

Effects of deleterious habits on teeth-A literature review.

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ABSTRACT

The tooth is a complex structure made up of mineralized tissues—including enamel, dentin, and cementum—along with soft tissues such as the dental pulp and periodontal ligament. Preserving the integrity of these components is crucial for maintaining oral health. However, various harmful habits, such as smoking, alcohol consumption, betel nut chewing, and other behavioral oral habits, can significantly affect dental well-being. Smoking and alcohol use are linked to both systemic diseases and oral health deterioration. Tobacco use, in particular, is a well-established risk factor for periodontal disease, tooth discoloration, and increased susceptibility to cavities. The relationship between these detrimental habits and dental health is complex, involving microbial alterations, reduced salivary flow, and direct chemical effects on tooth structure. This review examines the impact of these habits on dental health, explores the underlying mechanisms, and discusses strategies for prevention and management.

Key words: Deleterious habits, Effect of smoking on oral cavity, Tobacco cessation, pacifier sucking habit

INTRODUCTION:

The tooth is a complex structure composed of mineralized tissues, including enamel produced by ameloblasts, which are epithelial cells, dentin, and cementum produced by mesenchymal cells called odontoblasts and cementoblasts, respectively. It also contains soft tissues such as the dental pulp and periodontal ligament, along with nerves and blood vessels. Maintaining the integrity of these components is essential for proper functions like mastication and overall oral health [1]. However, the use of various tobacco and non-tobacco products, including cigarettes and alcohol, has significantly impacted oral health in recent years. In adults, deleterious habits such as smoking, alcohol consumption, and betel nut chewing are common, while adolescents are more likely to engage in behaviours like nail biting, object biting, cheek or lip biting, mouth breathing, and bruxism—often stemming from thumb sucking during infancy. Over time, these habits can negatively affect tooth position, composition, surface roughness, and colour [2].

Smoking has been linked to various systemic diseases, such as heart and lung disorders, and several types of cancer [3]. It also has a negative effect on oral health. Individuals with poor oral hygiene, unhealthy eating habits, infrequent dental checkups, and a smoking habit are more likely to have a higher caries index. Maternal smoking and environmental tobacco smoke are known to be potential risk factors for caries in children [4]. Tooth discoloration can occur in several forms: intrinsic, extrinsic, and/or internalized. Chromogens from the diet and other external factors can stain the tooth surface or accumulate within the pellicle layer, leading to extrinsic color changes. Smoking, alcohol consumption, and betel nut chewing are some of the harmful habits that contribute to tooth discoloration due to extrinsic factors. Oral habits like nail biting, bruxism, finger sucking, and lip or cheek biting in infants and adolescents are associated with separation anxiety and malocclusion. These habits can lead to malalignment of teeth, notches along the enamel margins, and other dental issues. Early identification and intervention are crucial for managing such cases [5].

MATERIALS AND METHODS:

A total of 80 articles published between 1952 and 2024 were selected using keywords such as "deleterious habits," "smoking," "alcohol," "betel nut," and "oral habits," along with key phrases like "effect of smoking on teeth," "effect of alcohol consumption on oral health," and "oral habits and their effect on teeth." These articles were sourced from databases including PubMed, Google Scholar, Scopus, ClinicalKey, and ScienceDirect. After prescreening, 14 articles were excluded due to duplication, 4 were excluded for being in languages other than English, and 12 were deemed irrelevant. In the end, 50 articles were included in this literature review.

DISCUSSION:

Cigarette smoking

The World Health Organization predicted that tobacco deaths in India may exceed 1.5 million annually by 2020. Further, people who smoke are more likely to have a shorter life span as compared to those who don't [6]. Dental caries is a multifactorial disease, where the use of tobacco and its products are not directly linked with the cause of caries but just adds on to the risk of developing caries over a period, along with the other factors involved, which includes socio- economic and demographic variables also. Smoking has also shown to affect the oral health in a lot of ways ranging from esthetics, such as staining, to potentially life-threatening conditions such as oral cancer [7]. In the oral cavity, smoking has been seen in relation to gingivitis, periodontitis, tooth loss, epithelial malignancy and tooth staining. The particulate fraction of cigarette smoke causes deposit on the surface of teeth and dental restorations, resulting in yellowing and darkening [8].

Cigarettes are made with more than 7000 chemicals and give out hundreds of different chemicals such as acetone, acetamide, acetaldehyde etc. that can cause serious damage to the humans including the teeth. Cigars are not a safe alternative to cigarettes and cigar smoke is at least as toxic as cigarette smoke, if not more. Large cigars can deliver as much as 10 times the nicotine, two times the tar, and

more than five times the carbon monoxide of a filtered cigarette. Waterpipe smokers may absorb even more of the harmful chemicals found in cigarette smoke because smoking sessions are typically longer. A typical one-hour hookah session involves inhaling 100–200 times the volume of smoke from a single cigarette [9].

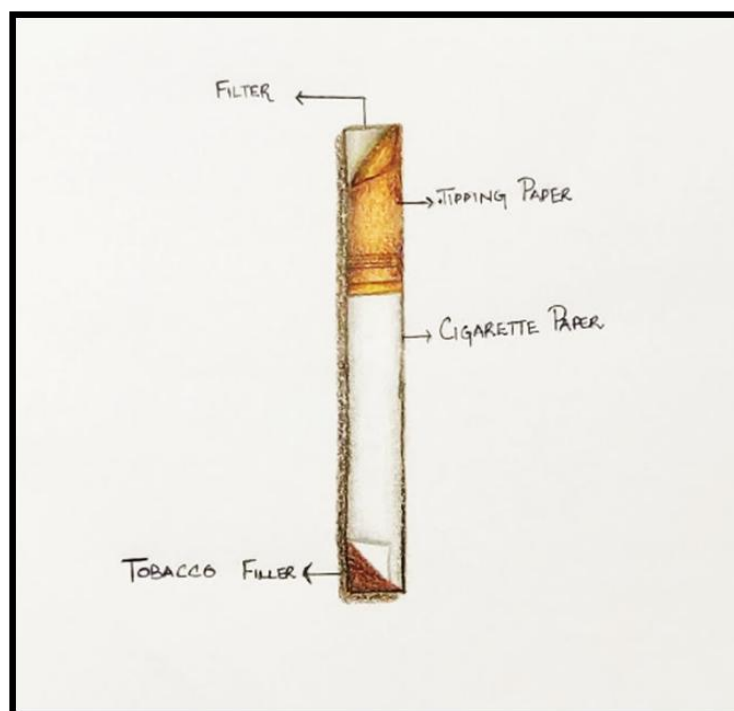


Fig. 1. Schematic diagram of cigarette

Smokeless tobacco products:

Most smokeless tobacco use involves placing the product between the gum and the cheek or lip. Smokeless tobacco is a noncombustible tobacco product. Both the smoking and non-smoking forms of tobacco use have their respective negative impacts on oral health producing caries susceptible conditions such as reduced salivary flow, acidic pH, and increased microbial count. The association of smokeless tobacco use and increased dental caries can be attested to the fact that in the pouch and plug varieties of smokeless tobacco forms, sugar is usually found to be present [10]. The mechanism through which tobacco causes gingival recession and tooth wear lesion may be through local frictional and vascular effects. The high sugar content increased gingival recession and enhanced collagenase activity were

postulated by Tomar and Winn, (1999) as reason for increased risk for development of root surface caries among chewing smokeless tobacco users [11].

Tobacco usage immediately stimulates salivary flow, but there is no long-term effect on saliva flow rates. The pH of saliva rises during smoking, but over longer time periods most studies indicate that smokers have slightly reduced pH and buffering power compared to nonsmokers. Few studies have shown a relationship between smoking and a higher incidence of dental care. There is no evidence of any direct aetiological relationship, but the findings of higher counts of lactobacillus and, although various results are reported, Streptococcus mutans in smokers may explain this relationship [12].

A biologically plausible explanation for an association between chewing tobacco use and dental caries is that the high levels of fermentable sugars in these products can stimulate growth of cariogenic bacteria. The way that chewing tobacco typically is used in the United States creates an environment conducive to dental caries; a wad of tobacco is kept in the oral cavity for 30 minutes on average, and the chewing tobacco often is used over an extended period each day. This hypothesis is supported by in vitro evidence for stimulated growth of *S. mutans* and *S. sanguis* in the presence of chewing tobacco extracts. Extracts from chewing tobacco with high sugar content also have been found to increase the in vitro growth of *Lactobacillus casei*, a bacterium implicated in root-surface caries [13]. Studies conducted by Huang et al [14] revealed that nicotine increases the formation of biofilm by the action of *S. mutans* bacteria and its metabolic activity on teeth surfaces which suggests the possibility of increased risk of dental caries in smokers.

Effect of smoking on tooth loss:

Cigarettes contain toxic materials that may influence tooth retention through a number of different local and systemic mechanisms. Local effects on the periodontium that have been proposed are gingival mucosal irritation, altered salivary flow, and microbial growth. Systemic effects of smoke also have an impact

on periodontal tissues. Nicotine and other toxins absorbed into the blood stream suppress immunologic activity, increase epinephrine levels, and induce vasoconstriction. In several cross-sectional studies, cigarette smoking has been associated with increased prevalence of alveolar bone loss [15].

Alcohol consumption and its effect on teeth:

Consumption of alcohol inevitably affects the oral cavity, oral mucosa and teeth. Literature indicates that alcohol dependents may have increased risk of dental caries, probing pocket depth and mucosal lesions. With respect to oral health, alcohol is among the most important risk factors for oral cancer. Alcohol causes a change in the rate of penetration of substances from the oral environment across the mucosa and this alteration of mucosal permeability may have a role to play in carcinogenesis [16].

Alcoholic dependents might experience dry mouth at night, they consume higher levels of refined carbohydrate to satisfy their –munchies and neglect both personal and professional oral health care, all of these might increase their risk of caries. The acidity of wine can cause dental erosion. Furthermore, its constituents may lead to excessive staining of teeth. Dental erosion is associated with the loss of superficial tooth substance from either acid exposure or chelation; it is independent of bacterial processes. Common features of dental erosion may include sensitivity of the exposed dentin, "cupping" concavities of enamel cusps and extruding restorations resulting from the loss of adjacent hard tissues. In severe circumstances teeth may become disfigured, fracture along thinned incisal edges, and the erosions may extend into the pulp. Because of the presence of tartaric and malic acids, wine possesses a pH 3.0-3.8, far below the critical value for enamel decalcification. White wines have been reported to be slightly more acidic than red wines. Sparkling wines additionally contain carbonic acid but, surprisingly, have not been found to be more erosive than white wines. Excessive intake of alcohol beverages with low pH, for a long duration of time can lead to acidic PH, such continuous consumption of alcohol

may also lead to reduced salivary flow rate. Salivary PH and salivary flow rate are directly proportional, such as with decrease in the flow rate there is also considerable decrease in the PH of saliva and vice versa [17,18].

Relation between betel nut chewing and caries:

Epidemiological studies in Southeast Asia suggest that betel chewing may provide protection against dental caries, with a lower prevalence of caries among betel chewers compared to non-chewers. Several factors are thought to contribute to this cariostatic effect [19]. First, the betel stain that often coats the teeth may act as a physical barrier, preventing tooth demineralization. Additionally, the tannin content in betel has antimicrobial properties, which could further reduce the risk of caries. Chronic betel chewers often experience marked attrition of the cusps of their teeth, leading to the loss of occlusal pits and fissures, which can decrease the likelihood of pit and fissure caries by eliminating areas where food and bacteria might stagnate. Furthermore, the act of chewing stimulates saliva production, and when combined with added slaked lime, it may help raise the pH in the oral environment, making it less conducive to tooth decay. Lastly, the increased production of sclerosed dentine in response to attrition may offer additional protection against microbial invasion, contributing to the overall reduction in dental caries [20,21].

Influence of deleterious habits on tooth stain

Aesthetics and color of the teeth are reflection of systemic health. Tooth discoloration is a major concern in clinical dentistry primarily because a set of white teeth is considered aesthetically pleasing. Cigarette smoking is also thought to penetrate cracks within teeth resulting in further staining, the level of discoloration is also proposed to be proportional to the number of cigarettes smoked per day. Cigarette smoking stain cannot be easily removed; a recent study that used nicotine as a marker of particulate deposition highlighted that brushing removed only 36% of the deposited nicotine from teeth. Direct staining chromogens derived from dietary sources, such as tea and coffee are taken up into the pellicle and their natural color imparts the stain onto the tooth. Smoking or chewing tobacco or the

consumption of red wine are also known to cause direct staining, it is the polyphenolic compounds found in food that are thought to give rise to the color of the stain [22].

The acid white wine and cayenne were found to contain a high concentration of tannin, which may be responsible for the discoloration. The chemistry of tannins is complex and nonuniform, and they can be divided into two main groups: derivatives of flavanols and hydrolysable tannins, which are esters of a sugar with one or more trihydroxybenzene carboxylic acids. Metallic salts, when dissolved in solution, can precipitate with substances such as albumin and starch, producing a bluish-black color or gradually darkening when exposed to air and light after reacting with ferric salts. The penetration of tannins into exposed dentinal tubules and enamel could account for the resulting black color, although sound enamel is not penetrated. Joiner et al. also demonstrated that components of black tea and red wine had a significant effect on in vitro pellicle maturation, causing thickened layers of stained material to accumulate [23].

Oral habits:

Pacifier-sucking habit:

The sucking needs of infants differ from child to child. Some require both nutritive and non-nutritive sucking at very frequent intervals, while others manifest the sucking response infrequently. For non-nutritive sucking, pacifiers are effective in satisfying an infant's sucking needs. In general, dental problems caused by pacifiers are usually minimal but can cause an increased overjet or an increased horizontal distance between the maxillary and mandibular incisors. Such malocclusions are considered temporary and usually self-correct after the habit is discontinued. Studies show that children who suck a pacifier experience more caries and inflammation of the periodontal tissues. This may result from dipping the pacifier into honey or syrup [24,25].

Mouth breathing

There are several advantages to breathing through the nose. Not only is the air cleaned, warmed, and moistened while passing through the nasal passages, but the lips, when closed, exert a balancing force against the incisors. Mouth-breathing may cause excessive drying of the teeth and gingivae and produce an imbalance of soft tissue forces against the occlusion. The xerostomic effect is usually limited to the anterior maxillary and mandibular areas. This dryness increases the susceptibility of the gingivae to chronic inflammation and the teeth to caries [26].

Management of Oral Habits:

In cases where oral habits are due to skeletal abnormalities, the underlying cause should be addressed orthodontically using growth-modulating appliances. For mouth breathing, an oral screen serves as an early treatment option, helping to prevent the development of this habit while also reducing oral dryness and the risk of increased caries incidence. Additionally, parental and professional counselling from a young age has been shown to be effective in overcoming deleterious oral habits [26, 27]

Management of stains:

Tooth discoloration caused by improper eating habits, beverages, and tobacco use can initially be treated with thorough oral prophylaxis, along with the cessation of such habits to prevent further discoloration. Proper tooth brushing using the modified Bass technique twice a day helps prevent the development of external stains on the tooth surface. Dentifrices typically contain an abrasive, a detergent, and an anti-tartar agent, with some now incorporating tooth-whitening agents. Additionally, professional tooth cleaning methods, such as ultrasonic cleaning, rotary polishing with an abrasive prophylactic paste, or air-jet polishing with an abrasive powder, can help remove certain extrinsic stains. However, these techniques may lead to enamel removal, making their repeated use undesirable [28]

Management of Decay:

Management of tooth decay in patients with tooth discoloration involves a comprehensive approach that addresses both structural damage and aesthetic concerns. Regular oral checkups are essential for early detection and timely restoration of carious teeth. Restorative treatments, such as dental fillings, composite bonding, or crowns, help preserve tooth integrity while improving appearance. For discoloration caused by decay, professional cleaning, bleaching, or veneers may be recommended to enhance aesthetics after treating the underlying issue. Additionally, reinforcing proper oral hygiene practices, dietary modifications, and fluoride applications can help prevent further decay and maintain overall oral health [29].

Cessation of deleterious habits:

The dental team can help in creating and maintenance of a tobacco free community by participating in community as well as various political programs and counselling their parents to quit, so as to be a good role model for their kids. There are various evidence on both the efficacy and budget friendliness of tobacco avoidance and interference, as shown in Fig 2 [30].

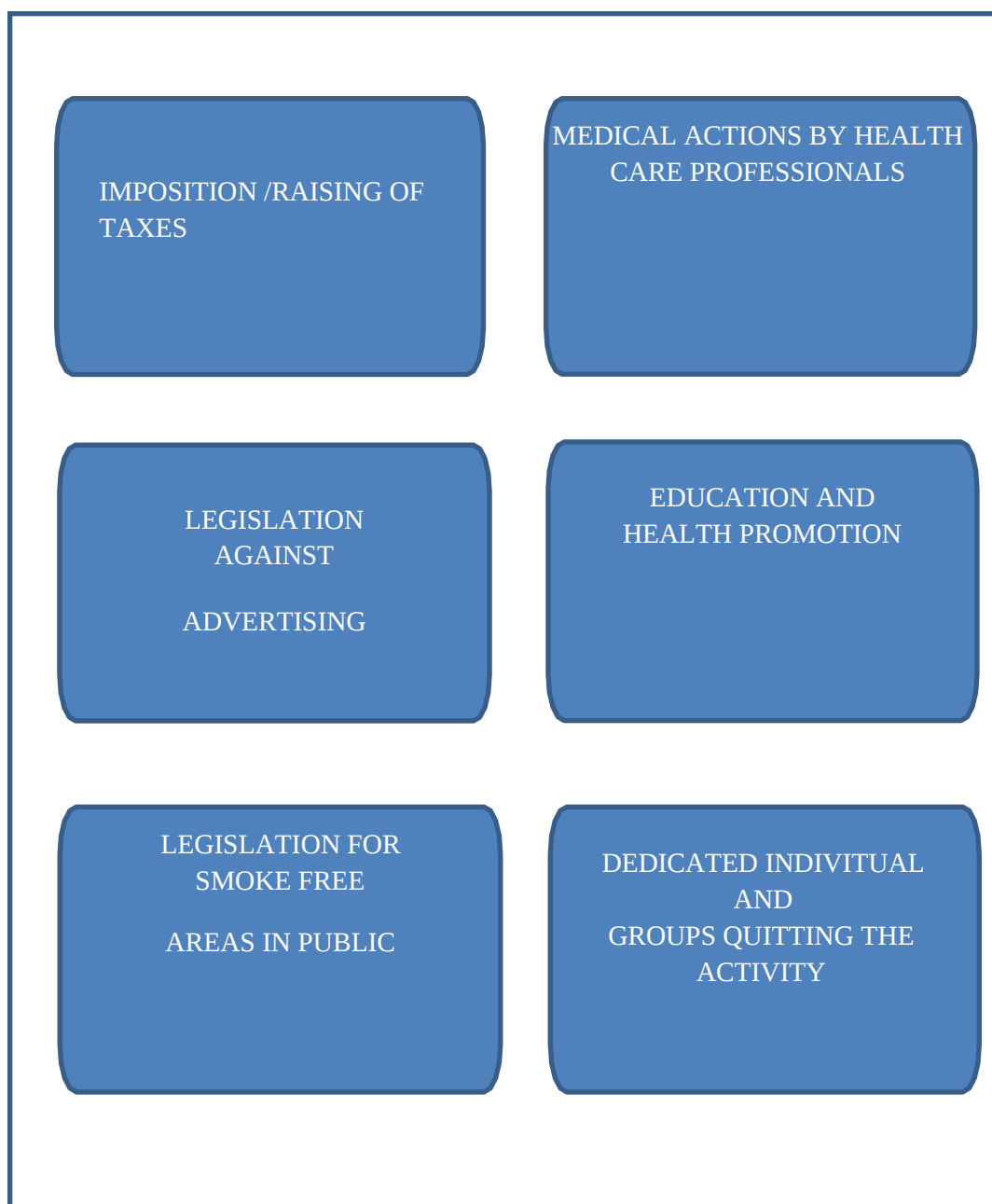


Fig 2 : Hierarchy of cost effectiveness of approaches to smoking cessation

Outstanding opportunities for dental team:

- Discuss prevention with smokers and nonsmokers, especially with the younger generation, so as to educate them about the harmful effects of tobacco and to advise them about tobacco cessation prior to the development of any tobacco related diseases
- Approach the general population following the 5 A's [31] as shown in Fig 3



Fig 3: 5 A's in Tobacco Cessation

Intervention in health care settings:

Services providing tobacco cessation has been used since a long time by the health care sector, dental clinics also provide a platform for such programs to be taken and expand in the general population, various studies and surveys have also proven the fact that dentist and dental hygienist in the health care sector have a better impact in making these programs of tobacco cessation a better

success as they have one to one interaction with the patient [32]. Research have also shown success in abstinence from smoking in a group of subjects when self-help videos were the modes used to educate and persuade the people on cessation of the habits. Communication over calls has also been a mode used to persuade and motivate the tobacco users for cessation of their habits [33].

CONCLUSION:

The adverse effects of deleterious habits on oral health are extensive and multifaceted, affecting both the structural and functional aspects of teeth. These habits contribute not only to aesthetic concerns such as staining and discoloration but also to severe oral conditions like dental caries, periodontal disease, and even oral malignancies. The long-term consequences of these habits extend beyond the oral cavity, influencing overall systemic health and quality of life. Addressing these issues requires a collaborative approach involving dental professionals, healthcare providers, policymakers, and individuals. Increased awareness, targeted prevention programs, and access to effective cessation interventions can significantly reduce the burden of these habits. Future research should focus on developing novel treatment strategies, improving early detection methods, and enhancing the effectiveness of preventive measures. A strong emphasis on patient education and behavioural modification is crucial in mitigating the impact of these habits, ultimately promoting better oral and general health outcomes for individuals and communities alike.

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