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EVIDENCE BASED REVIEW ON TOBACCO SMOKING AND DENTAL CARIES

Radio-diagnosis

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ABSTRACT

Purpose: The relation between smoking tobacco and dental caries has been the topic of research for quite some time. Varied association is presented in literature. A systematic review was conducted to analyse the relationship between smoking tobacco and dental caries. Methods: For the purpose of the review, only observational and prospective studies were selected. No case reports, reviews and letter to editors were excluded. All the studies measured dental caries using the DMFT index and the habit of smoking tobacco was self reported. **Results:** All the 9 articles appraised presented an increased risk of dental caries in smokers. **Conclusion:** A definite association was established between smoking tobacco and the increased risk of dental caries. Extensive research is needed to guarantee the causal relationship between the two variables.

KEYWORDS

Smoking tobacco, dental caries, cigarettes, oral health, habits, prevalence

Introduction:
Smoking tobacco is a major public health concern today1. The health consequences of this habit is that, it is responsible for over 7 million deaths and loss to economy globally every year, as reported in World Health Organization2. Tobacco use in India has a prevalence of 55.8% , as per the National household survey of drug and alcohol use3. The chemicals in tobacco affects several systems causing cardiovascular diseases, cancers, atherosclerosis, etc[4].

Tobacco is smoked in various forms such as cigarettes, cigars and piped tobacco5. In Asian countries, it is also taken in the form of bidis, hookah and chillum. Globally, cigarettes make for the mass production of tobacoo, which is smoke. It is estimated that more than 1.1 billion adult population are currently cigarette smokers worldwide[6].

Tobacco not only affects general health, but even oral health. Tobacco use impairs oral health and can cause stains on teeth and restorations, dysguesia, periodontal pathology, development of oral mucosal lesions and conditions such as leukoplakia, oral submucous fibrosis,smokers palate, coating of the tongue and dental caries[7].

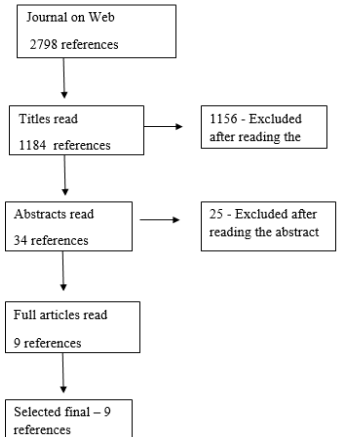
Association between smoking and dental caries has varied opinions. Johnson8 proposed that smoking tobacco helps to reduce caries, who supported this proposal by the presence of higher concentration of Thiocyanate in the smoker's saliva, which is a constituent of tobacco smoke and exhibits caries inhibiting effect. On the other hand, low salivary pH and decreased buffering effect along with higher number of Streptococcus mutans and Lactobacilli in smokers may greaten the risk of caries susceptibility was proposed by several authors9,10,11,12. Literature documents the association of tobacco use with greater risk of dental caries in the adult population[13].

Varied data regarding the increased presence of dental caries in tobacco smokers prompted us to review the concurrent presence of these two variables based on literature evidence.

Materials and methods:
The MEDLINE (PubMed) and the Journal of Web electronic database was explored for articles published in English language on the relation between dental caries and tobacco smoking. Studies published up to 2019 were included. Key words and terms used for the search were smoking tobacco, dental caries, cigarettes, oral health. Reference checks of the articles found were also made to garner further studies. The variables assessed were tabulated which included Study ID (First author name and year of study), study design, sample size, mean age of the sample, habit assessment, lesion evaluation and inference.

The PICO was formed for the study, wherein

P – People who smoked tobacco
I – Observational study
C – General population
O – Dental caries
The question generated was "Does the habit smoking increase the risk of dental caries?".
Flow chart for evidence based review on relation between smoking tobacco and dental caries



Results:
A total of 2798 articles were found in Pubmed and Journal of Web, of which 25 were rejected after reading the abstracts. For the sake of the review, 9 full articles in English were included which fulfilled the inclusion criteria of the reviewers. Studies included in the review were: Vijaya Hegde et al, Gunnel Hansel Peterson et al, Shreya Sharma et al, Tanner et al, Anders Holmen et al, Aguilar Zinser et al, Vellapally et al and Axelsson et al.

Out of nine appraised studies, seven were of cross sectional design and 2 were of prospective design. The habit of smoking was self reported in all studies.

One among the nine studies reviewed, reported microbial counts of Streptococcus mutans, Streptococcus sanguis and Candida albicans. Streptococcus mutans had a colony count of 46 X 104 and 3.85 X 104 among smokers and non – users respectively, while Streptococcus sanguis had a colony count of 10 X 104 and 1.3 X 104 among smokers and non – users respectively. The mean colony forming unit of Candida Albicans was 1.3 X 102 and 0.00 among smokers and non – smokers, inferring that smoking tobacco habit influences microbial growth.

Study ID	Study design	Sample number	Mean age	Habit assessment	Caries evaluation	Inferences
Vijaya Hegde, 201914	Cross sectional study	75	20-40 years	Self reported	DMFT index of WHO 1997 Basic Oral health survey	Mean DMFT was higher in smokers at 4.63 than 1.79 in non-smokers

Gunnel Hansel Petersson, 201915	Prospective study	1295 at baseline and 982 after 3 years with a drop	19 years	Self reported	DMFS index of WHO criteria	Relative risk of 1.5((95% CI 1.2-1.7) was observed in smokers
Shreya Sharma, 201816	Cross sectional study	300	20-40 years	Fagerstrom test for nicotine dependence	Mean DMFT / DMFS index of WHO 1987	Mean DMFT was greater in smokers than non – users(2.50 + 1.51vs 1.75 + 1.41) Mean DMFS also was higher in smokers than non – smokers (5.67 + 4.19 vs 3.18 + 3.05)
Tanner, 201517	Cross sectional study	8539	19.6 years	Self reported	Mean DMFT	Mean DMFT in smokers and non users was 6.35 +4.86 and 3.75 +4.05
Tanner, 201418	Cross sectional study	8537	19.6 years	Self reported	Mean DMFT	Mean DMFT in smokers and non-smokers was reported at 5.43 +4.85 and 3.55 +3.78
Anders Holmen, 201318	Prospective type	10,068	16-19 years	Self reported	Mean DMFS	Mean DMFS significantly differed between never and ever users (p<0.0001)
Aguilar Zinser, 200819	Cross sectional	824	35.5 + 10	Self reported	DMFT	Mean DMFT in smokers was 8.80 +6.56 versus non-smokers which was 8.55 + 5.72
Vellappally, 200820	Cross sectional	805	30 - 69	Self reported	DT, MT and FT	DT in smokers was 6.44 + 3.95 compared to non smokers, 5.1 + 4.25
Axelsson, 199821	Cross sectional study	1093	Not known	Self reported	DMFT and DMFS	

Discussion:

Tobacco in any form affects oral health resulting in gingival and periodontal destruction, oral pre-cancerous and cancers, cleft lip and cleft palate. Smoking during pregnancy can cause congenital defects in children22. Dental caries is a progressive, microbial disease of the oral cavity resulting in dissolution of the organic portion and demineralisation of the inorganic substance of the tooth resulting in cavity formation. It left untreated, it can result in pulpal and periapical pathologies, and ultimately tooth loss. Several factors are concurrently found with dental caries, of which tobacco smoking is also one.

All the studies reviewed presented a positive correlation between smoking tobacco and dental caries in ages 16 years and above.

All the 9 appraised articles involving cross – sectional and prospective research reported a negative impact of smoking on dental health. Dental caries was found to higher amongst smokers than non – smokers. But as caries is a multi – factorial , non-communicable disease, it is imperative to the habit of smoking might coincide with other risks involved such as biological, psychosocial, life style and socio-economic risk factors. The biological risk factors can be decreased salivary buffer capacity and salivary IgA levels along with decreased salivary pH23. Though literature has reported an association of cigarette smoking with caries prevalence, certain host factors also needs to be looked into like, age, oral hygiene habits, dietary habits, consumption of alcohol and regular visits to dentists24. Natural tobacco has a sugar level of 20% wt. In addition to this, during tobacco processing, various sugars and sweetners are also added for the flavour or to act as a humectants. Sweetners like glucose, fructose, invert sugars and sucrose are added upto 13% wt. Sugar additives may be appreciated by young adult smokers for their sweet taste and pleasant smell. This may contribute for the increased of dental caries among smokers.Another theory favouring increased prevalence of dental caries in smokers is that nicotine changes oral ecology, supported by an invitro study which proposes that nicotine accelerates plaque formation[25].

All the included studies used Decayed – Missing - Filled Teeth or Decayed – Missing – Filled Surface to score dental caries. None of the authors used any form of radiographs for caries assessment. DMFT index is universally acceptable and applied as it is simple while DMFS index adds a sensitive component.

Though the review showed a positive relation between smoking tobacco and dental caries, a causal relationship between the two cannot be drawn as most of the studies were of cross sectional design. Clinical trials, prospective studies and experiments are further needed to identify the independent effect of dental caries as the cause for smoking tobacco.

Certain limitations may impact the review results. Tobacco assessment was self reported inducing a subjective bias. As the participants knew the purpose of the study, social desirability bias would be incorporated as tobacco usage would not be reported appropriately.

Conclusion:

The review undeniably presented smoking tobacco bearing a negative impact on oral health. Dental caries was found to be in higher prevalence in smokers than smokers. Further research is needed to educate and promote awareness about smoking tobacco.

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