periodontitis: a systematic review. *J Clin Periodontol.* 2015;42(Suppl 16):S221–36.
 31. Wu D, Yang HJ, Zhang Y, Li XE, Jia YR, Wang CM. Prediction of loss to follow-up in long-term supportive periodontal therapy in patients with chronic periodontitis. *PLoS One.* 2018;13(2):e0192221.
 32. Martinez-Canut P. Predictors of tooth loss due to periodontal disease in patients following long-term periodontal maintenance. *J Clin Periodontol.* 2015;42(12):1115–25.
 33. Kim SY, Lee JK, Chang BS, Um HS. Effect of supportive periodontal therapy on the prevention of tooth loss in Korean adults. *J Periodontol Implant Sci.* 2014;44(2):65–70.
 34. Wang TF, Fang CH, Hsiao KJ, Chou C. Effect of a comprehensive plan for periodontal disease care on oral health-related quality of life in patients with periodontal disease in Taiwan. *Medicine.* 2018;97(5):e9749.
 35. Chambrone L, Chambrone D, Lima LA, Chambrone LA. Predictors of tooth loss during long-term periodontal maintenance: a systematic review of observational studies. *J Clin Periodontol.* 2010;37(7):675–84.
 36. Tan H, Peres KG, Peres MA. Retention of Teeth and Oral Health-Related Quality of Life. *J Dent Res.* 2016;95(12):1350–7.
 37. Al-Harathi LS, Cullinan MP, Leichter JW, Thomson WM. The impact of periodontitis on oral health-related quality of life: a review of the evidence from observational studies. *Aust Dent J.* 2013;58(3):274–7.
 38. Haag DG, Peres KG, Balasubramanian M, Brennan DS. Oral Conditions and Health-Related Quality of Life: A Systematic Review. *J Dent Res.* 2017;96(8):864–74.
 39. Lu HX, Xu W, Wong MC, Wei TY, Feng XP. Impact of periodontal conditions on the quality of life of pregnant women: a cross-sectional study. *Health Qual Life Outcomes.* 2015;13:67.
 40. Costa FO, Miranda Cota LO, Pereira Lages EJ, Vilela Câmara GC, Cortelli SC, Cortelli JR, Costa JE, Medeiros Lorentz TC. Oral impact on daily performance, personality traits, and compliance in periodontal maintenance therapy. *J Periodontol.* 2011;82(8):1146–54.

41. Ferreira MC, Dias-Pereira AC, Branco-de-Almeida LS, Martins CC, Paiva SM. Impact of periodontal disease on quality of life: a systematic review. *J Periodontol Res.* 2017;52(4):651–65.
42. Wallander JL, Schmitt M, Koot HM. Quality of life measurement in children and adolescents: issues, instruments, and applications. *J Clin Psychol.* 2001;57(4):571–85.
43. U.S. Department of Health and Human Services. Oral Health in America: A Report of the Surgeon General. Rockville, MD: United States: Department of Health and Human Services, National Institute of Dental and Craniofacial Research, National Institutes of Health; 2000.
44. Slade GD. Derivation and validation of a short-form oral health impact profile. *Community Dent Oral Epidemiol.* 1997;25(4):284–90.
45. Lawal FB, Taiwo JO, Arowojolu MO. Comparison of two oral health-related quality of life measures among adult dental patients. *Oral Health Prev Dent.* 2015;13(1):65–74.
46. Drumond-Santana T, Costa FO, Zenóbio EG, Soares RV, Santana TD. [Impact of periodontal disease on quality of life for dentate diabetics]. *Cad Saude Publica.* 2007;23(3):637–44.
47. Silva ME, Villaça EL, Magalhães CS, Ferreira EF. [Impact of tooth loss in quality of life]. *Cien Saude Colet.* 2010;15(3):841–50.
48. Borges Tde F, Regalo SC, Taba M Jr, Siéssere S, Mestriner W Jr, Semprini M. Changes in masticatory performance and quality of life in individuals with chronic periodontitis. *J Periodontol.* 2013;84(3):325–31.
49. Ostberg AL, Hall-Lord ML. Oral health-related quality of life in older Swedish people with pain problems. *Scand J Caring Sci.* 2011;25(3):510–6.
50. Adulyanon S, Sheiham A. A new socio-dental indicator of oral impacts on daily performances. *J Dent Res.* 1996;75:1711.
51. Tsakos G, Marcenes W, Sheiham A. The relationship between clinical dental status and oral impacts in an elderly population. *Oral Health Prev Dent.* 2004;2(3):211–20.
52. Wandera MN, Engebretsen IM, Rwenyonyi CM, Tumwine J, Astrøm AN, PROMISE-EBF Study Group. Periodontal status, tooth loss and self-reported periodontal problems effects on oral impacts on daily performances, OIDP, in pregnant women in Uganda: a cross-sectional study. *Health Qual Life Outcomes.* 2009;7:89.
53. Chalub LLFH, Ferreira RC, Vargas AMD. Influence of functional dentition on satisfaction with oral health and impacts on daily performance among Brazilian adults: a population-based cross-sectional study. *BMC Oral Health.* 2017;17(1):112.
54. Santuchi CC, Cortelli JR, Cortelli SC, Cota LO, Fonseca DC, Alencar CO, Costa FO. Scaling and Root Planing per Quadrant Versus One-Stage Full-Mouth Disinfection: Assessment of the Impact of Chronic Periodontitis Treatment on Quality of Life--A Clinical Randomized, Controlled Trial. *J Periodontol.* 2016;87(2):114–23.