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# Periodontal disease and its impact in Latin America

**Giuseppe Alexandre ROMITO**

LAOHA President

Following the example of work done by some dental associations around the world, in which meetings of opinion leaders in the field are promoted to discuss and establish parameters related to some condition or treatment in the area of dentistry,[1] the *Latin American Oral Health Association* (LAOHA), which is supported by Colgate-Palmolive, promoted the first Workshop on Periodontal Conditions in the Latin-American and Caribbean Region, in 2019.

This initiative assembled professionals and opinion leaders of the academic area, class and specialty associations and government agencies. The discussion involved topics such as Prevention, Diagnosis, Treatment Plans and Epidemiological data of Latin America. Resulting from this debate, a Consensus was structured, which we have the privilege of publishing as a special supplement in Brazilian Oral Research.

The importance of this type of initiative is to bring to light scientific data and guidance with respect to a certain geographical area, because although we live in a globalized world, as far as conditions of health are concerned, regional particularities related to socio-cultural conditions are important, as they enable patients to be envisioned within their social context, which may have a direct impact on their condition of health and disease.

Disclosure of this Consensus throughout the Latin American and Caribbean region is fundamental to enable the professionals who work at whatever level, ranging from the private clinic through to government agencies, to understand the reality of periodontal conditions. As a result, they will be able to promote changes in public health, by basing their decision making on the most up-to-date data of existent scientific evidence.

**Declaration of Interests:** The authors certify that they have no commercial or associative interest that represents a conflict of interest in connection with the manuscript.

## References

1. Chapple ILC, Mealey BL, Van Dyje TE, Bartold PM, Dommisch H, Eickholz P, et al. Periodontal health and gingival diseases and conditions on an intact and a reduced periodontium: Consensus report of workgroup 1 of the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions. J Clin Periodontol. 2018;89(Suppl 1):S74-84. https://doi.org/10.1002/JPER.17-0719

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# Periodontal disease and its impact on general health in Latin America. Section I: Introduction part I

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**Abstract:** A high level of general and oral health are invaluable assets, a factor not always considered a basic human right for their better life quality. The mouth is a critical point of contact with the external environment, which is established when we talk, chew, swallow and when food digestion begins. From a perspective of the human condition, the mouth is crucial for the integration of sound, social appearance of the individual, and is one of the fundamental components of overall health. Therefore, not having an adequate level of oral health affects self-esteem, quality of life and people's general well-being.

**Keywords:** Global Burden of Disease; Periodontal Diseases; Public Health.

## Introduction

Periodontal disease is a public health problem, socially determined and major cause of tooth decay, leading to greater impact on the quality of life of people, exacerbated by their association with chronic non-communicable diseases (NCD). Periodontal treatment and traditional actions of promotion and prevention carried out in the dental unit not enough to control of periodontal diseases and access to health care systems is unfair, which reinforces health inequities and maintains the current situation of oral diseases around the world.

In oral epidemiology, understanding the causal association between lifestyle practices such as oral hygiene, smoking or diet, and caries, erosion and periodontal disease, does not explain why individuals and communities choose to engage in such practices and the historical dimension of such behavior and its change over time.[1]

The WHO Commission on Social Determinants in Health established by the Organization in 2006 complements this work for equity in health through support to countries and global health partners to address the social factors leading to ill health and inequities and lack of access to health services. The commission initiative also incorporates analysis of the social determinants in oral health.[2]

## Oral diseases as a public health problem and the global burden.

A high level of general and oral health is an invaluable asset, a factor not always considered a fundamental human right for a better life quality

for the individuals.[3] From a perspective of the human condition, the mouth is crucial for the integration of sound, social appearance of the individual, and is one of the fundamental components of overall health.[4] Therefore, not having an adequate level of oral health affects self-esteem, quality of life and people's general well-being.[3]

Oral diseases (caries and periodontal diseases, such as gingivitis and periodontitis) are now recognized as being both an epidemic and one of the most important public health problems in the world.[1] In 2015, 3,500 million people were suffering from untreated dental conditions; 2,500 million people with untreated decay in permanent teeth; 573 million children with untreated decay in temporary teeth; 538 million people with severe periodontitis; and 276 million people with total loss of teeth.[6,7] We also know that as populations continue to age, the number of people affected by periodontal diseases will increase even further,[7] and their prevalence will be concentrated on the most vulnerable groups (and segments of society), thus becoming a significant source of social inequality.[8]

A significant contribution made by the Global Burden of Disease (GBD) study was to develop the Disability-Adjusted Life Year (DALY) for use as an indicator in cost-effectiveness studies.[9] The DALYs represent the years of life lost due to death or disability. Interestingly, in the 2015 GBD report, it was stated that during the 25-year period 1990-2015, there was minimal change among the 10 most critical diseases causing impairment or death, except for one significant point: the rise in oral disease caused it to be ranked among the 10 most important diseases causing disability in the world.[10]

## Periodontitis as a chronic non-communicable disease and impact on health

Periodontitis is now considered a chronic non-communicable disease (NCD), among others such as cardiovascular disease, diabetes, cancer and chronic respiratory diseases, since all of them share the same social determinants and risk factors of NCD, which in turn are responsible for about two-thirds of world's deaths.[4,11] Smoking, obesity and malnutrition (both in terms of caloric intake and quality of nutritional components) hyperglycemia (with or without diabetes) and physical inactivity have been associated with an increased risk of periodontitis, among others.[12] Clinical studies have shown the effects of periodontal treatment on the reduction of systemic inflammation, improvement in biomarker levels of cardiovascular disease and endothelial function, and decrease in blood glucose levels in patients with type 2 diabetes mellitus.[13] The close relationship between periodontitis and systemic diseases results in exacerbation of the inflammatory response with an altered immune response.[14] There are close to 57 systemic conditions with presumed possibility of being associated with periodontal diseases, confirming that the associations are established via a common pathogenic mechanism.[15]

In 2010, worldwide treatment costs were estimated at US $298 billion, an average of 4.6% of the global health expenditure.[16] In the European Union, annual expenditure on oral disease treatments was approximately €79 billion (annual average expenditure 2008-2012) and if this trend continues, this figure could rise to 93 billion by 2020. These costs (€ 79.0 B) outweigh the costs incurred in the treatment of neuromuscular diseases (€ 7.7 B), multiple sclerosis (€ 14.6 B), cancer (€ 51.0 B), respiratory diseases (€ 55.0 B) and Alzheimer's disease (71.1 million euros).[17] In addition to significant financial implications both for the Government and individuals, there are other costs affecting the population and incumbent on the government, considering the time lost at school and at work.[12,18,19]

## Proposal for comprehensive intervention in periodontal diseases

This type of intervention requires a conceptual change towards the type in which social determinants underlying oral health have greater explanatory value.[20] These determinants, defined as the conditions in which people are born, grow, live, work and grow old, are currently understood as "causes of the causes" of health events and include various structural factors, such as income and education. This proposal sets

forth that people's lives are affected not only by their personal characteristics but also by characteristics of the social groups to which they belong, which would determine the effects of attributes at the individual level. These could be the result of norms, values and beliefs that prevail in the social context of people or certain characteristics of the physical environments in which they live.[21] Therefore, to be able to study the characteristics "of a population" or "of a grouping area", a geographical or territorial approach is made, based on the individuals' place of residence, such as the neighborhood, commune, region or country, or based on the location of the dwelling (i.e., in an urban or a rural area). This approach assumes that individuals who live in the same geographic area share a series of socioeconomic, environmental, and cultural variables and a socio-political context.[22,23]

## Current global trends: The European Federation of Periodontology call to action

Periodontitis is a disease that can be often prevented and usually easily diagnosed; it can be successfully treated and controlled in the long term, provided that appropriate care is taken by the patient and dentist. In the contemporary scenario, there are diverse cultural and socio-economic obstacles hindering professional dental care for the population and the development of preventive approaches.[8] Our proposal is aligned with the call for action from the European Federation of Periodontology, with a comprehensive intervention plan that aims to improve periodontal and general health. This includes the participation of dental surgeons, dental specialists, physicians, educators, teachers, technical health teams, institutions that hire professionals as well as the same target population, with strategies for the health promotion, diagnosis and treatment of periodontal diseases.[24]

## Opportunities in prevention, diagnosis and treatment of periodontal diseases.

The European Federation of Periodontology proposes to identify preventive programs to be developed on a large scale, with specific actions for the purpose of reducing the prevalence of periodontal diseases.[25] We must work on the effective management of gingivitis by promoting healthy lifestyles at both population and individual levels.[26] This can be achieved through: (i) professional instruction for effective oral hygiene, such as tooth brushing and interdental cleaning, and (ii) an integrated and population-based approach to health education, supported by a common approach to risk factors.[27] A critical element is that through the diagnosis and development of risk profiles, prevention must be tailored to the needs of each individual. We emphasize that all individuals should play a proactive role in raising awareness of their oral health, self-care measures, health promotion and disease prevention, for optimal oral and general health during the course of their lives and develop strategies for oral hygiene that would be considered a healthy lifestyle by WHO and other organizations.

Only oral health public policies, based on evidence, with adequate financial support, with specific laws and rules, will be able to reverse the current epidemiological indicators of oral health, always considering aspects like comprehensive care, quality of life, health promotions and preventions of diseases.[28,29] Organizations such as World Health Organization (WHO) and Pan-American Health Organization (PAHO) can be important agents of change in practice and can inspire policymakers and stakeholders to take decisions to build public policies that address oral health in the context of the general health of individuals and populations.

## Conclusions

Periodontitis is a chronic non-communicable disease with impact on health and quality of life. Periodontitis and gingivitis are diseases socially determined. Therefore, only public policies, focused on health equity and comprehensive care will be able to modify the epidemiological indicators.

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Consensus", promoted by the Latin American Oral Health Association (LAOHA) and Colgate Palmolive Co., with participation of experts from the region, including representatives of the Periodontal Societies of Latin America. All participants had the opportunity to review the content, and eventually make their own contributions. Consensus Report was based on this paper. The author (JG) was supported by a grant provided by the Fondef I+D, NºID18I10034. The authors point out that they have no conflicts of interest.

## References


1. Popay J, Williams G, Thomas C, Gatrell A. Theorising inequalities in health. Sociol Health Illn. 1998;20(5):619-44. https://doi.org/10.1111/1467-9566.00122
2. Petersen PE. Challenges to improvement of oral health in the 21st century: the approach of the WHO Global Oral Health Programme. Int Dent J. 2004 Dec;54(6 Suppl 1):329-43. https://doi.org/10.1111/j.1875-595X.2004.tb00009.x
3. Glick M, Silva OM, Seeberger GK, Xu T, Pucca G, Williams DM, et al. FDI Vision 2020: shaping the future of oral health. Int Dent J. 2012 Dec;62(6):278-91. https://doi.org/10.1111/idj.12009
4. United-Nations. General Assembly. Political declaration of the high-level meeting of the general assembly on the prevention and control of non-communicable diseases. 19 Sep 2011 [cited 2012 Jan 24]. Available from: https://www.who.int/nmh/events/un_ncd_summit2011/political_declaration_en.pdf
5. FDI World Dental Federation. The challenge of oral disease: a call for global action: the oral health atlas. 2nd ed. Brighton: FDI World Dental Federation; 2015.
6. Jin LJ, Lamster IB, Greenspan JS, Pitts NB, Scully C, Warnakulasuriya S. Global burden of oral diseases: emerging concepts, management and interplay with systemic health. Oral Dis. 2016 Oct;22(7):609-19. https://doi.org/10.1111/odi.12428
7. Kassebaum NJ, Smith AG, Bernabé E, Fleming TD, Reynolds AE, Vos T, et al. Global, regional, and national prevalence, incidence, and disability-adjusted life years for oral conditions for 195 countries, 1990-2015: a systematic analysis for the global burden of diseases, injuries, and risk factors. J Dent Res. 2017 Apr;96(4):380-7. https://doi.org/10.1177/0022034517693566
8. Jin LJ, Armitage GC, Klinge B, Lang NP, Tonetti M, Williams RC. Global oral health inequalities: task group—periodontal disease. Adv Dent Res. 2011 May;23(2):221-6. https://doi.org/10.1177/0022034511402080
9. Murray CJ, Lopez AD. Measuring the global burden of disease. N Engl J Med. 2013 Aug;369(5):448-57. https://doi.org/10.1056/NEJMra1201534
10. The L; The Lancet. GBD 2015: from big data to meaningful change. Lancet. 2016 Oct;388(10053):1447. https://doi.org/10.1016/S0140-6736(16)31790-1
11. Jin L. The global call for oral health and general health. Int Dent J. 2013 Dec;63(6):281-2. https://doi.org/10.1111/idj.12085
12. Chapple IL, Bouchard P, Cagetti MG, Campus G, Carra MC, Cocco F, et al. Interaction of lifestyle, behaviour or systemic diseases with dental caries and periodontal diseases: consensus report of group 2 of the joint EFP/ORCA workshop on the boundaries between caries and periodontal diseases. J Clin Periodontol. 2017 Mar;44 Suppl 18:S39-51. https://doi.org/10.1111/jcpe.12685
13. Lalla E, Papapanou PN. Diabetes mellitus and periodontitis: a tale of two common interrelated diseases. Nat Rev Endocrinol. 2011 Jun;7(12):738-48. https://doi.org/10.1038/nrendo.2011.106
14. Loos BG. Periodontal medicine: work in progress! J Clin Periodontol. 2016 Jun;43(6):470-1. https://doi.org/10.1111/jcpe.12550
15. Monsarrat P, Blaizot A, Kémoun P, Ravaud P, Nabet C, Sixou M, et al. Clinical research activity in periodontal medicine: a systematic mapping of trial registers. J Clin Periodontol. 2016 May;43(5):390-400. https://doi.org/10.1111/jcpe.12534
16. Listl S, Galloway J, Mossey PA, Marcenes W. global economic impact of dental diseases. J Dent Res. 2015 Oct;94(10):1355-61. https://doi.org/10.1177/0022034515602879
17. Patel R. The state of oral health in Europe. Report Commissioned by the platform for better oral health in Europe. 2012 [cited 2012 Sep 5]. Available from: http://www.oralhealthplatform.eu/our-work/the-state-of-oral-health-in-europe/
18. Casamassimo PS, Thikkurissy S, Edelstein BL, Maiorini E. Beyond the dmft: the human and economic cost of early childhood caries. J Am Dent Assoc. 2009 Jun;140(6):650-7. https://doi.org/10.14219/jada.archive.2009.0250
19. Chapple IL, Van der Weijden F, Doerfer C, Herrera D, Shapira L, Polak D, et al. Primary prevention of periodontitis: managing gingivitis. J Clin Periodontol. 2015 Apr;42 Suppl 16:S71-6. https://doi.org/10.1111/jcpe.12366
20. Watt RG. From victim blaming to upstream action: tackling the social determinants of oral health inequalities. Community Dent Oral Epidemiol. 2007 Feb;35(1):1-11. https://doi.org/10.1111/j.1600-0528.2007.00348.x
21. Baelum V, Lopez R. Periodontal epidemiology: towards social science or molecular biology? Community Dent Oral Epidemiol. 2004 Aug;32(4):239-49. https://doi.org/10.1111/j.1600-0528.2004.00159.x

22. Celeste RK, Nadanovsky P, Ponce de Leon A, Fritzell J. The individual and contextual pathways between oral health and income inequality in Brazilian adolescents and adults. Soc Sci Med. 2009 Nov;69(10):1468-75. https://doi.org/10.1016/j.socscimed.2009.08.005
23. Espinoza I, Thomson WM, Gamonal J, Arteaga O. Disparities in aspects of oral-health-related quality of life among Chilean adults. Community Dent Oral Epidemiol. 2013 Jun;41(3):242-50. https://doi.org/10.1111/cdoe.12001
24. Tonetti MS, Jepsen S, Jin L, Otomo-Corgel J. Impact of the global burden of periodontal diseases on health, nutrition and wellbeing of mankind: A call for global action. J Clin Periodontol. 2017 May;44(5):456-62. https://doi.org/10.1111/jcpe.12732
25. Tonetti MS, Eickholz P, Loos BG, Papapanou P, Velden U, Armitage G, et al. Principles in prevention of periodontal diseases: consensus report of group 1 of the 11th European Workshop on Periodontology on effective prevention of periodontal and peri-implant diseases. J Clin Periodontol. 2015 Apr;42 Suppl 16:S5-11. https://doi.org/10.1111/jcpe.12368
26. Jepsen S, Blanco J, Buchalla W, Carvalho JC, Dietrich T, Dörfer C, et al. Prevention and control of dental caries and periodontal diseases at individual and population level: consensus report of group 3 of joint EFP/ORCA workshop on the boundaries between caries and periodontal diseases. J Clin Periodontol. 2017 Mar;44 Suppl 18:S85-93. https://doi.org/10.1111/jcpe.12687
27. United-Nations. The 2030 agenda for sustainable development. New York: United-Nations; 2015.
28. Oliveira APC, Dal Poz MR, Craveiro I, Gabriel M, Dussault G. Fatores que influenciaram o processo de formulação de políticas de recursos humanos em saúde no Brasil e em Portugal: estudo de caso múltiplo. Cad Saúde Pública. 2018 Mar;34(2): e00220416. https://doi.org/10.1590/0102-311x00220416
29. Pucca Junior GA, Gabriel M, Araujo ME, Almeida FC. Ten years of a national oral health policy in Brazil: innovation, boldness, and numerous challenges. J Dent Res. 2015 Oct;94(10):1333-7. https://doi.org/10.1177/0022034515599979

# Periodontal disease and its impact on general health in Latin America. Section II: Introduction part II

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**Abstract:** The epidemiological data on gingivitis and periodontitis in Latin America are scarce, as the majority of the Latin American studies have analyzed probing depth instead of clinical attachment loss. Reported data have shown high variations in results between different Latin American countries, with the main causes of these differences being the clinical case definition and methodological strategies used. In general, data have revealed that the prevalence of periodontal disease is higher in Latin Americans than in populations in the USA or Europe. Regarding its relations with other diseases and conditions, some Latin American studies have focused on the association between periodontitis and adverse pregnancy outcomes, or poor glycemic control in diabetic patients; however, these studies have reported controversial results. In Chile, reports have indicated that periodontal treatment significantly reduced the preterm birth rate; however, no association between periodontitis and perinatal outcome was found in Brazil. For diabetes mellitus, Brazilian studies have reported controversial findings; however, a Chilean interventional study reported significant reductions in the glycosylated hemoglobin levels after periodontal treatment. Although epidemiological data for Latin America are scarce, the information available at present is useful for establishing national policies on health promotion, prevention, and treatment of periodontal disease. Therefore, dental schools must play a key role in educating professionals who are highly trained in the promotion, prevention, early diagnosis and treatment of periodontal disease, with an approach to risk, and strong biopsychosocial and ethical components. Thus, future Latin American dentists would be able to face the challenge of decreasing the prevalence of periodontal diseases by leading interdisciplinary health teamwork.

**Keywords:** Periodontal Diseases; Gingivitis; Periodontitis; Epidemiology; Latin America.

## Introduction

Gingivitis is a prevalent type of periodontal disease in subjects of all ages, including children and adolescents. However, epidemiological data on gingivitis are scarce in Latin America, particularly with respect to nationwide representative studies.[1] Furthermore, when gingivitis is

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studied, there are some methodological difficulties, such as the lack of a uniform case definition of gingivitis, a cut-off point to determine its presence, diversity of periodontal indices used, and the use of partial records that could over- or under-estimate the prevalence of the disease.[2] The most frequently used indices are the Community Periodontal Index (CPI) and the Community Periodontal Index of Treatment Needs (CPITN), both corresponding to partial registers proposed by the World Health Organization (WHO).

For periodontitis, most data available for Latin America still rely directly or indirectly on periodontal probing depth estimates. The measurement of periodontal attachment loss allows for estimation of the cumulative periodontal breakdown, while periodontal probing depth ignores the periodontal destruction accompanied by gingival recession or the position of the gingival margin in relation to the size of the periodontal pocket. Therefore, the use of periodontal probing depth estimates leads to controversial information. Several case definitions of periodontitis have been proposed and used[3,4]; for example, during the World Workshop 2017, a single definition of periodontitis was suggested, outlined by either interdental clinical attachment loss (CAL) detectable at sites in two or more non-adjacent teeth or buccal or oral CAL ≥ 3mm with periodontal pockets > 3mm in at least 2 teeth.[5] Nevertheless, there are no Latin American studies using this periodontitis case definition at the moment.

## Prevalence and risk indicators for gingivitis in Latin America

A recent literature review reported that inflammatory periodontal diseases were highly prevalent in Latin American children and adolescents. On an average, gingivitis affects 34.7% of young Latin American individuals, with the highest prevalence found in Colombia (77%) and Bolivia (73%), and the lowest prevalence in Mexico (23%). In other countries, the prevalence of gingivitis ranged from 31 to 56%.[2] Therefore, due to its high prevalence, gingivitis needs to be identified and treated in young individuals, particularly considering its implication as a risk indicator for the development of periodontitis when these individuals become adults.[6,7]

The most common risk indicators for gingivitis in Latin America are poor oral hygiene and low socioeconomic status.[2,8] Furthermore, it has been clearly established that the prevalence of gingivitis increases with age.[2,8] In the Latin American adult population, three multicentric studies have been conducted with the purpose of estimating the prevalence and severity of gingival inflammation.[9,10,11] In Brazil, Argentina, and Chile, the prevalence of gingival inflammation reached 96.5%.[9] In Jamaica, the Dominican Republic, and Puerto Rico, all the subjects analyzed had gingival inflammation.[11] In these countries, the main risk indicators for gingival inflammation were higher indices of calculus, visible plaque ≥ 30%, and having ≤ 12 years of schooling.[9,11] In Mexico, Costa Rica, and Colombia, the prevalence of gingival inflammation reached 99.6% and the most important risk indicator was dental plaque accumulation.[10] Regarding the severity of gingival inflammation, these studies revealed that the majority of individuals examined had moderate gingival inflammation,[9,10,11] according to the gingival index of Löe and Silness.

## Prevalence and risk indicators for periodontitis in Latin America

Epidemiological studies in Latin America have not consistently used any uniform case definition of periodontitis. In addition, the possibility of making comparisons between the prevalence of periodontitis among the different countries has been hindered by the use of different methodological strategies for selecting representative sample, calculating the sample size, calibrating the examiners, selecting the teeth for analysis, selecting the periodontal sites for analysis, and recording the data obtained.[12]

In general terms, a high prevalence of periodontal destruction was reported in most of the Latin American studies, with high variability among the periodontal estimates. In Argentina, using the CPI, it was reported that 40.7% of adults ≥ 18-years-old had at least one periodontal pocket ≥ 3.5 mm.[13] In Brazil, a national survey conducted in 2010, using the

CPI/CPITN indexes, reported that the prevalence of subjects from 35 to 44 years of age with periodontal probing depth ≥ 4 mm was 19.4%.[12] In Porto Alegre, Brazil, the prevalence of at least six teeth with CAL ≥ 5 mm was 62.6% and with CAL ≥ 7 mm was 37.3% in ≥ 18 year-old subjects, while the prevalence of periodontitis was 31.4%, defined as individuals with CAL ≥ 5 mm affecting ≥ 30% of teeth, and this increased with age. In addition, periodontitis was more prevalent among male subjects, individuals with low socioeconomic status, and heavy smokers.[14] The Chilean National Dental Examination Survey conducted in 2007 reported a high prevalence of CAL ≥ 5 mm, affecting 58.3% of subjects from 35 to 44 years of age, and 81.4% of subjects from 65 to 74 years old; the associated risk indicators were less than 12 years of schooling, being a man, smoking, and age.[15] The Colombian Oral Health Survey conducted in 2014 reported that 61.8% of the adult population presented periodontitis, using the case definition for surveillance of periodontitis proposed by the Center for Disease Control/ American Academy of Periodontology (CDC/AAP).[4] In addition, the prevalence of severe periodontitis was 7.8% in 35 to 44-year-old individuals, 20.3% in 45 to 64-year-old individuals, and 25.9% in 65 to 79-year-old individuals.[16] Thus, periodontitis was not homogenously distributed in the Latin American population, and the risk indicators identified were the male gender, education/schooling, socio-economic status, smoking, obesity, and income.[2]

According to a recent multicenter study,[17] periodontal damage was prevalent in Latin American adolescents from 15 to 18 years of age. In fact, the prevalence of CAL ≥ 3 mm in at least 1 periodontal site was 32.6%, the probing pocket depth ≥ 4 mm was 59.3%, and bleeding on probing ≥ 25% was 28.6%. This prevalence was higher than that previously reported in Santiago, Chile (4.5%),[18] and Santo Domingo, Dominican Republic (4.8%)[19] − both studies using a partial-mouth recording − and Porto Alegre, Brazil (22.9%), with a full-mouth recording.[20] The risk indicators associated with CAL ≥ 3 mm, in at least 1 periodontal site for this age group, were smoking, attending a public school, and having bleeding on probing ≥ 25%.[17]

Overall, studies on the prevalence of destructive periodontal disease in urban and remote areas of Latin America have indicated high prevalence and low extent of moderate to severe periodontal attachment loss.[12] Although the data available are scarce and have diverse limitations, they clearly established that CAL was more prevalent in Latin Americans than it was in the USA or in the European populations.[2]

## Impact of periodontal disease on other diseases

Periodontitis has been associated with several systemic diseases and conditions, such as adverse pregnancy outcomes, cardiovascular diseases (CVD), respiratory diseases, diabetes mellitus (DM), chronic kidney disease, rheumatoid arthritis, dementia, metabolic syndrome, and cancer. The biological plausibility of these associations relies mainly on the low-grade systemic inflammatory burden characteristic of periodontitis.[21] In this context, a long-lasting but persistent periodontal infection has a huge impact on the healthcare economy,[22] because uncontrolled periodontal disease may contribute to the pathogenic events of these diseases, inducing changes in their progression and severity.[21]

The majority of the studies conducted in Latin America have focused on adverse pregnancy outcomes, CVD, and glycemic control during DM, and have shown controversial findings.[12] In Chile, reports have indicated that periodontal treatment significantly reduced preterm birth rate; however, contradictory results have been reported in studies conducted in Brazil.[23,24,25] In fact, a recent study reported no association between the clinical periodontal parameters analyzed and the perinatal outcome.[26] To understand the differences between the data obtained in Chile and Brazil, it is necessary to consider that the Chilean population is an ethnically and demographically more homogenous population than the Brazilian population, and that Chilean women receive a uniform and well-designed prenatal care program regulated by the Government. Perhaps a more important aspect to bear in mind is that Chilean women have been reported to have more severe periodontitis than women of the other Latin American countries.[25]

A meta-analysis of observational studies consistently supported an association between periodontal disease and CVD.[27] The epidemiological studies conducted in Latin America have, in general, supported this association; however, the results have shown high variability.[12] In this context, periodontal treatment has been shown to reduce short-term levels of systemic markers of inflammation directly related to the etiopathogenesis of CVD.[28]

A bidirectional relationship between periodontal disease and DM has been proposed (31). Indeed, periodontitis may impair glycemic control in DM patients[29] and periodontal treatment may improve glycemic control in these patients.[30] Interventional studies conducted in Brazil have obtained controversial findings, with some studies reporting significant reductions in the levels of glycosylated hemoglobin (HbA1c), whereas others found no significant changes in the HbA1c levels after periodontal treatment. These conflicting findings may be explained, at least partly, by the different therapeutic strategies used, small sample size, and criteria for selection of the subjects analyzed.[12] A recent study conducted in Chile reported that periodontal therapy led to a reduction in the level of HbA1c in DM patients with HbA1c > 9%, irrespective of the type of periodontal treatment.[31]

## Latin America strategies to increase the awareness of periodontal diseases

Currently, various cultural and socio-economic barriers to professional care prevent the population from applying correct preventive approaches, receiving early diagnosis and seeking timely treatment, resulting in limited progress in improving periodontal health.[32] Periodontal disease is socially determined. In order to effectively combat this disease, efforts and equity public policies that reduce social inequalities are required. Prevention should be the main measure of oral health actions, policies and programs for maintaining oral health and avoiding periodontal disease, through the effective management of gingivitis and promotion of healthy lifestyles at both population and individual levels.[33] This can be accomplished by dental and health professionals providing patients with instructions on effective self-performed oral hygiene, such as how to properly brush the teeth and clean interdental spaces; in addition to an integrated and population-based approach to health education, focused on the common risk factor. Moreover, the concept should be emphasized that each individual needs to play a proactive role in the awareness of oral health, self-care measures, health promotion, and disease prevention, for optimal oral and general health throughout the course of life.[34] Furthermore, increasing awareness of the population about the importance of recognizing the early signs of periodontal diseases is advocated, by instructing people to understand the role of gingival inflammation, presence of bleeding gums, and self-examination of gingival tissues, in helping to prevent these diseases. To achieve these objectives, social networks could be a useful tool that should be explored, given that they provide quick, friendly, and massive means of disseminating information, which could favor the implementation and massification of strategies with the aim of educating our patients in periodontal health. For instance, a self-report questionnaire, designed for population-based surveillance of gingivitis in adolescents could be implemented.[35] In addition, these platforms could enhance public and professional awareness of periodontal health.[36]

The long-term sustainable strategy for global oral health must focus on health promotion and disease prevention, through controlling their common and modifiable risk factors based on the integrated link of oral health and general well-being. Thus, common oral diseases such as periodontal disease should be subject to effective prevention, control, care, and management by all healthcare professionals through a collaborative approach to achieving overall health.[37,38] Nevertheless, despite the need for more Latin American studies, the information available at present is very useful for establishing national policies on health promotion, prevention, and treatment of oral health, focused on comprehensive care. In almost all cases, destructive periodontal disease can be reduced or avoided if prevention and treatment of severe gingivitis begin early in life. The possibility of untreated periodontal disease being

capable of negatively affecting people's general health puts extra pressure on improving the periodontal health of young people in Latin America.

## Concluding remarks

Although periodontal disease represents one of the most common public health issues, regrettably, it has frequently been neglected in public health strategies and policies. This has led to significant socioeconomic impact in terms of healthcare costs, absence from school or work, and on the daily lives and self-esteem of individuals.[39] Periodontal diseases and non-communicable diseases share risk factors, such as consumption of tobacco. Thus, it is crucial to incorporate oral health into the general health agenda, with the purpose of achieving optimal health and general well-being.[34] In this context, dental schools should play a key role in training professionals with a focus on promotion, prevention, and early diagnosis of oral diseases, including periodontal diseases with an approach to risk, and strong biopsychosocial and ethical components. Thus, future Latin American dentists would be able to face the challenge of decreasing the prevalence of periodontal diseases by leading interdisciplinary health teamwork. Along this line, general dentists should be professionally prepared to treat most periodontal patients in the mild and moderate stages of periodontitis (I and II stages, according to the 2018 classification for periodontal diseases and conditions),[5] and also be able to identify the subjects that should be referred to periodontal specialists.[40] The uses of goal setting, self-monitoring, and planning are effective interventions for improving oral hygiene in patients with periodontal disease. Therefore, we need future dentists who understand the seriousness of periodontal diseases and the benefits of changes in behavior by periodontal patients in the context of the comprehensive care of individuals.[41]

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## References

1. Gjermo P, Rösing CK, Susin C, Oppermann R. Periodontal diseases in Central and South America. Periodontol 2000. 2002;29(1):70-8. https://doi.org/10.1034/j.1600-0757.2001.290104.x
2. Botero JE, Rösing CK, Duque A, Jaramillo A, Contreras A. Periodontal disease in children and adolescents of Latin America. Periodontol 2000. 2015 Feb;67(1):34-57. https://doi.org/10.1111/prd.12072
3. Savage A, Eaton KA, Moles DR, Needleman I. A systematic review of definitions of periodontitis and methods that have been used to identify this disease. J Clin Periodontol. 2009 Jun;36(6):458-67. https://doi.org/10.1111/j.1600-051X.2009.01408.x
4. Eke PI, Page RC, Wei L, Thornton-Evans G, Genco RJ. Update of the case definitions for population-based surveillance of periodontitis. J Periodontol. 2012 Dec;83(12):1449-54. https://doi.org/10.1902/jop.2012.110664
5. Tonetti MS, Greenwell H, Kornman KS. Staging and grading of periodontitis: framework and proposal of a new classification and case definition. J Clin Periodontol. 2018 Jun;45 Suppl 20:S149-61. https://doi.org/10.1111/jcpe.12945
6. Lang NP, Schätzle MA, Löe H. Gingivitis as a risk factor in periodontal disease. J Clin Periodontol. 2009 Jul;36 Suppl 10:3-8. https://doi.org/10.1111/j.1600-051X.2009.01415.x
7. Schätzle M, Löe H, Lang NP, Heitz-Mayfield LJ, Bürgin W, Ånerud A, et al. Clinical course of chronic periodontitis. III. Patterns, variations and risks of attachment loss. J Clin Periodontol. 2003 Oct;30(10):909-18. https://doi.org/10.1034/j.1600-051X.2003.00401.x
8. Ministerio de Salud (Chile). Perfil epidemiológico de salud bucal. [cited 2018 June 15]. Available from: http://www.minsal.cl/portal/url/item/7dc33df0bb34ec58e04001011e011c36.pdf2010

9. Carvajal P, Gómez M, Gomes S, Costa R, Toledo A, Solanes F, et al. Prevalence, severity, and risk indicators of gingival inflammation in a multi-center study on South American adults: a cross sectional study. J Appl Oral Sci. 2016 Sep-Oct;24(5):524-34. https://doi.org/10.1590/1678-775720160178
10. Murillo GV, Castillo J, Serrano J, Ramirez G, Viales J, Benitez C. Prevalence and severity of plaque-induced gingivitis in three Latin American cities: Mexico City-Mexico, Great Metropolitan Area-Costa Rica and Bogota-Colombia. ODOVTOS-Int J Dental Sci. 2018 May-Aug;20(2):91-102. https://doi.org/10.15517/ijds.v20i2.32451
11. Elías-Boneta AR, Toro MJ, Rivas-Tumanyan S, Rajendra-Santosh AB, Brache M, Collins C JR. Prevalence, severity, and risk factors of gingival inflammation in Caribbean adults: A multi-city, cross-sectional study. P R Health Sci J. 2018 Jun;37(2):115-23.
12. Oppermann RV, Haas AN, Rösing CK, Susin C. Epidemiology of periodontal diseases in adults from Latin America. Periodontol 2000. 2015 Feb;67(1):13-33. https://doi.org/10.1111/prd.12061
13. Romanelli H, González y Rivas M, Chiappe V, Gómez M, Macchi R. Periodontal treatment needs in Argentine adult subjects. Acta Odontol Latinoam. 2007;20(1):39-47.
14. Susin C, Dalla Vecchia CF, Oppermann RV, Haugejorden O, Albandar JM. Periodontal attachment loss in an urban population of Brazilian adults: effect of demographic, behavioral, and environmental risk indicators. J Periodontol. 2004 Jul;75(7):1033-41. https://doi.org/10.1902/jop.2004.75.7.1033
15. Gamonal J, Mendoza C, Espinoza I, Muñoz A, Urzúa I, Aranda W, et al. Clinical attachment loss in Chilean adult population: First Chilean National Dental Examination Survey. J Periodontol. 2010 Oct;81(10):1403-10. https://doi.org/10.1902/jop.2010.100148
16. Ministerio de Salud y Protección Social (Colombia). IV Estudio Nacional de Salud Bucal de Colombia. 2015 [cited 2015 June 1]. Available from: https://www.minsalud.gov.co/sites/rid/Lists/BibliotecaDigital/RIDE/VS/PP/ENSAB-IV-Situacion-Bucal-Actual.pdf
17. Morales A, Carvajal P, Romanelli H, Gómez M, Loha C, Esper ME, et al. Prevalence and predictors for clinical attachment loss in adolescents in Latin America: cross-sectional study. J Clin Periodontol. 2015 Oct;42(10):900-7. https://doi.org/10.1111/jcpe.12452
18. López R, Fernández O, Jara G, Baelum V. Epidemiology of clinical attachment loss in adolescents. J Periodontol. 2001 Dec;72(12):1666-74. https://doi.org/10.1902/jop.2001.72.12.1666
19. Collins J, Carpio AM, Bobadilla M, Reyes R, Gúzman I, Martínez B, et al. Prevalence of clinical attachment loss in adolescents in Santo Domingo, Dominican Republic. J Periodontol. 2005 Sep;76(9):1450-4. https://doi.org/10.1902/jop.2005.76.9.1450
20. Susin C, Haas AN, Valle PM, Oppermann RV, Albandar JM. Prevalence and risk indicators for chronic periodontitis in adolescents and young adults in south Brazil. J Clin Periodontol. 2011 Apr;38(4):326-33. https://doi.org/10.1111/j.1600-051X.2011.01699.x
21. Tonetti MS, Van Dyke TE. Periodontitis and atherosclerotic cardiovascular disease: consensus report of the Joint EFP/AAP Workshop on Periodontitis and Systemic Diseases. J Periodontol. 2013 Apr;84(4 Suppl):S24-9. https://doi.org/10.1902/jop.2013.1340019
22. Chapple IL, Busby M, Clover H, Matthews R. Periodontal disease and systemic disease. J R Soc Med. 2014 Mar;107(3):94. https://doi.org/10.1177/0141076813518770
23. López NJ, Smith PC, Gutierrez J. Periodontal therapy may reduce the risk of preterm low birth weight in women with periodontal disease: a randomized controlled trial. J Periodontol. 2002 Aug;73(8):911-24. https://doi.org/10.1902/jop.2002.73.8.911
24. López NJ, Silva I, Ipinza J, Gutierrez J. Periodontal therapy reduces the rate of preterm low birth weight in women with pregnancy-associated gingivitis. J Periodontol. 2005 Nov;76(11 Suppl):2144-53. https://doi.org/10.1902/jop.2005.76.11-S.2144
25. López NJ, Uribe S, Martínez B. Effect of periodontal treatment on preterm birth rate: a systematic review of meta-analyses. Periodontol 2000. 2015 Feb;67(1):87-130. https://doi.org/10.1111/prd.12073
26. Kruger M, Casarin RP, Pinto GD, Pappen FG, Camargo MB, Correa FO, et al. Maternal periodontal disease and adverse perinatal outcomes: is there an association? A hospital-based case-control study. J Matern Fetal Neonatal Med. 2019 Oct;32(20):3401-7. https://doi.org/10.1080/14767058.2018.1464554
27. Humphrey LL, Fu R, Buckley DI, Freeman M, Helfand M. Periodontal disease and coronary heart disease incidence: a systematic review and meta-analysis. J Gen Intern Med. 2008 Dec;23(12):2079-86. https://doi.org/10.1007/s11606-008-0787-6
28. Paraskevas S, Huizinga JD, Loos BG. A systematic review and meta-analyses on C-reactive protein in relation to periodontitis. J Clin Periodontol. 2008 Apr;35(4):277-90. https://doi.org/10.1111/j.1600-051X.2007.01173.x
29. Tsai C, Hayes C, Taylor GW. Glycemic control of type 2 diabetes and severe periodontal disease in the US adult population. Community Dent Oral Epidemiol. 2002 Jun;30(3):182-92. https://doi.org/10.1034/j.1600-0528.2002.300304.x
30. Simpson TC, Needleman I, Wild SH, Moles DR, Mills EJ. Treatment of periodontal disease for glycaemic control in people with diabetes. Cochrane Database Syst Rev. 2010 May;(5):CD004714. https://doi.org/10.1002/14651858.CD004714.pub2
31. Quintero AJ, Chaparro A, Quirynen M, Ramírez V, Prieto D, Morales H, et al. Effect of two periodontal treatment modalities in patients with uncontrolled type 2 diabetes mellitus: A randomized clinical trial. J Clin Periodontol. 2018 Sep;45(9):1098-106. https://doi.org/10.1111/jcpe.12991
32. Jin LJ, Armitage GC, Klinge B, Lang NP, Tonetti M, Williams RC. Global oral health inequalities: task group—periodontal disease. Adv Dent Res. 2011 May;23(2):221-6. https://doi.org/10.1177/0022034511402080

33. Jepsen S, Blanco J, Buchalla W, Carvalho JC, Dietrich T, Dörfer C, et al. Prevention and control of dental caries and periodontal diseases at individual and population level: consensus report of group 3 of joint EFP/ORCA workshop on the boundaries between caries and periodontal diseases. J Clin Periodontol. 2017 Mar;44 Suppl 18:S85-93. https://doi.org/10.1111/jcpe.12687
34. Tonetti MS, Jepsen S, Jin L, Otomo-Corgel J. Impact of the global burden of periodontal diseases on health, nutrition and wellbeing of mankind: a call for global action. J Clin Periodontol. 2017 May;44(5):456-62. https://doi.org/10.1111/jcpe.12732
35. Quiroz V, Reinero D, Hernández P, Contreras J, Vernal R, Carvajal P. Development of a self-report questionnaire designed for population-based surveillance of gingivitis in adolescents: assessment of content validity and reliability. J Appl Oral Sci. 2017 Jul-Aug;25(4):404-11. https://doi.org/10.1590/1678-7757-2016-0511
36. Bernhardt JM, Alber J, Gold RS. A social media primer for professionals: digital dos and don'ts. Health Promot Pract. 2014 Mar;15(2):168-72. https://doi.org/10.1177/1524839913517235
37. FDI World Dental Federation. FDI policy statement on non-communicable diseases. Adopted by the FDI General Assembly: 30 August 2013 - Istanbul, Turkey. Int Dent J. 2013 Dec;63(6):285-6. https://doi.org/10.1111/idj.12078
38. Jin L. The global call for oral health and general health. Int Dent J. 2013 Dec;63(6):281-2. https://doi.org/10.1111/idj.12085
39. Jin LJ, Lamster IB, Greenspan JS, Pitts NB, Scully C, Warnakulasuriya S. Global burden of oral diseases: emerging concepts, management and interplay with systemic health. Oral Dis. 2016 Oct;22(7):609-19. https://doi.org/10.1111/odi.12428
40. Kornman KS, Giannobile WV, Duff GW. Quo vadis: what is the future of periodontics? How will we get there? Periodontol 2000. 2017 Oct;75(1):353-71. https://doi.org/10.1111/prd.12217
41. Newton JT, Asimakopoulou K. Managing oral hygiene as a risk factor for periodontal disease: a systematic review of psychological approaches to behaviour change for improved plaque control in periodontal management. J Clin Periodontol. 2015 Apr;42 Suppl 16:S36-46. https://doi.org/10.1111/jcpe.12356

# Strategies for the prevention of periodontal disease and its impact on general health in Latin America. Section III: Prevention

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**Abstract:** Dental plaque removal and the understanding of risk factors, risk indicators and social determinants are important components in the prevention of periodontal disease. Periodontal diseases and dental caries are largely preventable conditions, but require a "common risk factor approach" with non-communicable diseases with the purpose of improving their prevention and control, and positive impact on health. The aim of this consensus was to identify the evidence and gaps in periodontal prevention in Latin American, and to propose individual and collective recommendations for the population, health professionals, dental practice and government. The prevention of periodontal diseases in Latin America has mainly been focused on oral hygiene instruction, use of toothbrushes and interproximal devices, but in some patients, it is necessary to use adjuncts to these measures, such as antimicrobial and/or probiotic products that are backed by broad scientific evidence. Some evidence has shown that there are inadequate knowledge, attitudes and practices among patients, dentist and other health professionals. The prevention of periodontal diseases and caries should be adopted as a healthy lifestyle routine, because of their local and systemic effects. Recently, new empowerment strategies have been proposed in order to generate behavioral changes. Periodontal diseases can often be prevented, or controlled by joined efforts between government health systems, scientific associations, universities, health professionals, private companies and communities. In conclusion, the relations between periodontal diseases, caries, healthy lifestyles and NCD's offer an ideal opportunity to change Latin American prevention strategies at both the individual level and population levels.

**Keywords:** Periodontal Diseases; Public Health; Latin America.

## Introduction

The International Dental Federation (FDI) has defined oral health as being multi-faceted and it includes the ability to speak, smile, smell, taste, touch, chew, swallow and convey a range of emotions through facial expressions with confidence and without pain, discomfort or disease of the craniofacial complex.[1] Periodontal diseases are chronic multi-factorial diseases

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initiated by bacterial microorganisms. They produce infectious and inflammatory reactions that impact the body locally and systemically. There is evidence that periodontal diseases are linked to systemic conditions and their risk factors are shared with caries and non-communicable diseases (NCDs).[2] Therefore, the concept of oral health should also include "oral health without negative consequences on general health". The prevalence of periodontal diseases is related to plaque biofilm and risk factors such as smoking and diabetes. In addition, periodontal diseases may be associated with other risk indicators, such as: metabolic syndrome, hereditary factors, behavioral factors, compliance during periodontal maintenance, stress, and obesity.[3,4] Dental plaque removal and the understanding of risk factors, risk indicators and social determinants are important components in the prevention of periodontal diseases. Health professionals should be involved in programs for the prevention of caries and periodontal diseases because they could initiate or exacerbate the development of NCDs.[5,6,7,8,9,10] Periodontal diseases and dental caries are largely preventable bacterial infections that require a "common risk factor approach" with NCDs with the purpose of their prevention and control.[5,11]

At present preventive approaches require individual and collective measures, on the understanding that they seek different goals and impacts; in Latin America the dental profession faces three major challenges, which include: education on the importance of periodontal health; empowerment of patients through the incorporation of healthy lifestyles; and the development of new strategies and technologies to promote adequate oral healthcare habits. The aim of this consensus is 1) to identify the evidence and gaps in periodontal prevention in Latin American, and 2) to propose individual and collectives recommendations for the population, community, health professionals, dental practice and government with the purpose of improving prevention strategies.

## Evidence for the population (Individual-level measures)

The prevention of periodontal diseases in Latin America has mainly been focused on oral hygiene instruction for reducing dental plaque. Although clinical evidence has shown that mechanical oral hygiene is fundamental to prevent periodontal diseases, it is important to highlight that optimal control is not always achieved.[12] Despite the short-term efficacy of plaque reduction in clinical studies, these positive results have not been corroborated in Latin American prevalence studies.[13,14,15] Some evidence has shown that there is inadequate knowledge, as well as attitudes and practices in Latin America relative to diagnosis, prevention, risk factors and systemic consequences.[16,17] In addition, some people fear the diagnosis and treatment of periodontal diseases (dental phobia) and are negligent with regard to prevention, maintenance and early detection.[18] Therefore, the actions of individuals are governed by the personal misconceptions about their dental needs. An individual´s perception of control is regarded as an important socio-behavioral factor in general. There is some evidence that having a strong internal perception of control contributes to the prevention of dental caries and periodontal diseases.[5] Limited qualitative research has been done in Latin America to investigate what patients think about the term "dental plaque". There is evidence of lack of recognition of the term "periodontal diseases" as a gingival oral condition. A clinical sign of periodontal diseases such as gingival bleeding is not considered a health problem by many patients, and they are unaware of the health implications of the infectious and inflammatory characteristics of periodontal diseases.[16]

Epidemiological data relative to oral health habits and behavior are scarce and disclose only limited information on adult subjects. A multicenter study in three South American cities regarding oral health behavior showed that 84.2% of the participants who brushed twice a day or more, 66% never cleaned interproximally, and only 39.6% sought a preventive dental checkup at least once a year.[19] More years of education were significantly associated with higher frequency of tooth brushing, use of dental floss, regular dental checkups, less gingival bleeding and lower plaque scores. Low frequency of interdental cleaning and no regular preventive dental care were

associated with the presence of more plaque and gingival inflammation.

The majority of studies on prevention of periodontal diseases have not taken into account behavioral change models and patient empowerment (by incorporating oral health into a healthy lifestyle) such as: COM-B (Capability, Opportunity and Motivation-Behavior) [20], Patient-Centered Care (5 key components of PCC: connection, attitude, communication, empowerment and feeling valued) [21] and Empathy-Based Medicine.[22] Additionally, a new health perspective included a holistic, global and integrative approach (systems biology and digital revolution) called Proactive P4 medicine (P4: Predictive, Preventive, Personalized, Participatory).[23,24] A major oral health challenge will be to promote proactive strategies in patients and the community. There may possibly be different opportunities and oral hygiene behaviors when the various countries of Latin America are compared at both individual and collective levels. In this sense, the key to success will depend on the collaborative research and working networks. Positive experiences observed in one place could be replicated in other places. In addition, this requires the effective use of information technologies, human social networks, social networks on the Internet and new education strategies.

## Recommendations

a. It is necessary to promote educational strategies for dental caries, periodontal diseases and NCDs prevention as a healthy lifestyle in different patient groups and communities (children and adolescents, smokers and patients with systemic diseases or disabilities);
b. It is necessary to promote positive attitudes and changes in behavior relative to periodontal and dental caries prevention and common risk factors with NCDs, through internationally proposed models and risk profile tools;
c. It is necessary to promote new empowerment strategies to modify oral health habits based on patient knowledge, attitudes, practices, abilities and self-monitoring.

## Evidence for dental practice and health professionals

A systematic review on professional mechanical dental plaque removal in primary prevention has indicated its effectiveness when it was complemented with oral health instructions and this procedure has been useful in maintenance programs. The effectiveness of periodontal disease prevention depends on motivation, knowledge, patient empowerment, provision of adequate oral hygiene instruction, type of oral hygiene aids and patient dexterity. [12,17,25,26] Evidence has shown that brushing associated with flossing can control dental biofilm buildup when performed adequately and systematically, at regular intervals.[25] However, in Latin America most of the population has presented low adherence to flossing and interdental devices.[27] Provision of oral hygiene instructions alone led to small reduction in dental plaque and gingivitis. A single exercise of manual brushing or using a power toothbrush has been associated with 42% and 46% of the reduction of dental plaque respectively, but there was little evidence of the clinical impact on gingival inflammation. The key is therefore to train regional health professionals and dental hygienists on how to educate and motivate patients on the adequate selection of techniques and tactics, since there is not a single one that is indicated for the entire population, given variations in manual dexterity, anatomical types of oral cavities, and psycho-social backgrounds. Regarding the latter, the importance of dental hygienists must be highlighted with regard to accompanying patients in this process, in the role of health coaches and guides, going beyond their traditional, very passive role in Latin America, which has been limited to primary prevention.

Interproximal cleaning is essential in order to maintain interproximal gingival health. Moderate evidence has suggested that as an adjunct to tooth brushing the use of interdental brushes provided higher levels of plaque reduction than manual tooth brushing alone, but there is conflicting and scare evidence on the effectiveness in reducing inflammation and clinical relevance. Other interproximal devices (flossing, oral irrigators and wood sticks) showed weak evidence of reducing

inflammation.[25] The use of chemical antiplaque agents in mouthwashes or dentifrices provides improvement in plaque and gingival inflammation reduction. Chemical plaque control should be regarded as a needed related treatment, not as a substitute for mechanical dental plaque control.[26] Mouthwashes are effective in the reduction of dental plaque and gingivitis provided that they are used in combination with mechanical control. The selection of the mode of use is dependent on the active agent, cost, patient preference and compliance.[25] Among the contemporary strategies are prebiotics and probiotics used for the prevention of gingivitis, which appear to modulate the oral microbioma and decrease inflammatory processes.[28] The use of adjunct products supported by broad scientific evidence, therefore, seems to be an interesting strategy from a public health stance, given the difficulty in changing the social and behavioral conditions of the population.

Health professionals receive limited information and documentation on the diagnosis, prevention, systemic consequences and common risk factors for dental caries, periodontal diseases and NCD´s. Periodontal prevention also depends on interdisciplinary relationships with other medical and dental specialties. Emerging evidence has shown the lack of knowledge of some health professionals in Latin America with reference to periodontal diseases and their oral and systemic consequences. Furthermore, dentists have not participated sufficiently in healthy lifestyle programs such as prevention of tobacco use, diabetes and cardiovascular prevention programs, etc.

## Recommendations - Strategies for dental practice and health professionals

a. It is important for dental professional to be acquainted with agents, products and devices to enable them to evaluate their effectiveness and adverse effects according to guidelines and future research. (Evaluate clinical impact of new technologies: dentifrices with active ingredients, toothbrushes, interdental brushes, flossing, mouth rinses and probiotics);
b. It is essential to teach dental students and health professionals about the importance of dental biofilm control, risk factor evaluation, patient empowerment strategies and methods to change behavior;
c. It is necessary to change the role of the health professionals in the prevention and control of risk factors for periodontal diseases together with dental caries and NCDs (common risk factors approach);
d. It is necessary to propose common shared strategies between the periodontal scientific associations in Latin America and medical and patient associations;
e. It is necessary to promote technological strategies with the aim of motivating self-care and establishing agreements with different patient groups such as diabetic or cardiovascular patient associations;
f. Health professionals in Latin America require preventive guidelines and training that includes a common risk factor approach, behavioral change and patient empowerment strategies.

## Evidence for public health prevention in Latin America

The integration of biological systems with the digital revolution suggests that treating patients in a more personalized way might be the best option, but from a population perspective this increases costs considerably. In this sense, individuals can be phenotypically characterized according to their risk factors, risk indicators and health determinants.[23,24] It is necessary to consider the barriers that impede the implementation of preventive measures; in Latin America the low level of proactive involvement of governments is a factor that interferes in the decision-making process. Partnerships between universities, industry and government support are a critical pathway to produce knowledge and cooperation, which may include subsidies and supply of oral hygiene products. Considering secondary prevention, concepts need to be broadened in education and minimize interventions (*e.g.*, professional elimination of biofilm). Most

countries have a formal framework for programs to prevent chronic diseases such as cancer and diabetes, but these programs do not include oral cavity. In this sense, it is necessary to include the most common oral diseases in government prevention programs. Consideration should be given to the participation of oral care professionals in the control and prevention of smoking, recommendation on medical and health products. Considerations should also be given to incorporating measures and laboratory test in dental office, such as measuring waist circumference and glucose level, among others. Dentists and Oral Healthcare professionals can play a fundamental role in the cessation of smoking and possibly in reducing the risk of NCD´s. The prevention of oral diseases is a preponderant issue that should not be in the hands dentists only, but also of other health professionals. This must also be taken into account when training dentists so they are motivated to work in a multidisciplinary way.

Periodontal diseases can often be prevented, reduced or controlled by joint efforts between government health systems, scientific associations, universities, health professionals, private companies, non-governmental organizations (NGOs) and communities. The third goal of sustainable development objectives established by the United Nations is the search for wellbeing and a healthy life in the population and a control of risk factors in developing countries. It is necessary to evaluate socio-biological interactions in periodontal diseases and models that may help to develop a better understanding of the causes of oral health inequalities and implicate the importance of addressing social determinants of oral health in innovative public health interventions. A prerequisite for properly implementing a preventive program directed towards periodontal diseases seems to be a well-organized public/oral health care system. To maximize cost-effectiveness, prevention of periodontal diseases should be based on predictive and risk models and the preventive strategy should be chosen based on risk evaluation. Health systems should put more work into recognition of the disease, its systemic consequences and risk factors.[17,27,29,30,31]

## Recommendations for public health prevention

a. It is necessary to strengthen public policies to integrate prevention of oral diseases (dental caries and periodontal diseases) and NCD´s;
b. It is necessary to establish alliances between dental associations, governmental and non-governmental organizations (policymakers and stakeholders), and health systems to emphasize the replacement of Oral Health Programs by Oral Health Policies. It is suggested that such policies should prioritize the concept of "Whole Mouth Health", focused on comprehensive care. This concept is an essential component for the general health of the human organism;
c. It is necessary to evaluate socio-biological interactions in periodontal diseases and models that may help to develop a better understanding of the causes of oral health inequalities and also implicate the importance of addressing the social determinants of oral health in innovative public health interventions;
d. It is necessary to promote massive campaigns to improve knowledge, attitudes and practices with reference to periodontal diseases in social networks, patient associations (e-patients) and the media.

## Conclusions and future perspectives for Latin America

Dental plaque reduction represents the main component in the prevention and control of periodontal diseases, but new evidence and research is needed to evaluate the implementation of new strategies to improve education, empowerment and the acquisition of good oral health habits and healthy lifestyles by patients and the community.

There are two main preventive approaches: a preventive approach at the individual level centered on the patient; and a preventive approach at the level of the population / community that requires the proactive participation of the government in decision-making. The relations between periodontal

diseases, caries, healthy lifestyles and NCD's offer an ideal opportunity to change prevention strategies at both the individual and population levels. Therefore, new preventive models should include the promotion of periodontal health as a healthy lifestyle. Each of the recommendations proposed in this consensus should be evaluated at the individual and / or population level with different approaches and strategies according to the particular circumstances in each Latin American country. Successful experiences should be shared among different countries for implementation in another context with the goal of improving oral health throughout the Latin American population.

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## References

1. Glick M, Williams DM, Kleinman DV, Vujicic M, Watt RG, Weyant RJ. A new definition for oral health developed by the FDI World Dental Federation opens the door to a universal definition of oral health. Br Dent J. 2016 Dec;147(12):915-7. 10.1016/j.adaj.2016.10.001
2. Tonetti MS, Eickholz P, Loos BG, Papapanou P, Velden U, Armitage G, et al. Principles in prevention of periodontal diseases: consensus report of group 1 of the 11th European Workshop on Periodontology on effective prevention of periodontal and peri-implant diseases. J Clin Periodontol. 2015 Apr;42 Suppl 16:S5-11. https://doi.org/10.1111/jcpe.12368
3. Genco RJ, Borgnakke WS. Risk factors for periodontal disease. Periodontol 2000. 2013 Jun;62(1):59-94. https://doi.org/10.1111/j.1600-0757.2012.00457.x
4. Knight ET, Liu J, Seymour GJ, Faggion CM Jr, Cullinan MP. Risk factors that may modify the innate and adaptive immune responses in periodontal diseases. Periodontol 2000. 2016 Jun;71(1):22-51. https://doi.org/10.1111/prd.12110
5. Jepsen S, Blanco J, Buchalla W, Carvalho JC, Dietrich T, Dörfer C, et al. Prevention and control of dental caries and periodontal diseases at individual and population level: consensus report of group 3 of joint EFP/ORCA workshop on the boundaries between caries and periodontal diseases. J Clin Periodontol. 2017 Mar;44 Suppl 18:S85-93. https://doi.org/10.1111/jcpe.12687
6. 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. J Clin Periodontol. 2018 Feb;45(2):138-49. https://doi.org/10.1111/jcpe.12808
7. Ramírez JH, Arce RM, Contreras A. Periodontal treatment effects on endothelial function and cardiovascular disease biomarkers in subjects with chronic periodontitis: protocol for a randomized clinical trial. Trials. 2011 Feb;12:46. https://doi.org/10.1186/1745-6215-12-46
8. Jaramillo A, Contreras A, Lafaurie GI, Duque A, Ardila CM, Duarte S, et al. Association of metabolic syndrome and chronic periodontitis in Colombians. Clin Oral Investig. 2017 Jun;21(5):1537-44. https://doi.org/10.1007/s00784-016-1942-9
9. Chambrone L, Foz AM, Guglielmetti MR, Pannuti CM, Artese HP, Feres M, et al. Periodontitis and chronic kidney disease: a systematic review of the association of diseases and the effect of periodontal treatment on estimated glomerular filtration rate. J Clin Periodontol. 2013 May;40(5):443-56. https://doi.org/10.1111/jcpe.12067
10. Flores MF, Montenegro MM, Furtado MV, Polanczyk CA, Rösing CK, Haas AN. Periodontal status affects C-reactive protein and lipids in patients with stable heart disease from a tertiary care cardiovascular clinic. J Periodontol. 2014 Apr;85(4):545-53. https://doi.org/10.1902/jop.2013.130255
11. Niederman R, Feres M, Ogunbodede E. Dentistry. In: Debas HT, Donkor P, Gawande A, Jamison DT, Kruk ME, Mock CN, editors. Essential surgery: disease control priorities. 3rd ed. Washington, DC: The International Bank for Reconstruction and Development; 2015. Vol. 1.
12. Rode SM, Gimenez X, Montoya VC, Gómez M, Blanc SL, Medina M, et al. Daily biofilm control and oral health: consensus on the epidemiological challenge—Latin American Advisory Panel. Braz Oral Res. 2012;26(spe1 Suppl 1):133-43. https://doi.org/10.1590/S1806-83242012000700020
13. Carvajal P, Gómez M, Gomes S, Costa R, Toledo A, Solanes F, et al. Prevalence, severity, and risk indicators of gingival inflammation in a multi-center study on South American adults: a cross sectional study. J Appl Oral Sci. 2016 Sep-Oct;24(5):524-34. https://doi.org/10.1590/1678-775720160178

14. Murillo G, Vargas MA, Castillo J, Serrano JJ, Ramirez GM, Viales JH, et al. Prevalence and severity of plaque-induced gingivitis in three Latin American cities: Mexico City-Mexico, Great Metropolitan Area-Costa Rica and Bogota-Colombia. Odovtos; 2018 May-Aug;20(2):91-102. https://doi.org/10.15517/ijds.v0i0.32451
15. Elías-Boneta AR, Toro MJ, Rivas-Tumanyan S, Rajendra-Santosh AB, Brache M, Collins C JR. Prevalence, severity, and risk factors of gingival inflammation in Caribbean adults: a multi-city, cross-sectional study. P R Health Sci J. 2018 Jun;37(2):115-23.
16. Duque A, Cuartas C, Muñoz C, Salazar C, Sanchez Y. Nivel de conocimeinto sobre enfermedad periodontal en una muestra de empleados en Medellin. Revista CES Odontologia. 2011;24(2):43-7.
17. Carvajal P. Enfermedades periodontales como un problema de salud pública: el desafío del nivel primario de atención en salud. Rev Clín Periodoncia Implantol Rehabil Oral. 2016;9(2):177-83. https://doi.org/10.1016/j.piro.2016.07.001
18. Heidari E, Andiappan M, Banerjee A, Newton JT. The oral health of individuals with dental phobia: a multivariate analysis of the Adult Dental Health Survey, 2009. Br Dent J. 2017 Apr;222(8):595-604. https://doi.org/10.1038/sj.bdj.2017.361
19. Gómez MV, Toledo A, Carvajal P, Gomes SC, Costa RS, Solanes F, et al. A multicenter study of oral health behavior among adult subjects from three South American cities. Braz Oral Res. 2018;32(0):e22. https://doi.org/10.1590/1807-3107bor-2018.vol32.0022
20. Newton JT, Asimakopoulou K. Behavioral models for periodontal health and disease. Periodontol 2000. 2018 Oct;78(1):201-11. https://doi.org/10.1111/prd.12236
21. Mills I, Frost J, Cooper C, Moles DR, Kay E. Patient-centred care in general dental practice--a systematic review of the literature. BMC Oral Health. 2014;14:64. https://doi.org/10.1186/1472-6831-14-64
22. Howick J, Rees S. Overthrowing barriers to empathy in healthcare: empathy in the age of the Internet. J R Soc Med. 2017 Sep;110(9):352-7. https://doi.org/10.1177/0141076817714443
23. Hood L, Flores M. A personal view on systems medicine and the emergence of proactive P4 medicine: predictive, preventive, personalized and participatory. N Biotechnol. 2012 Sep;29(6):613-24. https://doi.org/10.1016/j.nbt.2012.03.004
24. Kornman KS, Giannobile WV, Duff GW. Quo vadis: what is the future of periodontics? How will we get there? Periodontol 2000. 2017 Oct;75(1):353-71. https://doi.org/10.1111/prd.12217
25. Chapple IL, Van der Weijden F, Doerfer C, Herrera D, Shapira L, Polak D, et al. Primary prevention of periodontitis: managing gingivitis. J Clin Periodontol. 2015 Apr;42 Suppl 16:S71-6. https://doi.org/10.1111/jcpe.12366
26. Axelsson P, Albandar JM, Rams TE. Prevention and control of periodontal diseases in developing and industrialized nations. Periodontol 2000. 2002;29(1):235-46. https://doi.org/10.1034/j.1600-0757.2002.290112.x
27. Morales A, Bravo J, Baeza M, Werlinger F, Gamonal J. Las enfermedades periodontales como enfermedades crónicas no transmisibles: cambios en los paradigmas. Rev Clín Periodoncia Implantol Rehabil Oral. 2016;9(2):203-7. https://doi.org/10.1016/j.piro.2016.07.004
28. Montero E, Iniesta M, Rodrigo M, Marín MJ, Figuero E, Herrera D, et al. Clinical and microbiological effects of the adjunctive use of probiotics in the treatment of gingivitis: A randomized controlled clinical trial. J Clin Periodontol. 2017 Jul;44(7):708-16. https://doi.org/10.1111/jcpe.12752
29. Contreras Rengifo A. La promoción de la salud general y la salud oral: una estrategia conjunta. Rev Clín Periodoncia Implantol Rehabil Oral. 2016;9(2):193-202. https://doi.org/10.1016/j.piro.2016.07.003
30. Romanelli H. About the Gum Health Day: periodontal health is possible. Rev Asoc Odontol Argentina. 2018 Mar;106(1):1-4.
31. Duque A, Tirado M, Arbeláez C, García S. Conocimientos y actitudes sobre la posible asociación de la periodontitis como factor de riesgo de algunas enfermedades y condiciones médicas en una muestra de médicos en Medellín - Colombia. CES Odontol. 2011;24(1):8.

# Periodontal disease and its impact on general health in Latin America. Section IV: Diagnosis

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**Abstract:** The art of diagnosis is of great importance in the management of any disease. This includes preventive and therapeutic strategies. To make an accurate and effective diagnosis, knowledge about the health-disease process is fundamental. This paper reviews the important aspects for periodontal diagnosis in a contemporary approach, and endeavors to establish challenges for improving periodontal diagnosis, especially in Latin America. Considering that contemporary periodontal diagnosis should be based on knowledge of the etiopathogenesis of periodontal diseases, this paper highlights that the recently proposed classification system for periodontal diseases and conditions was based on the best available evidence. This system was conceived for individual diagnosis, therefore, its use in research and epidemiological settings might be limited. The system leads to a practical implication that stresses the importance of interviewing the patient, thorough periodontal charting, and requesting any imaging and other complementary tests necessary. An important observation is that partial periodontal data recordings usable for screening are not diagnostic methods and might underestimate disease. The goals of utmost importance for Latin America are to increase the awareness of both the population and the profession and to prioritize correct periodontal diagnosis. In addition, learning how to use the new classification system will help with diagnosing periodontal diseases.

**Keywords:** Diagnosis; Periodontal Diseases; Latin America.

## Introduction

Diagnosis of periodontal diseases and conditions has been subject to a series of controversies that led to difficulties in communication, and especially to different clinical approaches in Dentistry. The art of diagnosis should be considered above any classification system which, per se, is an arbitrary way of distinguishing different forms of disease and conditions. In this sense, this paper will make a contemporary approach to the diagnosis of the periodontal health/disease process, in an endeavor to understand its challenges, and to propose possible solutions, especially for Latin American countries. The paper was part of a Workshop including experts from Latin America. Contributions from the discussion are included in the article.

Historically, Dentistry has focused mainly on dental caries, since this was the major cause of tooth loss, pain, and impairment of oral health. This has led to a practice of underdiagnosis of periodontal diseases and conditions. After the decline in the occurrence of dental caries, and advent of understanding the importance of more comprehensive oral care, periodontal diseases need to be looked upon with more attention, from a health perspective of individuals and populations. This is supported by evidence of the role of periodontal diseases in oral outcomes *e.g.* tooth loss, as well as possible relations with other systemic conditions and oral health-related quality of life.[1,2,3] Studies have demonstrated that routine periodontal diagnosis is not performed as it would be expected. Several clinicians even have trouble with making a diagnosis, or they might find more than one differential diagnosis.[2,4] This is probably a reflection of how periodontal diagnosis is approached in dental schools and the way the health systems value periodontal clinical assessment and management.

## Diagnosis of the periodontal health/disease process

One important aspect that surrounds the art of diagnosis of periodontal health/disease process is the distinction between epidemiological and clinical settings. The aim of epidemiological surveys is to describe the occurrence of health and disease states in populations, associating them with possible risk factors/indicators. Therefore, epidemiological studies are not focused on individual diagnosis as such. The misunderstanding of the role of these epidemiological surveys has led to confusion in terms of diagnosis of periodontal diseases. Diagnosis of periodontal diseases from an individual perspective should be focused on the person as a whole. In this sense, data from epidemiological studies will be used to build the knowledge that will guide the process of diagnosis. There is one point of consensus: periodontal disease cannot be diagnosed after the tooth is about to be lost due to periodontal breakdown.

Periodontal diseases have been classified in different ways. The point that needs to be reinforced is that the periodontal health/disease process clinically manifests in two main types of impairment: gingivitis and periodontitis. The distinction between these two diseases is mainly based on the concomitant occurrence of loss of attachment. Gingivitis is an inflammatory process triggered by the presence of supragingival biofilm, and is not associated with periodontal breakdown. Periodontitis occurs after imbalance between the presence of subgingival biofilm and the host response, leading to loss of periodontal attachment and bone. Since both diseases have a background of an inflammatory process, diagnosis should include these aspects in the interview with the patient, in the physical examination, and with additional diagnostic tests that could help in the diagnosis.[5]

In 2018, a Joint Workshop hosted by both the European Federation of Periodontology and the American Academy of Periodontology launched a new classification system for periodontal and peri-implant diseases and conditions. An impressive effort was made to improve the existing classification systems.[6] Professionals usually require a learning curve to enable the new classification system to be adopted worldwide. The system comprises gingival health, gingivitis, periodontitis and peri-implant diseases and conditions. An in-depth study by the profession is necessary to enable implementation of this new system. The main difference from the existing classification, which was launched by the American Academy of Periodontology in 1999[5], is the fact that a more comprehensive diagnosis process is required when trying to establish case definitions. The system is based on the best available evidence, however, in some situations low-level evidence had to be used. An extremely important aspect to understand is that the classification system was not meant to be a priority for epidemiology or research, but was meant for individual diagnosis. Of course, it needs to be understood that the extensive study conducted in the literature should be the basis for epidemiological and research, without the need for complete standardization between these two activities. This paper acknowledges that a part of the new system was dedicated to defining gingival health - from pristine gingival health to clinically

healthy gingiva. In addition, this paper points out that periodontitis was mainly classified into stages and grades. This system allows the understanding that in each patient, both rate of progression and the way the function is affected, and accounts for tooth loss, for example. The system needs further evaluation, and when considered necessary, improvement. Close attentive reading of the special issues of both Journal of Clinical Periodontology and Journal of Periodontology is strongly recommended, in which the system is thoroughly presented.

## Periodontal diagnosis in practice

This paper emphasizes the importance of general practicioners and specialists being well trained in diagnostic capabilities. Specialists should also perform more in depth examination of complex cases. Furthermore, although this article has focused on periodontal diagnosis, it is mandatory that dentists should be proficient in oral health diagnosis. For example, root caries is a very frequent situation in periodontal individuals, and it should not be underdiagnosed.

The interview with the patient is of utmost importance in periodontal diagnosis. This is a challenge to dental schools, since a comprehensive interview is one of the keys of periodontal diagnosis. For example, in terms of other systemic conditions, classification systems have listed over 50 conditions related to the occurrence of periodontal diseases, from hormonal changes, exposure to environmental factors to rare syndromes.[5] Professionals need to have this knowledge and incorporate it into the interview with the patient. Moreover, since periodontal diseases are linked to behavioral components including oral hygiene methods, these should be part of the diagnostic process

The physical examination should consider the understanding that periodontal diseases are of a chronic nature. The progression of untreated periodontitis is known to be slow, therefore limiting the rapid clinical impact.[7] In this sense, periodontal physical examination still is based on the history of disease. Therefore, the most used diagnostic tool is periodontal probing, for the purpose of understanding both the inflammatory status (e.g. with probing depth or bleeding on probing) or the history of disease (with loss of attachment). This is also one of the best tools for monitoring progression of disease over time.[8] Considering the foregoing information, it is a consensus that in some way, every dentist needs to perform periodontal probing in every patient. The new classification system calls for probing attachment loss to enable better diagnosis of periodontitis.[6] Of course, for epidemiological reasons, periodontal probing to obtain the history of disease progression should be performed mainly in adult individuals. Children should be periodontally diagnosed with probing and/or radiographs if they have family history of periodontal disease.

Periodontal probing is known to be time consuming and laborious and this is one of the reasons why it has not been as widely used as expected. This paper urges that dental training reinforces the importance of using this tool to increase the quality of oral diagnosis.[6] Reported differences have been observed for different types of probes (manual vs. automatized/computerized).[8] Therefore, practitioners are encouraged to use any type of probe. The gold standard for periodontal diagnosis is full mouth periodontal examination, i.e. periodontal probing in six sites per tooth (disto-buccal, mid-buccal, mesio-buccal, disto-palatal/lingual, mid-palatal/lingual, mesio-palatal/lingual). When this approach is adopted, there are few chances of misdiagnosis of periodontal diseases.[9, 10] However, other simplified approaches have been proposed in an attempt to increase the number of dentists routinely performing periodontal examinations.

It should be kept in mind that screening is the main aim of any type of partial examination, thus if periodontal disease is found by means of this approach, complete periodontal charting is mandatory. Susin et al.[11] tested 7 partial recording protocols based both on full mouth and in half mouth examinations and observed that all partial examination protocols underestimated the occurrence of periodontal disease. The best partial recording protocol found in this study was probing 3 sites per tooth (mesio-buccal, mid-buccal and disto-lingual). Nevertheless, this is still time consuming. The more severe the disease is,

the worse partial recording for periodontal diagnosis will be. Therefore, the recommendation is that if an individual has periodontitis, full-mouth periodontal probing must be performed.

An alternative has been proposed for periodontal screening; that is the so called basic periodontal examination (periodontal screening and recording).[4] This examination is based on probing all the teeth and scoring the sextant according to probing depth. When deeper probing depths are observed, a full-mouth periodontal examination is recommended. This is an interesting alternative, for those who understand that periodontal charting is not necessary. However, it must be borne in mind that this type of periodontal diagnosis has the potential to underestimate the disease. On the other hand, if this were the only alternative considered for periodontal diagnosis, this would allow screening of more severe cases. Screening is an effective way of covering a larger number of the population. In different settings, this should be subject to discussion. The premise is that "doing something is better than doing nothing". This is partially true, especially in individual situations. It should be emphasized that screening is not diagnosis.

In addition to interviewing the patient and periodontal physical examination, additional diagnostic tests are available. Image tests are the most used in terms of periodontal diagnosis. However, considering the international guidelines for radioprotection, they should be preceded by clinical indication, i.e. data from either the interview with the patient or from the physical examination are the core factors for indicating imaging examinations. The most common image tests used in periodontal diagnosis are periapical and panoramic radiographs, and more contemporarily, the cone-beam computed tomography (CBCT). All of them expose the individual to x-rays and therefore need to be limited. This paper recommends that the practitioners must be aware of the international guidelines for radioprotection before indicating such examinations.[12]

The panoramic radiograph is one of the most cost-effective images, however, in cases of periodontal breakdown, it offers limited image detail. Therefore, in cases of moderate disease, complementation with selected periapical or vertical bitewings is warranted, and in cases of severe periodontal disease, a complete periapical radiographic examination could be necessary. The use of CBCT is restricted to specific periodontal situations, including endo-perio relationships, fractures, perforations, etc.[13]

The most important aspect of image tests is that they are comprehensively analyzed, in order to yield a better diagnosis. In the specific case of periodontal diseases, the bone crest deserves special attention, both in terms of the presence of lamina dura (which might be indication of periodontal stability), and the amount of lost periodontal bone, especially for future analyses of disease progression.

Sophisticated diagnostic methods have been proposed in the literature, including microbiological, immunological, physical, molecular assays.[14] These methods have been extensively used in research. However, for the clinical approach, they have not proved to be necessary up to now. On the other hand, the desire is that more accurate diagnostic tools will be developed in the future, since the available tools are still based on probing, which is rudimentary and could be replaced by a more precise device.

Furthermore considering the complexity of peridontal disease, it is not possible to think of the diagnosis of periodontal diseases outside the concept of integral care, which includes additional tests (glycated hemoglobin data in diabetic individuals, or the aid of other blood tests in systemically compromised individuals), but not only that, the professional during the clinical examination should remember that to take care of a human being, it is necessary to consider aspects such as: life history, family dynamics, exposure to risk factors, social aspects and psychology.

## Goals for Latin America – concluding remarks

This section reviewed the important aspects of periodontal diagnosis, in an evidence-based approach, trying to summarize the state of the art, and taking into consideration the characteristics of the dental profession in Latin American countries.

These countries have experienced continuous development in oral health care. However, the prevalence of periodontal diseases is still high and a burden of disease is observed in the region. In addition, cultural and socioeconomic characteristics are common in the area, which call for specific approaches. With the aim of increasing the quality of the profession even further, the following aspects should be considered:

a. A call for action is necessary to increase awareness of periodontal diseases to enhance the quality of oral health care and proper maintenance of teeth throughout the patient's life;
b. Dental professionals should be trained right from the undergraduate curriculum to appropriately diagnose periodontal diseases and to successfully achieve prevention of periodontal pathology;
c. Dental professionals need to increase awareness in the community about periodontal diseases. Therefore, the information that gingival bleeding is not normal, and that tooth spacing or mobility might be signs of periodontal disease, etc. should be spread. Additionally, the use of self-reported periodontal diagnosis could be utilized;
d. Dental practitioners should be aware of systemic and behavioral aspects that are linked to periodontal diseases and include them in the interview with the patient; they must be able to work at a multidisciplinary level in cases in which this is required to accomplish overall health;
e. Oral health professionals should routinely perform periodontal clinical examination, according to the level of disease of the patient;
f. Additional diagnostic tests should be understood as being part of periodontal diagnosis and practitioners should know how to use them to obtain their best diagnostic yield;
g. Dental professionals should understand the periodontal health/disease process to enable them to approach it correctly, either by themselves or to refer their patients for a proper approach to treatment;
h. A learning process with continuous evaluation of the new classification system is important for the purpose of standardizing periodontal diagnosis in Latin America. In addition, it is necessary to promote constant periodontal education in the dental community.

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This paper was prepared for the consensus meeting titled "Periodontal disease and its impact on general health in Latin America - Latin American Consensus", promoted by the Latin American Oral Health Association (LAOHA) and Colgate Palmolive Co. with participation of experts from the region, including representatives from Periodontal Societies of Latin America. All participants had the opportunity to review the content, and eventually make their own contributions. Consensus Report was based on this paper. The authors point out that they have no conflicts of interest.

## References

1. Cardoso EM, Reis C, Manzanares-Céspedes MC. Chronic periodontitis, inflammatory cytokines, and interrelationship with other chronic diseases. Postgrad Med. 2018 Jan;130(1):98-104. https://doi.org/10.1080/00325481.2018.1396876
2. Haag DG, Peres KG, Balasubramanian M, Brennan DS. Oral conditions and health-related quality of life: a systematic review. J Dent Res. 2017 Jul;96(8):864-74. https://doi.org/10.1177/0022034517709737
3. 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. J Clin Periodontol. 2018 Feb;45(2):138-49. https://doi.org/10.1111/jcpe.12808
4. Preshaw PM. Detection and diagnosis of periodontal conditions amenable to prevention. BMC Oral Health. 2015;15(S1 Suppl 1):S5. https://doi.org/10.1186/1472-6831-15-S1-S5
5. Armitage GC. Development of a classification system for periodontal diseases and conditions. Ann Periodontol. 1999 Dec;4(1):1-6. https://doi.org/10.1902/annals.1999.4.1.1

6. Caton JG, Armitage G, Berglundh T, Chapple IL, Jepsen S, Kornman KS, et al. A new classification scheme for periodontal and peri-implant diseases and conditions - Introduction and key changes from the 1999 classification. J Periodontol. 2018 Jun;89 Suppl 1:S1-8. https://doi.org/10.1002/JPER.18-0157
7. Teles R, Moss K, Preisser JS, Genco R, Giannobile WV, Corby P, et al. Patterns of periodontal disease progression based on linear mixed models of clinical attachment loss. J Clin Periodontol. 2018 Jan;45(1):15-25. https://doi.org/10.1111/jcpe.12827
8. Donos N. The periodontal pocket. Periodontol 2000. 2018 Feb;76(1):7-15. https://doi.org/10.1111/prd.12203
9. Kingman A, Susin C, Albandar JM. Effect of partial recording protocols on severity estimates of periodontal disease. J Clin Periodontol. 2008 Aug;35(8):659-67. https://doi.org/10.1111/j.1600-051X.2008.01243.x
10. Silva-Boghossian CM, Amaral CS, Maia LC, Luiz RR, Colombo AP. Manual and electronic probing of the periodontal attachment level in untreated periodontitis: a systematic review. J Dent. 2008 Aug;36(8):651-7. https://doi.org/10.1016/j.jdent.2008.04.015
11. Susin C, Kingman A, Albandar JM. Effect of partial recording protocols on estimates of prevalence of periodontal disease. J Periodontol. 2005 Feb;76(2):262-7. https://doi.org/10.1902/jop.2005.76.2.262
12. Dula K, Benic GI, Bornstein M, Dagassan-Berndt D, Filippi A, Hicklin S, et al. SADMFR Guidelines for the Use of Cone-Beam Computed Tomography/Digital Volume Tomography. Swiss Dent J. 2015;125(9):945-53
13. Tugnait A, Carmichael F. Use of radiographs in the diagnosis of periodontal disease. Dent Update. 2005 Nov;32(9):536-8, 41-2. https://doi.org/10.12968/denu.2005.32.9.536
14. Armitage GC. Learned and unlearned concepts in periodontal diagnostics: a 50-year perspective. Periodontol 2000. 2013 Jun;62(1):20-36. https://doi.org/10.1111/prd.12006

# Periodontal disease and its impact on general health in Latin America. Section V: Treatment of periodontitis

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**Abstract:** Gingivitis and periodontitis are associated with a negative impact on Oral Health Related Quality of Life (OHRQoL), exerting a significant influence on aspects related to the patients' function and esthetics. Periodontitis has been associated with several systemic conditions, including adverse pregnancy outcomes, cardiovascular diseases, type 2 diabetes mellitus (DM), respiratory disorders, fatal pneumonia in hemodialysis patients, chronic renal disease and metabolic syndrome. The aim of this paper was to review the results of different periodontal treatments and their impacts on patients' OHRQoL and systemic health. Non-surgical and surgical periodontal treatments are predictable procedures in terms of controlling infection, reducing probing pocket depth and gaining clinical attachment. In addition, the treatment of periodontitis may significantly improve OHRQoL and promote a reduction in the levels of systemic markers of inflammation, including some cytokines associated with cardiovascular diseases. Studies have also suggested that periodontal treatment may improve glycemic control in patients with DM. Strategies and actions for preventing the onset and recurrence of periodontitis, and the challenges facing the field of periodontology in the XXI century are presented in this review.

**Keywords:** Periodontics; Periodontal Debridement; Quality of Life; Cardiovascular Diseases; Diabetes Mellitus.

## Introduction

Periodontitis is a chronic multifactorial inflammatory disease associated with a dysbiotic biofilm and characterized by progressive destruction of the tooth-supporting apparatus, which can lead to tooth loss.[1] Although it may progress with swelling and bleeding, periodontitis is normally considered a silent disease. However, this concept may not be accurate, since health and well-being are not merely medical concepts, but are encompassed by the biopsychosocial model. The American Dental Association (ADA) states that '*Oral health is a functional, structural, aesthetic, physiologic and psychological state of well-being and is essential to an individual's general health and quality of life*'.[2] Oral Health Related Quality of Life (OHRQoL) has been widely recognized as a valid parameter of assessment in almost every area of a person's physical and mental

health care, including oral health.[3,4,5] Periodontitis has been also associated with several systemic conditions, including adverse pregnancy outcomes,[6] cardiovascular diseases,[7] respiratory diseases, cancer, lupus, rheumatoid arthroses, diabetes mellitus (DM)[8] and chronic kidney disease.[9] The biological plausibility of these associations relies mainly on the low systemic inflammatory burden that has been associated with periodontitis.[10]

Periodontal treatment can improve not only periodontal parameters such as gingival bleeding, probing pocket depth and attachment levels, but also subjective OHRQoL. Therefore, OHRQoL might be considered an important endpoint to fully assess the efficacy of periodontal therapy for oral health. Periodontal treatment has been shown to reduce short-term levels of systemic markers of inflammation,[10] surrogate outcomes, and may, therefore, contribute to the control of other diseases.

The aim of this paper was to review the results of different periodontal treatments and their impacts on patients' OHRQoL and systemic health. This paper was part of the Latin American Oral Health Association (LAOHA) Workshop that included experts from different Latin America countries. Contributions from the discussions are included in the article.

### Periodontal disease and Oral Health-Related Quality of Life (OHRQoL)

In spite of its ubiquitous nature and the deleterious impact on the periodontium, periodontitis can progress as a 'silent disease' as it may be accompanied by swelling, bleeding and/or tooth mobility in the complete absence of pain. The recognition that health and well-being are not merely medical concepts, but are encompassed by the biopsychosocial model has been accepted for many years. OHRQoL has been defined as "an individual's perception of their position in life in the context of culture and value systems in which they live and in relation to their goals, expectations, standards and concerns".[3] Periodontal diseases play a significant role in oral health and impact on the QoL of affected individuals[4,5] and they may present a dose-response relationship.[11] A systematic review demonstrated that gingivitis and periodontitis were associated with a negative impact on OHRQoL, with a significant impact on aspects related to function and esthetics,[12] while another systematic review showed that tooth loss was associated with negative impacts on general OHRQoL.[13] Periodontitis in young subjects and adults may be associated not only with worse OHRQoL, but also with higher dental anxiety.[14,15] Therefore, the early diagnosis and treatment of periodontitis is important for the individual general health, and the perception of periodontitis as a "silent disease" should be changed.[11]

### Periodontal diseases and their association with systemic conditions

Periodontitis has been associated with several systemic conditions, including adverse pregnancy outcomes[6], cardiovascular diseases,[7,16] type 2 DM,[8] respiratory diseases,[17] pneumonia mortality in hemodialysis patients,[18] chronic kidney disease[9] and metabolic syndrome.[19] Early stages of atherosclerosis may be associated with severe chronic periodontitis related to endothelial and microvascular dysfunctions.[20] The biological plausibility of these associations relies mainly on the low systemic inflammatory burden that has been associated with periodontitis.[21] Increased levels of IL-1, IL-6 and TNF-α were observed in blood samples of patients with periodontitis.[21] A systematic review indicated that C-Reactive Protein levels were significantly higher among patients with chronic periodontitis.[10] In Brazilian populations, this observation was confirmed in systemically healthy patients[22] and patients with refractory arterial hypertension,[23] type 2 DM[24] and chronic kidney disease.[25] In diabetic patients, cardiovascular complications were associated with periodontitis, including increased overall mortality, coronary heart disease and stroke.[8] A multi-center study in Brazil indicated that diabetic patients with periodontitis had increased odds of microvascular complications and of hospitalizations related to hyperglycemia and ketoacidosis.[26]

## Periodontal treatment

Non-surgical (NSPT) and surgical periodontal treatment (SPT) are predictable procedures in terms

of controlling infection, reducing probing pocket depth (PPD) and gaining clinical attachment level (CAL).[27] Good plaque control is crucial to maintain periodontal health, and data related to tooth brushing behavior supported this statement.[28,29,30] An 11-year study showed that tooth brushing was associated with a decrease in the number of teeth with periodontal pocketing. There was a clear dose–response relationship between tooth brushing frequency and change in the number of teeth with PPD ≥ 4 mm.[30] Daily interdental brushing or flossing appeared to be the most effective procedures for reducing plaque and gingivitis scores, and was also the least expensive preventive therapy.[31]

Scaling and root planning (SRP) is considered the gold standard non-surgical treatment for periodontitis and its clinical efficacy has been well documented by several systematic reviews.[32,33] Even teeth with extensive periodontal destruction may be retained and treated. Plaque removal and SRP may reduce gingival bleeding on probing in approximately 45% of sites.[34] After NSPT, PPD reductions varied from 1–1.3 mm for pockets with initial PPD of 5–6 mm to 2–2.2 mm for PPD > 7 mm; CAL could improve by 0.5–2 mm.[32,33] NSPT may be delivered by conventional staged or full-mouth approaches. No clear difference existed between the 2 types of treatment, and the selected option may be chosen according to the specific situation.[35]

Tooth type, the degree of periodontal destruction, local factors, medical background and patients' age may interfere with the effectiveness of SRP. Non-molar teeth demonstrated higher PPD reduction after SRP than molars.[35] However, NSPT alone may not be sufficient to reestablish periodontal health in cases of patients with advanced periodontitis.[36] Thus, other forms of therapies, such as lasers, antiseptics, systemic antibiotics, host-modulators and probiotics have been suggested as adjuncts to SRP in order to potentiate the effects of this treatment.[35] Among other adjunctive therapies to SRP, amoxicillin and metronidazole have proven strong scientific evidence for their use in daily clinical practice. The clinical benefits of this treatment protocol have been supported by recent systematic reviews[37,38,39,40] and randomized clinical trials (RCTs) with 1 to 2 years of follow up.[41,42,43,44] In addition, a recent systematic review[45] concluded that adjunctive probiotics could result in additional CA gain in adults with periodontitis. Nonetheless, further high-quality RCTs including microbiological analyses are necessary before determining whether probiotics should be used for the treatment of periodontitis in daily clinical practice.

Intrabony and furcation defects may be treated by conservative, resective or regenerative surgeries. A meta-analysis of studies evaluating conservative surgery for the treatment of intrabony defects found a PPD reduction of 2.9 mm and CA gain of 1.7 mm at 12 months post-treatment.[46] Regenerative surgeries were mainly used for deep intrabony defects. Guided tissue regeneration and enamel matrix derivatives showed similar magnitudes of PPD reduction and CA gain: 1.2 mm.[47] In addition, the presence of furcation defects may increase the risk of tooth loss. Nibali et al.,[48] in a systematic review, described that the average tooth loss/year was 0.01 and 0.02 for molars without and with furcation involvement, respectively, in patients under supportive periodontal therapy for up to 10–15 years. The results showed that around 10% of the molars treated by root resection or by regenerative procedures in furcation and intrabony defects were lost during supportive treatment.[48]

## Periodontal treatment and OHRQoL

In addition to improvements in traditional clinical parameters, subjective OHRQoL should be considered an important endpoint for treatment with the aim of fully assessing the efficacy of periodontal therapy. Two systematic reviews were published on this topic.[11,49] The focused question of these reviews was "Does surgical or non-surgical periodontal therapy improve the OHRQoL in adults with periodontal disease"? The results indicated a statistically significant improvement in OHRQoL after NSPT. No significant differences were reported between different forms of NSPT. SPT had a relatively lower impact on OHRQoL and a correlation between poor clinical response to therapy and poor OHRQoL outcomes was observed. Functional (eating/chewing), psychological (appearance/discomfort) and physical

(pain) domains were the most affected at baseline, while functional and psychological domains as well as pain were those that improved the most after NSPT. OHRQoL improved with periodontal therapy, particularly after supragingival treatment, suggesting that this intervention was important for reducing the negative impacts of periodontal diseases in OHRQoL.

## Periodontal treatment and other diseases

### Treatment of periodontitis and cardiovascular disease (CVD)

Periodontal treatment has been shown to be effective in reducing short-term levels of systemic markers of inflammation.[10] Short-term studies have shown a reduction in systemic markers associated with CVD, including IL-1, IL-6 and fibrinogen,[23,25,50] after NSPT. A RCT indicated that the median values of C-reactive protein, total cholesterol and triglycerides were reduced after 6 months of periodontal treatment.[22] Two pilot studies described outcomes in the management of patients with CVD, after 6 months of NSPT.[23,25] Vidal et al.[23] observed reduction of cardiovascular markers, such as systolic and diastolic blood pressure and left ventricular mass in patients with severe chronic periodontitis and refractory arterial hypertension. These improvements were comparable with the introduction of a new medicine. In addition, six months after NSPT in patients with chronic renal diseases and periodontitis, there was a significant improvement in the estimated glomerular rate.[25] The probable link between these observations was related to an improvement of the endothelial dysfunction.[23,25]

## Treatment of periodontitis and glycemic control

Periodontitis may impair glycemic control in patients with DM,[51] and periodontal treatment may improve glycemic control in patients with DM, as demonstrated by systematic reviews with meta-analysis[8,52] and RCTs.[24,53] Reduction in HbA1c is an established outcome measure of successful DM treatment.[54] Evidence derived from a recent meta-analyses showed that NSPT resulted in a statistically significant reduction in HbA1C levels at 3 months post-treatment of about 0.40% (range: 0.27%–0.65%), while at 6 months, the estimated reduction was lower.[55] This decrease was considered equivalent to the introduction of a new medicine. A recent 1-year, double-blind and placebo-controlled RCT[24] demonstrated a significant improvement of the mean C-reactive protein and mean glucose and HbA1C levels after NSPT in adults with periodontitis and type 2 DM. Merchant et al.[56] demonstrated that after 1.7 years of follow-up, long term periodontal care improved long-term glycemic control among individuals with type 2 DM and periodontal disease. The reduction in HbA1c levels was greater among individuals with higher baseline HbA1c levels. Another group of investigators suggested that the beneficial effect of treating periodontitis on HbA1c may be sufficient to justify periodontal treatment in patients with type 2 DM at accepted cost-effectiveness thresholds in the UK[57]. On the other hand, at least one recent RCT[58] and one systematic review[59] have suggested that not even the adjunctive use of systemic antibiotics during periodontal treatment was able to promote a significant reduction of HbA1c levels in patients with type 2 DM.

In summary, although the reduction of HbA1C levels after periodontal treatment has not yet been completely determined, therefore, considering the high prevalence of periodontal disease in type 2 DM patients, the available data showing a positive effect of periodontal treatment on glycemic control and the oral health benefits for the patients' systemic health justify the inclusion of periodontal assessment and treatment in clinical guidelines for the management of DM.[57]

## Strategies for preventing periodontitis

Most patients with periodontitis can be predictably treated and maintained. However, approximately 20–25% of patients with periodontitis will continue to exhibit disease progression, despite proper therapy and maintenance. The predictable periodontal treatment outcomes for most patients has changed the marketplace, in which patients are treated by general dentists and dental hygienists. Periodontics should include the management of and decision-making about tooth retention in advanced periodontitis cases, complex dental implant cases and control of systemic inflammation resulting from certain types of periodontitis.[60]

Population-based measures for preventing periodontal disease, primarily target changes in individual behavior. Interventions to prevent and control periodontal diseases are focused on the individual level, and therefore, address behavior rather than social conditions. However, adults are more difficult to reach when compared with children, if they do not seek the dentist of their own accord. The only prevention activity for periodontitis successfully performed at a population level seems to have been anti-smoking campaigns, although evidence of their efficacy is completely lacking. A major goal for the prevention of periodontal diseases should, therefore, be to change people's behavior in the direction of a lifestyle that is more conducive to health at an individual level[61].

## Actions for prevention of periodontitis

a. Anti-smoking campaigns and promotion of smoking cessation.
b. Promotion of oral hygiene practices. Among disadvantaged populations, a key factor of self-care hygiene practices is the ability to afford a toothbrush/toothpaste/interdental device. The production and sale of affordable toothbrushes would enable poorer populations to access and use these products. Partnerships between governments, national and multi-national companies, health professionals and local communities are necessary. Reduction of taxation levels on oral hygiene products would have a major effect by making these items affordable and accessible, particularly in populations from low- and middle- income countries in Latin America.
c. Stimulate the use of tele-dentistry, a broad variety of technologies and tactics to deliver virtual medical, health, and educational services to communities and dentists. The use of telehealth systems and methodologies in dentistry may include patient care and delivery of education using Information and Communication Technologies (ICTs).[2]
d. Dental schools may stimulate the concept of a health promotion environment for students, staff and the community.

Gingivitis, mild forms of periodontitis and edentulism appear to be declining.[62] However, the percentage of severe periodontitis remained unchanged.[63] This trend may be an indication that primary prevention, including improvement of oral hygiene procedures and regular programs of professional health care have contributed to the reduction in the prevalence of gingivitis and mild forms of periodontitis. On the other hand, because of the global population growth (from 5.5 billion in 1990 to 7.4 billion in 2015), ageing societies (globally, the proportion of people 65 years and older increased from 6.0% in 1990 to 8.2% in 2015) and increased tooth retention, the number of people affected by periodontitis has grown substantially, increasing the total burden of this disease globally. Estimates have indicated that between 1990 and 2013, the number of people affected by severe periodontitis increased by 67%.[64] The global economic impact of oral disease in 2010 has been estimated at US$ 442 billion.[65]

By 2050, it is estimated that 22% of the world´s population will be older than 60 years of age. As a result, 80% of older adults will suffer from at least one chronic disease, and 50% will suffer from at least 2 disorders.[66] With the world population aging, early identification of individuals with a particular aging trajectory is necessary, as these are individuals at risk for early development of non-communicable chronic diseases (NCD), such as DM and CVD. By the year of 2030, the estimated percentage of worldwide deaths caused by NCD will be 70%. This trend would be seen for high, middle and low-income countries.[67] Care of NCD patients in the dental office is both a challenge and an opportunity. Periodontal professionals must increase their level of communication with other healthcare professionals, especially physicians and nurses, to identify all possible relations between these chronic diseases. Periodontitis should be regarded as a "sign post" condition, which could indicate that a patient may have an underlying chronic NCD (e.g. undiagnosed DM). The number of teeth maintained is a marker for general health, healthy aging and a longer lifespan. Sharing the importance

and significance of retained teeth with both dental and non-dental health-care providers may provide a valuable impetus to improve oral hygiene and retain teeth. Periodontal disease, tooth loss and longevity may be related.[68]

## Challenges facing the field of periodontology in the 21st Century: concluding remarks

a. Promote adequate communication between general dentists and periodontists, so that they know in which periodontal affections the patient could require a more specialized treatment, especially in those cases when non-surgical therapy does not achieve periodontal health.
b. Increase participation of periodontists in the decision-making about tooth extraction and implant reconstruction, and management of advanced, complex periodontal cases. Dentists ARE trained to PRESERVE teeth.[69]
c. Periodontists should establish connections with non-dental healthcare professionals, including physicians and nurses, who urgently need to know about the fundamentals of the onset and progression of periodontal diseases.
d. Dental schools could participate in developing educational programs for dentists and for non-dental healthcare professionals.
e. National Dental Associations could help policy makers and governments to promote the recognition of oral health as a vital and integral aspect of general health and wellbeing.

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## References

1. Papapanou PN, Sanz M, Buduneli N, Dietrich T, Feres M, Fine DH, et al. Periodontitis: Consensus report of workgroup 2 of the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions. J Periodontol. 2018 Jun;89 Suppl 1:S173-82. https://doi.org/10.1002/JPER.17-0721
2. American Dental Association - ADA. D9995 and D9996 ADA guide: version 1. Chicago: American Dental Association, 2017 [cited 2018 Dec 20]. Available from: https://www.ada.org/~/media/ADA/Publications/Files/D9995andD9996_ADAGuidetoUnderstandingandDocumentingTeledentistryEvents_v1_2017Jul17.pdf?la=en
3. Sischo L, Broder HL. Oral health-related quality of life: what, why, how, and future implications. J Dent Res. 2011 Nov;90(11):1264-70. https://doi.org/10.1177/0022034511399918
4. Meusel DR, Ramacciato JC, Motta RH, Brito Júnior RB, Flório FM. Impact of the severity of chronic periodontal disease on quality of life. J Oral Sci. 2015 Jun;57(2):87-94. https://doi.org/10.2334/josnusd.57.87
5. Needleman I, McGrath C, Floyd P, Biddle A. Impact of oral health on the life quality of periodontal patients. J Clin Periodontol. 2004 Jun;31(6):454-7. https://doi.org/10.1111/j.1600-051X.2004.00498.x
6. Ide M, Papapanou PN. Epidemiology of association between maternal periodontal disease and adverse pregnancy outcomes—systematic review. J Clin Periodontol. 2013 Apr;40 Suppl 14:S181-94. https://doi.org/10.1111/jcpe.12063
7. Humphrey LL, Fu R, Buckley DI, Freeman M, Helfand M. Periodontal disease and coronary heart disease incidence: a systematic review and meta-analysis. J Gen Intern Med. 2008 Dec;23(12):2079-86. https://doi.org/10.1007/s11606-008-0787-6
8. Graziani F, Gennai S, Solini A, Petrini M. A systematic review and meta-analysis of epidemiologic observational evidence on the effect of periodontitis on diabetes An update of the EFP-AAP review. J Clin Periodontol. 2018 Feb;45(2):167-87. https://doi.org/10.1111/jcpe.12837
9. Chambrone L, Foz AM, Guglielmetti MR, Pannuti CM, Artese HP, Feres M, et al. Periodontitis and chronic kidney disease: a systematic review of the association of diseases and the effect of periodontal treatment on estimated glomerular filtration rate. J Clin Periodontol. 2013 May;40(5):443-56. https://doi.org/10.1111/jcpe.12067

10. Paraskevas S, Huizinga JD, Loos BG. A systematic review and meta-analyses on C-reactive protein in relation to periodontitis. J Clin Periodontol. 2008 Apr;35(4):277-90. https://doi.org/10.1111/j.1600-051X.2007.01173.x
11. Buset SL, Walter C, Friedmann A, Weiger R, Borgnakke WS, Zitzmann NU. Are periodontal diseases really silent? A systematic review of their effect on quality of life. J Clin Periodontol. 2016 Apr;43(4):333-44. https://doi.org/10.1111/jcpe.12517
12. 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 Periodontal Res. 2017 Aug;52(4):651-65. https://doi.org/10.1111/jre.12436
13. Haag DG, Peres KG, Balasubramanian M, Brennan DS. Oral Conditions and Health-Related Quality of Life: A Systematic Review. J Dent Res. 2017 Jul;96(8):864-74. https://doi.org/10.1177/0022034517709737
14. Levin L, Zini A, Levine J, Weiss M, Lev R, Chebath Taub D, et al. Demographic profile, Oral Health Impact Profile and Dental Anxiety Scale in patients with chronic periodontitis: a case-control study. Int Dent J. 2018 Aug;68(4):269-78. https://doi.org/10.1111/idj.12381
15. Levin L, Zini A, Levine J, Weiss M, Lev RA, Hai A, et al. Dental anxiety and oral health-related quality of life in aggressive periodontitis patients. Clin Oral Investig. 2018 Apr;22(3):1411-22. https://doi.org/10.1007/s00784-017-2234-8
16. Tonetti MS, Van Dyke TE; Working group 1 of the joint EFP/AAP workshop. Periodontitis and atherosclerotic cardiovascular disease: consensus report of the Joint EFP/AAP Workshop on Periodontitis and Systemic Diseases. J Clin Periodontol. 2013 Apr;40 Suppl 14:S24-9. https://doi.org/10.1111/jcpe.12089
17. Sabharwal A, Gomes-Filho IS, Stellrecht E, Scannapieco FA. Role of periodontal therapy in management of common complex systemic diseases and conditions: an update. Periodontol 2000. 2018 Oct;78(1):212-26. https://doi.org/10.1111/prd.12226
18. Iwasaki M, Taylor GW, Awano S, Yoshida A, Kataoka S, Ansai T, et al. Periodontal disease and pneumonia mortality in haemodialysis patients: a 7-year cohort study. J Clin Periodontol. 2018 Jan;45(1):38-45. https://doi.org/10.1111/jcpe.12828
19. Nibali L, D'Aiuto F, Griffiths G, Patel K, Suvan J, Tonetti MS. Severe periodontitis is associated with systemic inflammation and a dysmetabolic status: a case-control study. J Clin Periodontol. 2007 Nov;34(11):931-7. https://doi.org/10.1111/j.1600-051X.2007.01133.x
20. Lira-Junior R, Figueredo CM, Bouskela E, Fischer RG. Severe chronic periodontitis is associated with endothelial and microvascular dysfunctions: a pilot study. J Periodontol. 2014 Dec;85(12):1648-57. https://doi.org/10.1902/jop.2014.140189
21. Loos BG. Systemic markers of inflammation in periodontitis. J Periodontol. 2005;76(11 Suppl):2106-15. https://doi.org/10.1902/jop.2005.76.11-S.2106
22. Caúla AL, Lira-Junior R, Tinoco EM, Fischer RG. The effect of periodontal therapy on cardiovascular risk markers: a 6-month randomized clinical trial. J Clin Periodontol. 2014 Sep;41(9):875-82. https://doi.org/10.1111/jcpe.12290
23. Vidal F, Figueredo CM, Cordovil I, Fischer RG. Periodontal therapy reduces plasma levels of interleukin-6, C-reactive protein, and fibrinogen in patients with severe periodontitis and refractory arterial hypertension. J Periodontol. 2009 May;80(5):786-91. https://doi.org/10.1902/jop.2009.080471
24. Mourão Carillo Jr R. LSMCAFRG. Homeopathy and periodontal treatment in type II diabetic patients: a 1-year randomized clinical trial. Braz Dent J. 2019 Mar-Apr;30(2):139-45. https://doi.org/10.1590/0103-6440201902124
25. Almeida S, Figueredo CM, Lemos C, Bregman R, Fischer RG. Periodontal treatment in patients with chronic kidney disease: a pilot study. J Periodontal Res. 2017 Apr;52(2):262-7. https://doi.org/10.1111/jre.12390
26. Oliveira LS, Lira-Junior R, Figueredo CM, Gomes MB, Fischer RG. Self-Reported Periodontitis and Complications in Type 1 Diabetes Patients: A Brazilian Nationwide Survey. Braz Dent J. 2016 Sep-Oct;27(5):599-603. https://doi.org/10.1590/0103-6440201601054
27. Feres M, Faveri M, Figueiredo LC, Teles R, Flemmig T, Williams R, et al. Group B Initiator paper. Non-surgical periodontal therapy: mechanical debridement, antimicrobial agents and other modalities. J Int Acad Periodontol. 2015 Jan;17(1 Suppl):21-30.
28. Kalf-Scholte SM, Van der Weijden GA, Bakker E, Slot DE. Plaque removal with triple-headed vs single-headed manual toothbrushes-a systematic review. Int J Dent Hyg. 2018 Feb;16(1):13-23. https://doi.org/10.1111/idh.12283
29. Van der Sluijs E, Slot DE, Hennequin-Hoenderdos NL, Van der Weijden GA. A specific brushing sequence and plaque removal efficacy: a randomized split-mouth design. Int J Dent Hyg. 2018 Feb;16(1):85-91. https://doi.org/10.1111/idh.12262
30. Joshi S, Suominen AL, Knuuttila M, Bernabé E. Toothbrushing behaviour and periodontal pocketing: An 11-year longitudinal study. J Clin Periodontol. 2018 Feb;45(2):196-203. https://doi.org/10.1111/jcpe.12844
31. Hyde S, Dupuis V, Mariri BP, Dartevelle S. Prevention of tooth loss and dental pain for reducing the global burden of oral diseases. Int Dent J. 2017 Sep;67 Suppl 2:19-25. https://doi.org/10.1111/idj.12328
32. Van der Weijden GA, Timmerman MF. A systematic review on the clinical efficacy of subgingival debridement in the treatment of chronic periodontitis. J Clin Periodontol. 2002;29(s3 Suppl 3):55-71. https://doi.org/10.1034/j.1600-051X.29.s3.3.x
33. Smiley CJ, Tracy SL, Abt E, Michalowicz BS, John MT, Gunsolley J, et al. Systematic review and meta-analysis on the nonsurgical treatment of chronic periodontitis by means of scaling and root planing with or without adjuncts. J Am Dent Assoc. 2015 Jul;146(7):508-24.e5. https://doi.org/10.1016/j.adaj.2015.01.028
34. Cobb CM. Clinical significance of non-surgical periodontal therapy: an evidence-based perspective of scaling and root planing. J Clin Periodontol. 2002 May;29(s2 Suppl 2):6-16. https://doi.org/10.1034/j.1600-051X.29.s2.4.x

35. Graziani F, Karapetsa D, Alonso B, Herrera D. Nonsurgical and surgical treatment of periodontitis: how many options for one disease? Periodontol 2000. 2017 Oct;75(1):152-88. https://doi.org/10.1111/prd.12201
36. Feres M, Figueiredo LC, Soares GM, Faveri M. Systemic antibiotics in the treatment of periodontitis. Periodontol 2000. 2015 Feb;67(1):131-86. https://doi.org/10.1111/prd.12075
37. Sgolastra F, Gatto R, Petrucci A, Monaco A. Effectiveness of systemic amoxicillin/metronidazole as adjunctive therapy to scaling and root planing in the treatment of chronic periodontitis: a systematic review and meta-analysis. J Periodontol. 2012 Oct;83(10):1257-69. https://doi.org/10.1902/jop.2012.110625
38. Keestra JA, Grosjean I, Coucke W, Quirynen M, Teughels W. Non-surgical periodontal therapy with systemic antibiotics in patients with untreated aggressive periodontitis: a systematic review and meta-analysis. J Periodontal Res. 2015 Dec;50(6):689-706. https://doi.org/10.1111/jre.12252
39. Keestra JA, Grosjean I, Coucke W, Quirynen M, Teughels W. Non-surgical periodontal therapy with systemic antibiotics in patients with untreated chronic periodontitis: a systematic review and meta-analysis. J Periodontal Res. 2015 Jun;50(3):294-314. https://doi.org/10.1111/jre.12221
40. Zandbergen D, Slot DE, Niederman R, Van der Weijden FA. The concomitant administration of systemic amoxicillin and metronidazole compared to scaling and root planing alone in treating periodontitis: =a systematic review=. BMC Oral Health. 2016 Feb;16(1):27. https://doi.org/10.1186/s12903-015-0123-6
41. Goodson JM, Haffajee AD, Socransky SS, Kent R, Teles R, Hasturk H, et al. Control of periodontal infections: a randomized controlled trial I. The primary outcome attachment gain and pocket depth reduction at treated sites. J Clin Periodontol. 2012 Jun;39(6):526-36. https://doi.org/10.1111/j.1600-051X.2012.01870.x
42. Harks I, Koch R, Eickholz P, Hoffmann T, Kim TS, Kocher T, et al. Is progression of periodontitis relevantly influenced by systemic antibiotics? A clinical randomized trial. J Clin Periodontol. 2015 Sep;42(9):832-42. https://doi.org/10.1111/jcpe.12441
43. Tamashiro NS, Duarte PM, Miranda TS, Maciel SS, Figueiredo LC, Faveri M, et al. Amoxicillin Plus Metronidazole Therapy for Patients with Periodontitis and Type 2 Diabetes: a 2-year Randomized Controlled Trial. J Dent Res. 2016 Jul;95(7):829-36. https://doi.org/10.1177/0022034516639274
44. Borges I, Faveri M, Figueiredo LC, Duarte PM, Retamal-Valdes B, Montenegro SC, et al. Different antibiotic protocols in the treatment of severe chronic periodontitis: a 1-year randomized trial. J Clin Periodontol. 2017 Aug;44(8):822-32. https://doi.org/10.1111/jcpe.12721
45. Ikram S, Hassan N, Raffat MA, Mirza S, Akram Z. Systematic review and meta-analysis of double-blind, placebo-controlled, randomized clinical trials using probiotics in chronic periodontitis. J Investig Clin Dent. 2018 Aug;9(3):e12338. https://doi.org/10.1111/jicd.12338
46. Graziani F, Gennai S, Cei S, Cairo F, Baggiani A, Miccoli M, et al. Clinical performance of access flap surgery in the treatment of the intrabony defect. A systematic review and meta-analysis of randomized clinical trials. J Clin Periodontol. 2012 Feb;39(2):145-56. https://doi.org/10.1111/j.1600-051X.2011.01815.x
47. Needleman IG, Worthington HV, Giedrys-Leeper E, Tucker RJ. Guided tissue regeneration for periodontal infra-bony defects. Cochrane Database Syst Rev. 2006 Apr;(2):CD001724. https://doi.org/10.1002/14651858.CD001724.pub2
48. Nibali L, Zavattini A, Nagata K, Di Iorio A, Lin GH, Needleman I, et al. Tooth loss in molars with and without furcation involvement - a systematic review and meta-analysis. J Clin Periodontol. 2016 Feb;43(2):156-66. https://doi.org/10.1111/jcpe.12497
49. Shanbhag S, Dahiya M, Croucher R. The impact of periodontal therapy on oral health-related quality of life in adults: a systematic review. J Clin Periodontol. 2012 Aug;39(8):725-35. https://doi.org/10.1111/j.1600-051X.2012.01910.x
50. Vidal F, Cordovil I, Figueredo CM, Fischer RG. Non-surgical periodontal treatment reduces cardiovascular risk in refractory hypertensive patients: a pilot study. J Clin Periodontol. 2013 Jul;40(7):681-7. https://doi.org/10.1111/jcpe.12110
51. Tsai C, Hayes C, Taylor GW. Glycemic control of type 2 diabetes and severe periodontal disease in the US adult population. Community Dent Oral Epidemiol. 2002 Jun;30(3):182-92. https://doi.org/10.1034/j.1600-0528.2002.300304.x
52. Teeuw WJ, Gerdes VE, Loos BG. Effect of periodontal treatment on glycemic control of diabetic patients: a systematic review and meta-analysis. Diabetes Care. 2010 Feb;33(2):421-7. https://doi.org/10.2337/dc09-1378
53. Quintero AJ, Chaparro A, Quirynen M, Ramirez V, Prieto D, Morales H, et al. Effect of two periodontal treatment modalities in patients with uncontrolled type 2 diabetes mellitus: A randomized clinical trial. J Clin Periodontol. 2018 Sep;45(9):1098-106. https://doi.org/10.1111/jcpe.12991
54. Chapple IL, Genco R. Diabetes and periodontal diseases: consensus report of the Joint EFP/AAP Workshop on Periodontitis and Systemic Diseases. J Clin Periodontol. 2013 Apr;40 Suppl 14:S106-12. https://doi.org/10.1111/jcpe.12077
55. Madianos PN, Koromantzos PA. An update of the evidence on the potential impact of periodontal therapy on diabetes outcomes. J Clin Periodontol. 2018 Feb;45(2):188-95. https://doi.org/10.1111/jcpe.12836
56. Merchant AT, Georgantopoulos P, Howe CJ, Virani SS, Morales DA, Haddock KS. Effect of Long-Term Periodontal Care on Hemoglobin A1c in Type 2 Diabetes. J Dent Res. 2016 Apr;95(4):408-15. https://doi.org/10.1177/0022034515622197
57. Solowiej-Wedderburn J, Ide M, Pennington M. Cost-effectiveness of non-surgical periodontal therapy for patients with type 2 diabetes in the UK. J Clin Periodontol. 2017 Jul;44(7):700-7. https://doi.org/10.1111/jcpe.12746
58. Miranda TS, Feres M, Perez-Chaparro PJ, Faveri M, Figueiredo LC, Tamashiro NS, et al. Metronidazole and amoxicillin as adjuncts to scaling and root planing for the treatment of type 2 diabetic subjects with periodontitis: 1-year outcomes of a randomized placebo-controlled clinical trial. J Clin Periodontol. 2014 Sep;41(9):890-9. https://doi.org/10.1111/jcpe.12282

59. Lira Junior R, Santos CM, Oliveira BH, Fischer RG, Santos AP. Effects on HbA1c in diabetic patients of adjunctive use of systemic antibiotics in nonsurgical periodontal treatment: A systematic review. J Dent. 2017 Nov;66:1-7. https://doi.org/10.1016/j.jdent.2017.08.001
60. Kornman KS, Giannobile WV, Duff GW. Quo vadis: what is the future of periodontics? How will we get there? Periodontol 2000. 2017 Oct;75(1):353-71. https://doi.org/10.1111/prd.12217
61. Sälzer S, Alkilzy M, Slot DE, Dörfer CE, Schmoeckel J, Splieth CH; Chairs of Working Group 3; ORCA. Socio-behavioural aspects in the prevention and control of dental caries and periodontal diseases at an individual and population level [Internet]. J Clin Periodontol. 2017 Mar;44 Suppl 18:S106-15. https://doi.org/10.1111/jcpe.12673
62. Kassebaum NJ, Bernabé E, Dahiya M, Bhandari B, Murray CJ, Marcenes W. Global Burden of Severe Tooth Loss: A Systematic Review and Meta-analysis. J Dent Res. 2014 Jul;93(7 Suppl):20S-8S. https://doi.org/10.1177/0022034514537828
63. Hugoson A, Norderyd O. Has the prevalence of periodontitis changed during the last 30 years? J Clin Periodontol. 2008 Sep;35(8 Suppl):338-45. https://doi.org/10.1111/j.1600-051X.2008.01279.x
64. GBD 2015 Disease and Injury Incidence and Prevalence Collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 310 diseases and injuries, 1990-2015: a systematic analysis for the Global Burden of Disease Study 20. Lancet. 2016;388(10053):1545-602. https://doi.org/10.1016/S0140-6736(16)31678-6
65. Listl S, Galloway J, Mossey PA, Marcenes W. Global economic impact of dental diseases. J Dent Res. 2015 Oct;94(10):1355-61. https://doi.org/10.1177/0022034515602879
66. Kanasi E, Ayilavarapu S, Jones J. The aging population: demographics and the biology of aging. Periodontol 2000. 2016 Oct;72(1):13-8. https://doi.org/10.1111/prd.12126
67. Lamster IB. Geriatric periodontology: how the need to care for the aging population can influence the future of the dental profession. Periodontol 2000. 2016 Oct;72(1):7-12. https://doi.org/10.1111/prd.12157
68. Friedman PK, Lamster IB. Tooth loss as a predictor of shortened longevity: exploring the hypothesis. Periodontol 2000. 2016 Oct;72(1):142-52. https://doi.org/10.1111/prd.12128
69. Giannobile WV, Lang NP. Are dental implants a panacea or should we better strive to save teeth? J Dent Res. 2016 Jan;95(1):5-6. https://doi.org/10.1177/0022034515618942

Critical Review
Periodontics

# Periodontal disease and its impact on general health in Latin America: LAOHA Consensus Meeting Report

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**Abstract:** Periodontal diseases are considered a worldwide public health problem, owing to their high prevalence in developed and developing countries. Periodontitis may lead to tooth loss, which can impact oral health-related quality of life. Gingivitis and periodontitis have been extensively studied regarding their etiopathogenesis, epidemiology, prevention and treatment outcomes. However, most of these aspects are studied and discussed globally, which may hamper a clear interpretation of the findings and the design of effective plans of action for specific regions or populations. For example, in Latin America, epidemiological data about the distribution of periodontal diseases is still scarce, mainly when it comes to nationwide representative samples. This Consensus aimed to address the following topics related to periodontal diseases in Latin America: a) The impact of the global burden of periodontal diseases on health: a global reality; b) Periodontal diseases in Latin America; c) Strategies for the prevention of periodontal diseases in Latin America; d) Problems associated with diagnosis of periodontal conditions and possible solutions for Latin America; e) Treatment of Periodontitis. This consensus will help to increase awareness about diagnosis, prevention and treatment of periodontal diseases, in the context of Latin American countries.

**Keywords:** Periodontitis; Periodontal Diseases; Gingival Diseases.

## Introduction

The Meeting coordinated by the Latin American Oral Health Association (LAOHA) was held on January 30, 2019, in São Paulo, Brazil. "Periodontal disease and its impact on general health in Latin America – Consensus Meeting" was the theme of this event that aimed to examine the main oral health problems in Latin America and to propose individual and collective recommendations to address these problems.

Sixty guests invited from 18 countries (15 Periodontal Associations from Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, El Salvador, Ecuador, Mexico, Panama, Peru, Puerto Rico,

Uruguay, and Venezuela) attended the meeting, and important organizations were represented at the event: the Ibero-American Federation of Periodontics (Federación Iberopanamericana de Periodoncia, FIPP), the Brazilian Association of Dental Education (Associação Brasileira de Ensino Odontológico, ABENO), the Brazilian Division of International Association for Dental Research (Sociedade Brasileira de Pesquisa Odontológica, SBPqO), the Caribbean Division of International Association for Dental Research, the Latin American Dental Federation (Federación Odontológica Latinoamericana, FOLA), Caribbean Oral Health Initiative (COHI) and the Ibero-American Observatory of Public Policies in Oral Health.

The opening address was given by Zilson Malheiros and Bernal Stewart (Executive Directors of LAOHA and Colgate-Palmolive regional directors) and Maria Ryan (Chief Dental Officer of Colgate-Palmolive Company). Subsequently, LAOHA's president, Giuseppe Alexandre Romito (University of São Paulo, SP, Brazil) presented the mission and the main goals of the Association. Five speakers each prepared a scientific paper on their specific topic of expertise, which was peer reviewed by the moderator of each session. The topics of the papers were as follows: (i & ii) two introductory presentations on the impact of the global burden of periodontal diseases on health in the world and Latin America, (iii) prevention, (iv) diagnosis and (v) periodontal treatment. The presentations were based on the content of each paper and followed by discussions including the guests and presenters. A final session presenting general conclusions of all topics presented during the meeting was conducted by Mariano Sanz (University Complutense of Madrid, Madrid, Spain). Closing remarks were made by Maria Ryan and Giuseppe Alexandre Romito.

LAOHA appreciates the support received from its members and students. This meeting was sponsored by LAOHA and the Colgate Palmolive Company (Piscataway, NY, USA). The key messages of the papers and the general recommendations sections are presented below.

## Program overview and summary of key conclusions

### Session 1. Impact of the global burden of periodontal diseases on health: Global reality

**Speaker:** Jorge Gamonal (University of Chile, Chile)

**Moderator:** Mariel Gomez (Maimónides University, Argentina)

#### Key messages

Periodontitis is a chronic non-communicable disease (NCD) that impacts on quality of life and represents a major public health problem around the world. Oral diseases (caries and periodontal diseases, such as gingivitis and periodontitis) are now recognized as being both an epidemic and one of the most important public health problems in the world. In 2015, 3,500 million people were suffering from untreated dental conditions; 2,500 million people with untreated decay in permanent teeth; 573 million children with untreated decay in temporary teeth; 538 million people with severe periodontitis; and 276 million people with total loss of teeth. Moreover, the number of people affected by periodontal diseases will increase even further, and their prevalence will be concentrated on the most vulnerable groups, thus becoming a significant source of social inequality. Periodontal treatment and traditional actions of promotion and prevention carried out in the dental unit are not enough to control the onset of periodontal diseases and access to health care systems is unfair, which reinforces health inequities and maintains the current situation of oral diseases around the world. Therefore the epidemiological indicators will only be modified by the implementation of public policies focused on health equity and comprehensive care.

### Session 2. Periodontal diseases in Latin America

**Speaker:** Paola Carvajal (University of Chile, Chile)

**Moderator:** Giuseppe Alexandre Romito (University of São Paulo, Brazil)

#### Key messages

The main risk factors and indicators for periodontal diseases in Latin American populations are: gender

(male), education/schooling, socio-economic status, smoking and obesity. Periodontitis is not homogenously distributed among the Latin American populations but establishing the actual prevalence and distribution of this disease is not a simple task, especially because there is a lack of a standardized "case definition system" to be used in epidemiological studies. The development of such a tool would help to generate reliable data regarding periodontitis in the region. Gingivitis and periodontitis are prevalent in subjects of all ages, including children and adolescents. However, epidemiological data are scarce in Latin America, particularly with respect to nationwide representative studies. On an average, gingivitis affects 34.7% of young Latin American individuals. In the Latin American adult population the prevalence of gingival inflammation reached 96.5% to 100%. In Latin American adolescents from 15 to 18 years of age, the prevalence of CAL ≥ 3 mm is 32.6%, and the prevalence of the probing pocket depth ≥ 4 mm is 59.3%. In addition, the prevalence of severe periodontitis in adults reached 7.8% to 25.9% from middle age to seniors, respectively. Raising awareness of the prevalence and consequences of periodontal diseases is still low in Latin America; thus, the use of social media and networks were suggested as an effective strategy to increase awareness about periodontal diseases in the population. Therefore, the implementation of a periodontal screening procedure during Primary Care is now being recommended, so that those who present clinical signs and symptoms of periodontal disease can be referred to specialists (periodontists) for complete periodontal examination and periodontal treatment, if necessary. This strategy would improve to the diagnosis of periodontal diseases in their early stages, and consequently improve the prognosis. Moreover, interlocutions between oral health associations and Academia were proposed in order to address topics related to diagnosis and prevention of periodontitis in undergraduate programs, specialist training and post-graduate programs in comprehensive care context.

## Session 3. Strategy for the prevention of periodontal diseases in Latin America

**Speaker:** Andres Duque (University of CES, Colombia)

**Moderator:** Hugo Romanelli (Maimónides University, Argentina)

### Key messages

Prevention of periodontal disease in Latin America has mainly been focused on oral hygiene instruction for reducing dental biofilm by means of motivational schemes, increasing patients' knowledge about the disease, patient empowerment, and providing adequate oral hygiene instruction. In this context, there are two main preventive approaches that could be used: (i) at the individual level - centered on patients, and (ii) the population/community level, which would require the proactive participation of the government in decision-making. The prevention of oral diseases is crucial in terms of public health and should not be concentrated on dentists only, but on interdisciplinary groups working together. In this context, the important role of dental hygienists should be highlighted; these professionals must participate proactively in this process as health coaches, going beyond their traditional role in Latin America, which has been passive and limited to primary prevention. In addition, there is emerging evidence of the lack of knowledge of some health professionals in Latin America about periodontal diseases and their oral and systemic consequences. Furthermore, health professionals should be part of healthy lifestyle initiatives, focusing on diabetes awareness, tobacco cessation, and cardiovascular prevention programs, among others. In addition, alliances between different associations, governmental and–non-governmental organizations (policymakers and stakeholders), and health systems should be encouraged in order to create a joint effort to replace Oral Health Programs by Oral Health Policies. It was suggested that such policies should emphasize the concept of "Full Mouth Health", focused on comprehensive care.

## Session 4. Problems associated with diagnosis of periodontal conditions and possible solutions for Latin America

**Speaker:** Cassiano Rösing (Federal University of Rio Grande do Sul, Brazil)

**Moderator:** Vicente Aránguiz (University of the Andes, Chile)

### Key messages

Periodontal diseases are clinically diagnosed in two main categories: gingivitis and periodontitis. One

important issue concerning periodontal health/disease diagnosis is the divergence between parameters used in epidemiological studies and those used for individual patients. It should be emphasized that the gold standard strategy for periodontal diagnosis is full-mouth periodontal examination, and when this approach is adopted, there is little likelihood of periodontal disease being misdiagnosed. However, other simplified approaches have been proposed in an attempt to increase the number of dentists routinely performing periodontal examinations. A common an effective tool for use in epidemiological studies and screenings in Public Health services in Latin America should be established. However, it should be borne in mind that although screening is an effective way of evaluating a higher percentage of the population more rapidly, it is not a diagnostic tool. In 2018, the European Federation of Periodontology and the American Academy of Periodontology launched a new classification system for periodontal and peri-implant diseases and conditions. This new classification system was meant for individual diagnosis, not for epidemiological studies/screening initiatives. In Latin America, dental professionals should routinely perform individual periodontal clinical examination, and researchers should attempt to develop a standardized diagnostic test that could help the clinical periodontal screening (for epidemiological studies). In addition, dental professionals should be trained at undergraduate level to appropriately diagnose periodontal diseases at their early stages.

### Session 5. Treatment of periodontitis

**Speaker:** Ricardo Fischer (Rio de Janeiro State University, Brazil)

**Moderator:** Magda Feres (Guarulhos University, Brazil)

### Key messages

In most patients, along with an oral hygiene maintenance program, Non-surgical (NSPT) and surgical periodontal treatment (SPT), good plaque control and regular maintenance programs are predictable procedures for treating periodontitis. However, NSPT and/or SPT alone may not be sufficient to re-establish periodontal health in patients with severe periodontitis or with associated risk factors. Therefore, other adjunct therapies, such as lasers, systemic antibiotics, host-modulators and probiotics have been suggested. Among these protocols, systemic metronidazole and amoxicillin is an adjunctive treatment backed by strong scientific evidence for its use in daily clinical practice. Periodontal diseases are associated with a negative impact on oral health-related quality of life (OHRQoL), especially on function and esthetics, and NSPT and SPT lead to a significant improvement in patients' OHRQoL. In addition, Patient-Reported Outcomes (PROs) used in medicine have been proposed to assess the impact of periodontal treatment on patients' OHRQoL. The development of an effective instrument to assess PRO in periodontal treatment could contribute to fully assessing the benefits of different protocols. It would also be helpful to increase the participation of periodontists in the decision-making about tooth extraction, implant reconstruction, and management of advanced, complex periodontal cases. Dentists are trained to preserve teeth. Periodontitis has been associated with several systemic conditions, including adverse pregnancy outcome, cardiovascular disease, respiratory diseases, and diabetes mellitus (DM) and chronic renal disease. There is good evidence in the literature that periodontal treatment may improve glycemic control of patients with *diabetes mellitus* (DM).[1] Thus, the inclusion of periodontal assessment and treatment in clinical guidelines for the management of DM has been suggested. In addition, periodontists should establish stronger connections with non-dental healthcare professionals, including physicians and nurses.

## Final recommendations

In general, health authorities in Latin America have recognized that periodontitis is a non-communicable disease with severe impact in the quality of life and represents a major health problem around the world. The consensus group recognizes that periodontitis and gingivitis are socially determined diseases and that their effective combat, necessarily requires efforts and public policies to promote equity by

reducing social inequalities. Prevention should be the main measure of oral health actions, policies and programs for maintaining oral health and avoiding periodontitis through the effective management of gingivitis and promotion of healthy lifestyles at both population and individual levels. The group identified the need for implementing the below mentioned actions in order to foster the awareness, prevention, diagnosis and treatment of periodontitis in Latin America:

### Awareness and prevention

a. Increase the awareness of both dental and non-dental health professionals regarding the prevalence and consequences of periodontal diseases for patients' oral and systemic health, using social media and networks.
b. Establish alliances between dental associations, governmental and non-governmental organizations (policymakers and stakeholders), and health systems to emphasize the replacement of Oral Health Programs by Oral Health Policies.
c. Encourage patient empowerment relative to oral and systemic health, by increasing patients' knowledge about adequate oral hygiene habits, the effects of oral health on systemic health.
d. Propose Oral Health Policies with emphasis on the concept of "Full Mouth Health", focused on comprehensive care. This concept is an essential component for the general health of the human organism.
e. Promote only products with proven clinical efficacy, including interdental devices, dental floss, toothpaste, mouthwash and toothbrushes.
f. Latin American healthcare professionals should be part of healthy lifestyle initiatives, focusing on diabetes awareness, tobacco cessation, and cardiovascular prevention programs, among others.

### Diagnosis

a. Implement periodontal screening procedures during Primary Care patient evaluations. "Moreover, public health care systems should offer specialized periodontal treatment for management of the more complex cases (second level of care)."
b. Encourage the development of a standardized diagnosis test that could be used in epidemiological studies and in public health screening exercises.
c. Highlight the importance of the role of the dental hygienist, who must proactively participate in the process as a health coach, going beyond their traditional role in Latin America.
d. Motivate Latin American dental professionals to routinely perform individual periodontal clinical examinations.
e. Motivate Latin American dental professionals to avoid periodontal misdiagnosis, with the use of truly evidence-based parameters. For example, especially in cases of moderate/severe periodontitis, the use of full-mouth periodontal examination with pocket-depth and clinical attachment levels and the presence of bleeding on probing is recommended.
f. At Dental Schools, reinforce the importance of training academic dental professionals to appropriately diagnose periodontal diseases in their early stages.

### Treatment

a. Make clear to the periodontal community that mechanical removal of plaque and calculus, good plaque control and a regular maintenance programs are essential procedures that should be applied to all patients with periodontitis.
b. Make clear to the periodontal community that NSPT and/or SPT alone may not be sufficient to re-establish periodontal health in patients with severe periodontitis or with associated risk factors. Therefore, other adjunct therapies, such as chlorhexidine, systemic antibiotics, lasers, host-modulators and probiotics have been suggested.
c. Develop a validated Patient Reported Outcome instrument to evaluate the effects of different periodontal treatments on patients' quality of life.
d. Preserving teeth should be a common and the most important goal for all dental professionals.

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## References

1. D'Aiuto F, Gkranias N, Bhowruth D, Khan T, Orlandi M, Suvan J, et al. Effects of periodontitis treatment in patients with type 2 diabetes: a 12 month, single-centre, investigator-masked, randomised trial. Lancet Diabetes Endocrinol. 2018 Dec;6(12):954-965. https://doi.org/10.1016/S2213-8587(18)30038-X

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**1.** de Albuquerque RF Jr, Head TW, Mian H, Muller K, Sanches K. Ito IY. Reduction of salivary S Aureus and mutans group streptococci by a preprocedural chlorexidine rinse and maximal inhibitiry dilutions of chlorexidine and cetylpyridinium, Quitessence Int. 2004 Sep; 35(8): 635-40 **2.** Willians C, , Mostler K, et al. (1998) Efficacy of a dentrifice containing zinc citrate for the control of plaque and gingivitis. Compend Contin Educ Dent. 19(2 Suppl):4-15. **3.** K.V.V. Prasad, A. Ivaturi, N. Rao, A.A. Ram, P.K. Sreenivasan. (2015) Effects of toothpastes on malodor and bacteria of oral environments. Data on File; Colgate Palmolive Company Study .

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