Plaque, sugar, obesity, diabetes and smoking
Reassessing risk factors for periodontal disease
By Prof. Crawford Bain, United Arab Emirates

Traditionally, dentists have been taught that both dental caries and periodontal disease develop and progress as a direct result of patients’ over-frequent consumption of refined sugars and patients’ failure to remove bacterial plaque effectively. Miller’s aetiological theory of caries development and the non-specific plaque hypothesis based on Lae’s work in the 1960s allow dentists to present a simple cause-and-effect explanation to patients.

Since then, the dental profession has blamed patients’ poor oral hygiene for periodontal breakdown and dental caries while often failing to diagnose and treat other contributing causative factors. Unfortunately, while plaque is generally a necessary ingredient of common dental diseases, the explanation contained in these theories of its pivotal role is simplistic given current knowledge. This brief article will attempt to put the more significant risk factors in context.

Plaque
Gingivitis is a natural bodily response to bacterial accumulation and as such is non-specific. Effective plaque removal will generally reverse gingivitis. The concept of inevitable progression from gingivitis to destructive periodontitis if oral hygiene is not good is, however, flawed. Figure 1 shows a 46-year-old patient with non-existent oral hygiene over several years. Figure 2 shows the same patient one month later after around 90 minutes of scaling and polishing by a student dental hygienist. He had no active caries and no more than ten per cent bone loss. The publication Type 1 Diabetes in Adults: National Clinical Guideline for Diagnosis and Management in Primary and Secondary Care (updated in July 2014) was compiled by a consensus reference group made up of 30 members. These included physicians, endocrinologists, nurses, oral health professionals, dieticians, podiatrists and lay people, but no dentists. Its 275 pages make no mention of dentistry or periodontal disease. The National Institute for Health and Care Excellence document on Type 2 diabetes, also updated in 2014, too fails to mention dentistry or periodontal disease.

Smoking
We have known for over 20 years that smoking increases the risk of periodontal breakdown. Odds ratios for developing periodontal disease as a result of smoking constitute a range of 2.5 to 3.97 for current smokers and 1.68 for former smokers, and 3.25 for light smokers to 7.28 for heavy smokers. A smoker with 20 pack years (20 cigarettes per day for 20 years) is up to 600 per cent more likely to lose teeth owing to periodontal disease, whereas a patient with poor plaque control has around 15 per cent risk of progressing to destructive periodontitis. Why then do we refer to hygiene phase therapy when smokers is a much greater risk factor than poor oral hygiene? How many dentists spend as much time on smoking cessation counselling as on oral hygiene instruction?

Sugar
Traditionally, teaching on caries prevention has focused on the number of sugar exposures per day, especially between meals. Academic paedodontists suggest that provid- ed there are two daily exposures to fluoride in toothpaste, a maximum of six sugar exposures a day is unlikely to lead to significant enamel decalcification in children. However, a large study conducted in 2003 by Bernabé et al. evaluated 1,702 adults over 11 years and concluded that “the amount of, but not how often, sugar intake was significantly associated with DMFT (0.5 to 1 per cent with the present levels of sugar)”. Traditionally, dentists have been taught that both dental caries and periodontal disease develop and progress as a direct result of patients’ over-frequent consumption of refined sugars and patients’ failure to remove bacterial plaque effectively. Miller’s aetiological theory of caries development and the non-specific plaque hypothesis based on Lae’s work in the 1960s allow dentists to present a simple cause-and-effect explanation to patients.

Obesity
The third National Health and Nutrition Examination Survey showed that body mass index was significantly associated with periodontal disease. Other studies have indicated a less strong association, and with the compounding variable of blood sugar levels in pre-diabetes, it is presently unclear whether obesity is in fact an independent risk factor or is associated with the established role of diabetes. Regardless, obesity is a known risk factor for Type 2 diabetes and cardiovascular problems, and it is part of the dental profession’s role to inform patients of these interrelationships.

Recent research in England has suggested that 4.1 million obese patients would benefit from gastric band or bypass (bariatric) surgery. Currently, around 8,000 people a year receive the treatment on the National Health Service (NHS). If all 4.1 million were offered surgery, the researchers estimate it would avert nearly 5,000 heart attacks and 40,000 cases of Type 2 diabetes over four years. They don’t, however, discuss potential costs of this surgery, which can vary from £3,000 to £11,500, according to NHS England. Assuming £3,000 per procedure, this would total around an additional £7 billion in health costs. Nor is there much discussion on death rates (0.5 to 1 per cent with the present skill level of surgeons) Even if surgical skills do not diminish, we should anticipate between 20,000 and 14,000 additional deaths. It is likely that comprehensive periodontal treatment of all obese/prediabetic patients would be significantly less costly and, hopefully, result in few if any fatalities.

Conclusion
It is clear that the simple story of plaque control preventing progression of common dental diseases is largely fiction rather than evidence-based fact. While effective oral hygiene will always be a significant part of the management of dental diseases, the modern dental professional must be equally aware of the other common risk factors outlined in this article.

Endnote
A complete list of references is available from the publisher

Crawford Bain, a UK-certified specialist in periodontology, prosthodontics and restorative dentistry, is currently Professor of Post-Graduate Periodontics at the Hamdan bin Mohammed College of Oral Health and Dentistry and Director of Post-Graduate Periodontics at the Hamdan bin Mohammed College of Oral Health and Dentistry in the United Arab Emirates. He can be contacted at crawford.bain@hbm.ac.ae.