



A Review: How Smoking Affects Oral Health?

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ABSTRACT

Usually, the first area of a smoker's body exposed to tobacco product ingredients or emissions is the mouth cavity. As a result, tobacco use's carcinogenic, microbiological, immunologic, and clinical impacts frequently occur in the oral cavity. The field of dentistry is evolving as new research consistently shows that systemic health is impacted by periodontal health and vice versa. Studies on populations, clinical settings, and in vitro experiments on animals highlight how vital dental health is to overall health. As dental conditions like periodontal disease spread, these intricate connections become more apparent. The multimodal links between oral and systemic health are borne by specific populations. Two prevalent, diverse neurovascular disorders that have a major impact on the lives of those who suffer from them as well as the economy are migraine and stroke. There is mounting evidence that migraines elevate the risk of cerebrovascular illnesses in general. Although this matter has not been well studied, those with migraines also appear to be at a higher risk of experiencing a transient ischemic stroke. The association between migraine and hemorrhagic stroke appears to be somewhat influenced by the aura status of migraines. Studies using neuroimaging have shown that migraineurs are more likely to have asymptomatic structural brain abnormalities. They also have a higher likelihood of having unfavorable vascular risk factors; nevertheless, those with migraine who do not have traditional risk factors appear to have a higher risk of stroke.

Keywords: Streptococcus mutans; carcinogenesis; electronic nicotine delivery systems; mucosal immunity; nicotine; smoking.

Introduction

Worldwide, cigarette smoking results in over 8 million deaths annually. Previous years' announcements of estimates predicted that by 2030, smoking-related diseases would claim millions more lives^{1,2}. Consequently, healthcare systems should place a high priority on smoking prevention and cessation. Smoking has been linked to a number of negative consequences, some of which are evidently detrimental to oral health, such as periodontal diseases. Tobacco contains nicotine, which causes addiction and necessitates patient-specific multi-step counseling to break the cycle of chronic dependence⁶. Since dental treatment must be completed in multiple sessions, dentists are in a unique position to offer current cessation advice that will be effective over the long term during these follow-up visits. Notwithstanding their understanding of the need to effectively include dental specialists, dentists are not competent to assist patients in quitting smoking. Tobacco smoking is one of the biggest global health costs, increasing the risk of several illnesses and resulting in almost 8 million deaths annually.¹ Inhaling environmental tobacco smoke (ETS), commonly referred to as secondhand smoke (SHS), is the act of passive smoking. This accounts for more than 15% of the tobacco-related death rate.¹ The family home is thought to be the primary source of passive smoking exposure for over half of all children worldwide.

It has been demonstrated that the more than 4000 compounds and carcinogens that have been identified from ETS raise the risk of various organ malignancies, heart and lung diseases, stroke, metabolic disorders, and respiratory ailments.³ Preterm delivery, low birth weight, SIDS, developmental delays, and congenital abnormalities like cleft lip or palate have all been related to prenatal passive smoking. Many oral health issues, including halitosis, staining, diminished taste, smoker's keratosis, leukoplakia, and oral malignancies, have been connected to passive smoking.⁶ In older children and adults, the relationship between passive smoking and gingival pigmentation, periodontal disease, and dental caries has been thoroughly studied. Growing data suggests that endogenous sex hormones, such as progesterone and estradiol, are important contributors to smoking-related consequences. While roughly 25% of premenopausal smokers use oral contraceptives (OCs), which dramatically change progesterone and estradiol levels, not much is known regarding the potential effects of OCs on smoking-related outcomes. This review article's objective is to outline the current status of the literature and provide suggestions for new lines of inquiry.

Effects of tobacco related products on oral health

Cigarettes, smokeless tobacco (such as chewing tobacco and snus), and other tobacco uses cause specific oral health issues like oral cancer, oral mucosal lesions, periodontal disease, implant failure, salivary gland hypofunction, dental caries, among many other oral diseases and conditions. These associations between tobacco product use and numerous diseases also exist.

Oral Cancer

The eighth most frequent cause of cancer-related death worldwide is oral cancer. In the United States, there were projected to be 54010 new cases in 2021, with a 5-year relative survival rate of 66.9% between As per the American Lung Association, around 90% of lung cancer cases are caused by cigarettes, which is the most widely used form of tobacco. In addition, compared to non-smokers, smokers have an increased risk of mouth cancer by ten times. Additionally, smoking has been connected to an elevated risk of over 12 different cancer forms. Furthermore, smoking cigarettes is connected to almost 1 in 5 deaths in the United States. There are over 60 recognised carcinogens in cigarettes. In addition to being hazardous nicotine delivery systems, cigarettes and other combusted tobacco products also include a complex mixture of co-carcinogens, tumour promoters, and other toxicants that compound the effects of the carcinogens.

Oral Mucosal lesions

Tobacco usage has been strongly linked to mucosal lesions such as smoker's melanosis, erythroplakia⁴⁰, nicotinic stomatitis, leukoplakia, and smokeless tobacco keratosis at the site of tobacco implantation. Even if some of the lesions on the oral mucosa are not cancerous, leukoplakia linked to tobacco use needs to be further investigated by taking a biopsy to check for carcinoma or epithelial dysplasia. Malignant transformation occurs in 3–6% of leukoplakias, and the probability rises with longer follow-up times⁴¹. When epithelial dysplasia results from hyperkeratosis or epithelial atrophy, it might show up clinically as red or white. Carcinoma in situ refers to epithelial dysplasia that affects the entire thickness of the epithelium without invading the connective tissue³⁹. The black hairy tongue is a condition that heavy smokers may also have. Due to enlargement of the filiform papillae and a delay in the normal rate of desquamation, the dorsal surface of the tongue resembles hair. For oral mucosal lesions to be appropriately managed, it is critical to assess both the lesions and the risk factors.

Periodontal Disease And Dental Implants

As the most significant modifiable risk factor for periodontal disease, tobacco use is regarded as avoidable. Research on the connection between tobacco usage and periodontium dates back to the 1940s. Smokers have deeper pockets, more tooth loss, and gingival recession. in contrast to nonsmokers⁴². According to a recent comprehensive study, smoking tobacco causes an 85% increase in periodontitis⁴³. In addition to significant gingival inflammation and increased gingival microvascular density, tobacco smokers also exhibit reduced angiogenesis as a result of local immune suppression and oxidative stress, which increases the risk of problems and periodontal disease⁴⁴. Saliva and gingival crevicular fluid samples were taken from cigarette smokers (CS), e-cigarette smokers (EC), dual smokers (DS), and non-smokers (NS) in a cross-sectional pilot research ³². Using immunoassay (enzyme-linked immunosorbent assay and Luminex), the samples were examined to assess biomarkers of inflammation, oxidative stress, anti-inflammatory lipid mediators, tissue injury and repair, and growth factors in the four groups. The detrimental consequences of tobacco use on dental implants have been thoroughly investigated, and in the past few years, several systematic reviews have been published. The main patient-centered risk factor for endosseous implant loss has been identified as smoking⁴⁷. It was discovered that smokers had a greater implant failure rate⁴⁸. A dose-response relationship between implant failure and cigarette smoking was discovered through a comprehensive study. Compared to non-smokers, patients who smoked more than 20 cigarettes a day were at a significantly increased risk of experiencing implant failure. Smoking has the potential to have both local and systemic negative consequences. Healing may be hampered by smoking's heat and its harmful byproducts, which include hydrogen cyanide, carbon monoxide, and nicotine. Furthermore, reduced blood flow and arteriolar vasoconstriction may compromise the outcome of implant-related surgical procedures⁵⁰. Giving up smoking could be a useful tactic to increase implant success rates.

Effects on salivary glands

Tobacco smoking has been linked to lower salivary flow rate and increased production of sialolithiasis (stones within salivary ducts), notwithstanding the paucity of relevant literature. An odds ratio of 1.31 indicating a statistically significant correlation between smoking and sialolithiasis, was discovered in a cross-sectional study involving 947 cases and 3788 controls. According to the results of several research, smokers had thicker saliva and less saliva flow than non-smokers⁵¹. It has been discovered that smoking affects secretory immunoglobulin levels ⁵³ and lowers saliva pH⁵². Dental caries and periodontal disease may rise as a result of all these variables.

Dental caries

Dental caries is a complex illness. Its aetiology is primarily associated with improper mouth hygiene, eating habits, and treatment compliance. Research has indicated a connection between smoking and microorganisms that cause dental cavities. Nicotine has been linked to an ecological imbalance as well as the colonisation and metabolism of *Streptococcus mutans*, a major tooth caries-causing bacterium. Smoking affects saliva in a few ways, including decreasing its capacity to act as a buffer, changing the chemical agent and bacterial composition of saliva, lowering salivary flow rate, and supporting the development of an environment that is more susceptible to dental caries. Numerous epidemiological studies have connected tobacco use to a higher incidence of dental caries. The frequency was double that of non-Hispanic White or non-poor persons who had never smoked and who had completed at least high school education. Compared to people who have never smoked, smokers over 65 have a twofold higher risk of untreated caries⁵⁶. Research from Finland and Italy has revealed that smokers have higher scores than non-smokers for decaying, missing, and filled teeth.

Tooth discoloration

Tooth discoloration is one of the most prevalent dental problems brought on by tobacco usage. Teeth can become discoloured by the nicotine and tar in cigarettes, giving them a yellow or brown appearance. This is indicative of poor dental hygiene in addition to negatively impacting the cosmetic appeal of your smile.

Bad breath

Additionally, smokers have a higher likelihood of developing halitosis, or bad breath. Tobacco smoke and oral bacteria accumulation combine to produce an unpleasant odour that can be challenging to cover up. This may make you feel uncomfortable in social settings and have a detrimental effect on your confidence.

Dry socket

After having a tooth extracted, smokers are three times more likely to experience a dry socket. When the extraction site heals improperly and a blood clot does not form, emerges, or dissolves before the wound heals, the condition is known as a dry socket. Because it hinders healing and exposes the underlying nerves and jawbone at the socket, a dry socket is extremely painful.

Chewing tobacco and other tobacco products

Dental team members should be informed on the several tobacco alternatives and how they are linked to oral cancer, other oral diseases, and other health impacts. For example, chewing tobacco instead of smoking is quite widespread in the Indian subcontinent, and the usage of betel quid (paan) with areca nut, with or without the inclusion of smokeless tobacco, is particularly common within South Asian culture. There is evidence that its social and cultural use is influencing the risk of oral cancer, and its use is widespread throughout the United Kingdom. Shisha smoking, sometimes referred to as hookah, water pipe, narghile, or hubble bubble, is a customary tobacco-using technique that is prevalent worldwide, primarily in the Eastern Mediterranean region. Because they believe that the water filters out the hazardous components in the smoke, many people mistakenly believe that smoking a waterpipe is less harmful than smoking. But it carries many of the same hazards as smoking cigarettes. Similar to smoking, shisha smoking releases a lot of harmful substances into the air, such as tar, carbon monoxide (CO), nitric oxide, and other carcinogens.



Figure 1.1 Nicotine tobacco products

Common names for products containing tobacco include:

- waterpipes, shisha, hookah, hubble-bubble (containing tobacco and flavourings)
- zarda (tobacco often added to paan)
- gutkha (processed tobacco with added sweeteners)
- scented chewing tobacco (tobacco with added flavours)
- naswar, nas, niswar (tobacco with slaked lime, indigo, cardamom, oil, menthol, water)
- chillam (heated tobacco)
- paan (tobacco, areca nut or 'supari', slaked lime, betel leaf)

- snuff, snus (powdered or ground tobacco)
- khaini (tobacco, slaked lime paste, sometimes areca nut)

Strategies to Help Parents and Pregnant People Quit Smoking



Help families understand the impact of smoking on health, including oral health.

Smoking and oral health

Smoking and periodontal disease



There has been much discussion over the years about how tobacco use contributes to the development of periodontal disease, and the literature has recently published a significant number of publications addressing this issue. Smoking creates an environment that is favorable for oral bacteria like *Porphyromonas gingivalis*, *Prevotella intermedia*, and *Aggregatibacter actinomycetemcomitans* because the byproducts of smoking hinder the processes that control the growth of harmful bacteria in the oral cavity. Smoking therefore encourages periodontal disease in its early phases. The harmful effects of cigar and pipe smoking on oral health are comparable to those of cigarette smoking. Numerous studies have also demonstrated that smokers who have periodontitis react less well to treatment for the condition. The global burden of oral illness is primarily caused by periodontal disease. However, oral health care practitioners and public health authorities have paid very little attention to periodontal disease in many different countries. Smoking has been identified as a risk factor for periodontal disease by dentists and dental researchers over the past ten years due to the significant impact smoking has on the occurrence and severity of the condition. Smokers have been found to have poorer oral hygiene than nonsmokers, to brush their teeth less effectively, and to have significantly higher calcium concentration in their dental plaque (as shown in figure 6) than nonsmokers.

Smoking and gingivitis



Additionally, smoking cigarettes lowers the oxidation-reduction potential (Eh), which increases the amount of anaerobic plaque bacteria. Prior research indicates that smoking one cigarette causes a considerable reduction in gingival Eh values (Friedman, 2008). Moreover, cyanides and phenols found in tobacco smoke may be responsible for its poisonous and antimicrobial qualities. Compared to nonsmokers, smokers have far higher concentrations of these and are much more likely to become infected with *Bacteroides forsythus*. Smokers are also more susceptible than nonsmokers to get subgingival infections from *P. gingivalis*. Nonetheless, there is a noticeably increased relative risk of infection from this bacterium. Three kinds of Gram-positive bacteria, *Streptococcus mitis*, *Streptococcus salivarius*, and *Streptococcus sanguinis*, are less vulnerable to cigarette smoke than three species of Gram-negative bacteria, *Branhamella catarrhalis*, *Neisseria perflava*, and *Neisseria sicca*.

Smoking and dental caries

Dental caries is a multi-microbial condition that is not contagious and is brought on by a number of factors. Because sugar-fermenting microbes cause the acid demineralization of dental enamel, it is thought to be a diet- and pH-dependent process (Simon-Soro, 2013). The frequency of dental caries in tobacco chewers and smokers was not fully understood. The literature covered tobacco users' higher and lower prevalence of dental caries. There is debate regarding smoking's link to dental caries. Early research findings in the literature suggested that smokers had lower dental caries rates, 16 suggesting that smoking really lowers dental caries rates.

Conclusion

An improved taxonomy of developmental and acquired disorders, as well as periodontal manifestations and conditions impacting the course of periodontitis and the periodontal attachment apparatus, is presented. Additionally provided are case definitions and diagnostic guidelines. An increasing amount of research is demonstrating the harmful consequences that e-cigarettes have on every organ system in the human body. To elucidate the implications of e-cigarette usage on individual and public health, further research is required on the chemical components, the variety of flavours, and the long-term impacts on both active and passive users. Roughly 50% of the individuals had visited a doctor after developing a dental issue. Treatment costs appear to have a significant impact on how often people use oral health services. It is advised to optimise expenses and raise knowledge of the advantages of using preventive dental care.

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