



# Australian Research Centre for Population Oral Health

## Periodontal disease and Obesity: Information for Dental Practitioners

### Periodontal disease – What is new?

Periodontal diseases are mostly chronic inflammatory conditions of an infectious nature induced by dental biofilm accumulation on the surfaces of the teeth. Besides the infectious component, its establishment and progression also depend on the quality of the host immune response, which is influenced by unhealthy habits and systemic conditions<sup>1</sup>.

In general, periodontal diseases can be classified into two different groups:

- > **Gingivitis:** Gingivitis is a reversible condition restricted to the marginal gingiva, clinically characterized by erythema, oedema, and bleeding of the gingiva. Among children and adolescents, gingivitis is the most prevalent periodontal condition. Treatment of gingivitis is based on plaque removal by the patient, thus, professionals should reinforce oral hygiene habits in order to assure dental biofilm control. While all individuals with periodontitis present with gingivitis at some stage, not all patients with gingivitis, nor all gingivitis lesions, will necessarily progress to periodontitis. Identifying lesions with gingivitis which will progress to periodontitis is difficult.
- > **Periodontitis:** Periodontitis affects the supporting tissue of the teeth, compromising alveolar bone and the periodontal ligament. The breakdown of the fibres of the periodontal ligament results in clinical loss of attachment together with resorption of the alveolar bone. Periodontitis is a major cause for tooth loss among adults and seniors<sup>1-6</sup>. Severe periodontitis affects 11.2% of the world population (1990-2010) and is ranked as the 6<sup>th</sup> most prevalent chronic disease worldwide<sup>7,8</sup>. As a consequence of rising population growth, increasing life expectancy and a significant reduction in tooth loss, an increase in the prevalence of periodontitis is expected<sup>7</sup>. This in turn will be a major concern for health professionals and policy makers, since periodontitis has been identified as a potential risk factor for other chronic inflammation-related conditions, such as cardiovascular diseases, adverse pregnancy outcomes, diabetes and cancer.

Even though the bacteria are important in initiating and perpetuating the inflammation, they are only directly responsible for a relatively small proportion of the tissue damage that occurs in periodontal disease. The great majority of the

tissue breakdown results from host's immune response. Thus, investigating and managing factors that may alter the quality of the host immune response is key for prevention and treatment of periodontal diseases.

### Obesity – a global public health challenge

According to the World Health Organization, obesity could be defined as “a systemic disease characterized by excessive body fat accumulation that can lead to adverse impacts on health conditions”.<sup>7</sup> Weight and nutritional status tend to remain stable in most adults for long periods of time, despite daily fluctuations in energy balance.<sup>9</sup> In this context, it is possible to assume that regulatory processes coordinate the dietary fuel supply with energy requirements with the intention of maintaining a stable body mass and adipose reservoir. However, when an imbalance between calorific intake and energy expenditure occurs, the body fat may excessively accumulate, leading to an excess of weight. Depending on how much fat is accumulated by the body, individuals may become overweight. However, if the weight gain continues, overweight individuals may become obese.<sup>9</sup> Many factors such as proportion of dietary macronutrients (fats, proteins and carbohydrates), physical activity patterns and genetic load may influence this process; however, there has been no consensus regarding the contribution of such factors.<sup>9</sup> The emerging literature about this topic has revealed the adverse impacts of obesity on chronic health conditions, such as type II diabetes, cardiovascular diseases, infectious diseases, cancer and all-cause mortality.

### Obesity and its impact on society

Obesity comes with a high cost to society. Obese people may impose on other taxpayers or members of an insurance pool, and there is a decreased average productivity among obese workers. Additionally, the costs of obesity are very likely to grow significantly in the next few decades. Apart from the personal and social costs such as morbidity, mortality, discrimination and social exclusion, there are significant health and social care costs associated with the treatment of obesity and its consequences, as well as costs to the wider economy arising from chronic ill health.

## What are the mechanisms that link up Obesity with Periodontal Disease?

Some mechanisms linking obesity to periodontal disease have been discussed in the literature.

### *Inflammatory process:*

It has been suggested that white adipose tissue is responsible for secreting different types of specific cytokines: adipocytokines, such as resistin, leptin and adiponectin; as well as non-specific cytokines, such as interleukins and tumour necrosis factors.<sup>10</sup> Thus, it works as an endocrine organ. Furthermore, it has been observed that the adipose tissue volume expands during weight gain. The constraint of blood vessels responsible for cellular nutrition causes hypoxia, and consequently, apoptosis of adipocytes located in the core of the adipose tissue. The recruitment of macrophages around compromised adipocytes exacerbates the inflammatory framework, by increasing the levels of proinflammatory cytokines.<sup>11</sup> Thus, the combination of the aforementioned situations leads to a chronic generalized low-grade inflammation, which in turn, is responsible for altering the host immune response threshold. It may make obese individuals more susceptible to infectious diseases, like periodontal diseases.<sup>11</sup> It has also been suggested that the lipopolysaccharide of gram-negative periodontal bacteria could induce hepatic dyslipidaemia and insulin resistance.

### *Behavioural aspects:*

Evidence suggests that mechanisms other than biological phenomena might play a role in this association. Taking into consideration behavioral aspects, obese subjects tend to present with more unhealthy habits such as tobacco and alcohol consumption, physical inactivity, unhealthy diet including higher consumption of fat, carbohydrates and sugar.<sup>12</sup> In addition, obese subjects are more likely to have neglected oral health habits, since low self-esteem and negative self-body image impact on the individual's propensity to carry out health-promoting behaviors.<sup>12</sup> Figure 1 depicts the potential mechanisms underlying the relationship between obesity and periodontal disease:

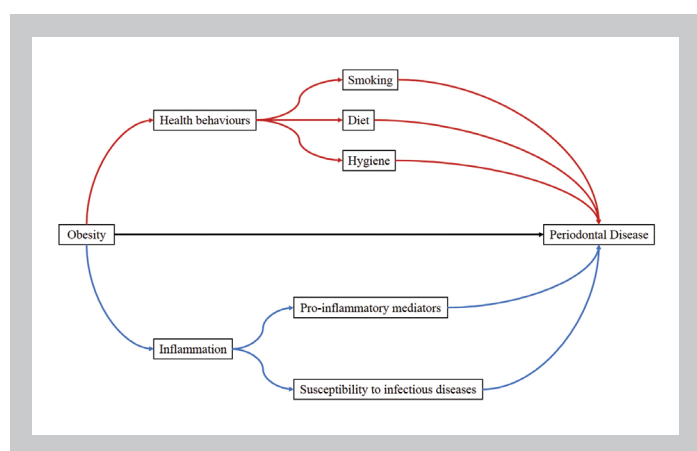


Figure 1. Potential mechanisms linking obesity to periodontal disease.

### *Socioeconomic background:*

Socioeconomic factors seem to have influenced the relationship between obesity and periodontal disease. Given that subjects from a disadvantaged background present with higher prevalence rates of obesity and periodontal disease, a consistent social pattern is observed.

## Periodontal disease in Australia – Who? Where? When?

The National Survey of Adult Oral Health (NSAOH 2004-06) showed that the prevalence of moderate or severe periodontitis in the Australian population was 22.9% (2.4% had severe disease, while 20.5% had moderate disease), according to the case definition of the US Centers for Disease Control and Prevention (CDC) and the American Academy of Periodontology (AAP). Moderate or severe periodontitis is more likely to be seen among Indigenous Australian adults (29.9%). Among people of all ages those with the highest prevalence were people who completed 9 years of schooling or less (38.7%) and the lowest prevalence was seen in females (19.0%) and people who usually visit a dentist for a check-up (19.0%). Relative differences in prevalence associated with dental insurance were also seen. Among people of all ages uninsured people had 1.4 times higher probability of having periodontitis than insured people (27.0% versus 19.4%). The prevalence of periodontal pocketing of 4+ mm in the Australian population was 19.8%, whereas the percentage of the Australian population with CAL of 4 mm or more was 42.5%.

## Obesity in Australia – Who? Where? When?

According to the 2011–13 Australian Health Survey, nearly two-thirds of Australians aged 18 or over are overweight (35%) or obese (28%). A person's likelihood of being overweight or obese can also be affected by where they live. Australians living outside major cities are more likely to be overweight or obese than their counterparts living in major cities. In 2011–12, men living in inner regional, outer regional and remote areas of Australia were more likely to be overweight or obese (74%) compared with men living in major cities (68%). This pattern was also consistent for women, with women living in inner regional, outer regional and remote areas being more likely to be overweight or obese (63%) than women living in major cities (53%). For women, socioeconomic disadvantage can also affect obesity levels. Women living in most disadvantaged socioeconomic areas are more likely to be overweight or obese than those in the wealthiest, but the same pattern is not evident among men. In 2012–13, nearly two thirds of Indigenous Australians aged 15 and over were overweight or obese.

## What is known about the relationship between Obesity and Periodontal disease?

### *Systematic reviews and longitudinal studies*

Some systematic reviews have demonstrated an association between obesity and periodontal disease in adults. According to the review conducted by Suvan and colleagues, the chance of developing periodontal disease in overweight and obese individuals, respectively, was 27% and 81% higher than in individuals with normal

weight<sup>12</sup>. Even though these estimates have mostly originated from cross-sectional studies, findings suggest a strong association between obesity and periodontal disease. A systematic review has revealed an association between weight gain and incidence (new cases) of periodontitis in adults. Pooled estimates from prospective longitudinal studies have revealed that the risk of periodontitis incidence was 13% (Figure 2) and 34% (Figure 3) higher in individuals who became overweight and obese, respectively<sup>13</sup>.

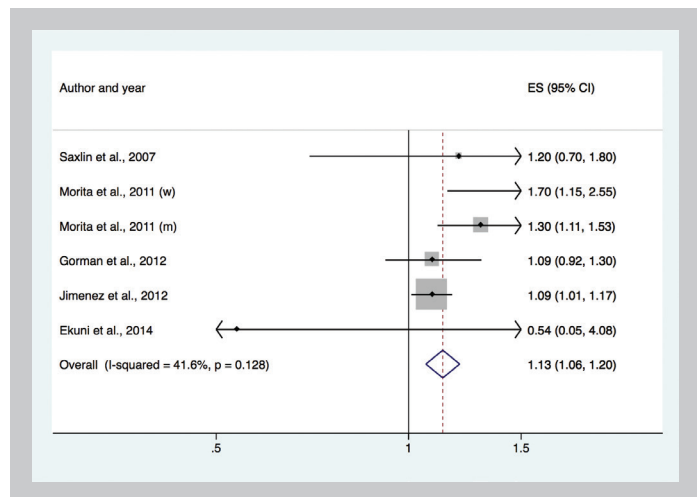


Figure 2. Effect of becoming overweight on the incidence (new cases) of periodontitis<sup>13</sup>.

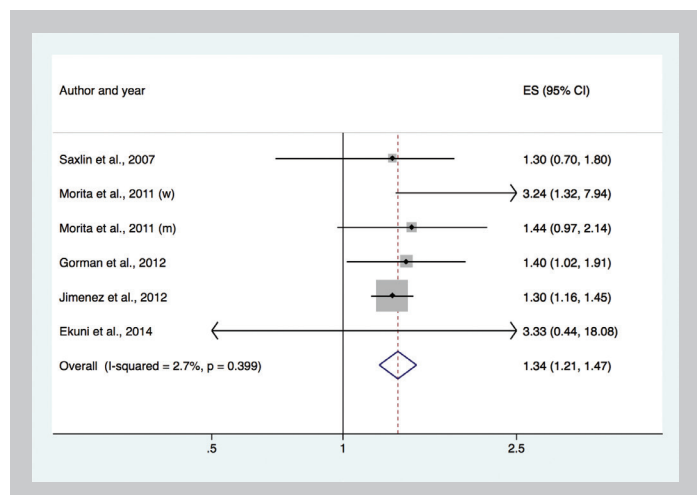


Figure 3. Effect of becoming obese on the incidence (new cases) of periodontitis<sup>13</sup>.

Findings from a population-based birth-cohort study showed that obesity and overweight increase the risk of periodontitis in adults aged 31 years. The effect of obesity on periodontitis was greater than the effect of smoking in this population, suggesting a strong relationship between obesity and periodontal disease. When individuals presented with other detrimental habits such as smoking, high consumption of alcohol and a diet rich in fat and carbohydrates combined with obesity, the risk of periodontitis was even greater<sup>14</sup>.

Even though the association between obesity and periodontal diseases seems to be well established, the impact of losing weight on periodontal diseases remains unclear within the literature. While in some studies no changes in periodontal parameters were observed, others have revealed an increase of periodontal bleeding and probing depth six months after losing weight by bariatric surgery. However,

there is a lack of well-designed longitudinal studies exploring the effects of losing weight on periodontal diseases.

### Periodontal treatment in obese patients

Information is scarce about periodontal treatment in obese patients. A systematic review with meta-analysis suggested that non-surgical periodontal treatment in obese patients seems to improve periodontal conditions (bleeding on probing; probing depth; clinical attachment level).<sup>15</sup> In addition, obesity seems unlikely to modify the periodontal healing after treatment, since obese and non-obese subjects showed similar improvement of clinical conditions, post-therapy. However, the current evidence should be carefully weighed considering the important methodological limitations of the available studies.<sup>15</sup>

## Summary of the key points of the association between periodontal disease and obesity.

- > Obesity and periodontal disease are highly prevalent conditions worldwide: prevalence of both conditions is likely to increase in the future ;
- > Evidence supports the association between an excess of body weight (being overweight or obese) and periodontal disease;
- > Obesity seems not to modify periodontal healing after periodontal therapy;
- > Since obesity and periodontal disease share common risk factors, prevention and treatment focusing on risk factors for both conditions (*The common risk factor approach*) is the best choice. Patients should be encouraged to change their lifestyle by quitting smoking and modifying diet, along with regular medical and dental visits.

## References

1. Van Dyke TE, van Winkelhoff AJ. Infection and inflammatory mechanisms. *J Clin Periodontol* 2013; 40 Suppl 14: S1-7.
2. Al-Zahrani MS, Bissada NF, Borawski EA. Obesity and periodontal disease in young, middle-aged, and older adults. *J Periodontol* 2003; 74: 610-615.
3. Franchini R, Petri A, Migliario M, et al. Poor oral hygiene and gingivitis are associated with obesity and overweight status in paediatric subjects. *J Clin Periodontol* 2011; 38: 1021-1028.
4. Silva DA, Peres KG, Boing AF, et al. Clustering of risk behaviors for chronic noncommunicable diseases: a population-based study in southern Brazil. *Prev Med* 2013; 56: 20-24.
5. Lula EC, Ribeiro CC, Hugo FN, et al. Added sugars and periodontal disease in young adults: an analysis of NHANES III data. *Am J Clin Nutr* 2014; 100: 1182-1187.
6. Cekici A, Kantarci A, Hasturk H, et al. Inflammatory and immune pathways in the pathogenesis of periodontal disease. *Periodontol* 2000 2014; 64: 57-80.
7. World Health Organization. *Obesity: Preventing and Managing the Global Epidemic*. Geneva: World Health Organization; 2000.
8. Jequier, E., Tappy, L. Regulation of body weight in humans. *Physiol Rev* 1999; 79: 451-480.
9. Martinez, J. A., Navas-Carretero, S., Saris, W. H., Astrup, A. Personalized weight loss strategies-the role of macronutrient distribution. *Nat Rev Endocrinol* 2014; 10: 749-760.
10. Tilg, H. & Moschen, A. R. Adipocytokines: mediators linking adipose tissue, inflammation and immunity. *Nat Rev Immunol* 2006; 6: 772-783.
11. Neels, J. G., Olefsky, J. M. Inflamed fat: what starts the fire? *J Clin Invest* 2006; 116: 33-35.
12. Suvan, J., D'Aiuto, F., Moles, D. R., Petrie, A., Donos, N. Association between overweight/ obesity and periodontitis in adults. A systematic review. *Obes Rev* 2011; 12: e381-e404.
13. Nascimento, G. G., Leite, F. R., Do, L. G., et al. Is weight gain associated with the incidence of periodontitis? A systematic review and meta-analysis. *J Clin Periodontol* 2015; 42: 495-505.
14. Nascimento, G. G., Peres, M. A., Mittinty, M. N., et al. Diet-induced overweight and obesity and periodontitis risk: an application of the parametric g-formula in the 1982 Pelotas birth cohort. *Am J Epidemiol*, 2017, ahead of print.
15. Nascimento, G. G., Leite, F. R. M., Correa, M. B., et al. Does periodontal treatment have an effect on clinical and immunological parameters of periodontal disease in obese subjects? A systematic review and meta-analysis. *Clin Oral Invest* 2016; 20:639-647.

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A joint program by  
**Colgate Oral Care and The University of Adelaide**

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