

Causal association between smoking and tooth loss is highly likely

Abstracted from

Hanioka T, Ojima M, Tanaka K, Matsuo K, Sato F, Tanaka H

Assessment of smoking and tooth loss: a systematic review of observational studies. *BMC Public Health* 2011; **11**: 221.

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Question: Does smoking cause tooth loss?

Data sources Medline, Embase, the Cochrane Central Register of Controlled Trials (CENTRAL) and hand searching of the journals; *Community Dentistry and Oral Epidemiology, Gerodontology, Journal of Clinical Periodontology, Journal of Dental Research, Journal of Periodontology, Journal of Periodontal Research, Journal of Public Health Dentistry and Oral Diseases*. Any potential studies in the reference lists of the identified articles read completely were also considered.

Study selection Studies published in English investigating associations between smoking and tooth loss and reporting the effect size were included. Literature reviews and studies that combined former smokers with non-smokers or current smokers were excluded.

Data extraction and synthesis Data were extracted by one reviewer and verified independently by another with disagreements being resolved by discussion. Methodological quality of studies was assessed using the modified Newcastle-Ottawa Scale (NOS). A qualitative summary is presented.

Results Six cross-sectional and two cohort studies were included examining 58,755 subjects in four countries. All studies reported significant associations, although the strength of the association was usually moderate. Four studies reported dose-response relationships between exposure to smoking and the risk of developing tooth loss. A decrease in the risk of tooth loss for former smokers was evident in six studies. Interpretation of evidence for each element was consistent, despite some shortcomings regarding study type and population.

Conclusions Based on the consistent evidence found with the existing biological plausibility, a causal association between smoking and tooth loss is highly likely. Further studies using a cohort design and different populations are necessary to confirm this association.

Commentary

The systematic review of Hanioka and colleagues is a landmark report. The authors comprehensively, competently, and carefully identify, appraise, and review observational studies linking smoking to tooth loss. They then convincingly demonstrate a substantial significant causal relationship between smoking and tooth loss.

These results caused me to question my clinical, legal and ethical responsibilities in pursuing caries and periodontal disease control among smokers, without simultaneously addressing smoking cessation. After all, the clinical measures we use for both caries and periodontal disease are really surrogates for the ultimate measure –

tooth loss. If a patient comes to see me to 'save my teeth', am I also responsible for smoking cessation, or at least appropriate informed consent and referral? And what is appropriate informed consent?

Let's be more specific. The systematic review indicates that the odds of losing teeth are two to four times higher in smokers than non-smokers. The converse suggests that I will be successful in saving teeth only half to a quarter of the time in smokers. And then I dived into the report. The authors searched three databases for observational trials and identified 15 trials: five cohort and ten cross-sectional, from five countries. They appraised the trials for quality (absence of bias) using the Newcastle-Ottawa scale. Eight studies were categorised as high quality – two cohort and six cross-sectional, in four countries – and the remainder were categorised as moderate quality. Using the results of the included studies, the authors categorised their findings according to the Bradford Hill criteria, and in every case the results met these criteria.

- Consistency of findings. All six studies provided similar directionality; that is, smoking is associated with greater tooth loss.
- Strength of association (magnitude and statistical strength). Among current smokers the odds ratio ranged from 1.7 to 4.0. That is, for smokers the odds were 2-4 times higher that they would be missing teeth than non-smokers, and all results were statistically significant.
- Biological gradient (dose response relationship). Four studies examined cigarette "consumption" and tooth loss among current and former smokers, and all identified a similar trend: increased smoking is associated with increase tooth loss.
- Natural experiments. One might expect former smokers to have reduced tooth loss compared with current smokers. This too was found to be true.
- Biological plausibility. From studies other than those reported here the authors identify the proposed mechanisms by which the components of tobacco smoke can generate inflammatory damage and alter the oral microbiology from health to disease-related.

Hanioka *et al.* were, to my mind, overly self-critical in underscoring the limitations of their report. While there is certainly no perfect study, and no perfect systematic review, the authors deserve substantial commendation for the yeoman's task they took on in dissecting out the nuances of the reports and collating them into a very usable and important whole. Their work truly establishes a base for professional self-assessment in terms of how we address smoking.

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Evidence-Based Dentistry (2011) **12**, 77. doi:10.1038/sj.ebd.6400809