Review Article

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E-Cigarettes and Oral Health: A Comprehensive Approach to Prevention Strategies Across Different Levels

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ABSTRACT

Introduction: E-cigarettes are gaining wide acceptance globally and are also posing a serious threat to people's health, especially oral health. **Methods:** This literature review was performed to review the existing literature using the PubMed, Scopus, and Web of Science databases. **Result:** Regarding the effect of e-cigarettes on oral health and potential prevention approaches for all levels of prevention. **Conclusion:** The review will shed light on the knowledge gaps and the need for further research.

KEYWORDS: e-cigarettes, electronic cigarettes, vaping, oral health, prevention

INTRODUCTION

Electronic cigarettes (e-cigarettes) have rapidly flourished worldwide since their first introduction in 2006, with estimates of the current number of users worldwide exceeding 40 million.[1] In late 2000s , it was promoted and introduced as a smoking cessation product to the public especially among young adults and adolescents as a less harmful alternative to conventional cigarettes.[2-5] However, increasing concerns have been raised about negative health effects of e-cigarettes on both oral[6] and general health[7,8] This review specifically explores the association of e-cigarettes with oral health and the need for and implementation of multi-level prevention strategies.

However, the effects of e-cigarette use on oral health remain a complex and emerging area of research.[1] The adverse impact of traditional cigarette smoking on oral health has been extensively examined,[1,9] as is the case for the oral health consequences of e-cigarette use, which, although less well understood, is equally troublesome.[3,10] Tobacco-free oral smokeless tobacco, nicotine inhalers/e-cigarettes, e-cigarette vapors and electronic cigars are some of the examples of tobacco products that can directly affect mucosal tissues and may be associated with oral diseases. They can lead to gum inflammation (gingivitis) , dry mouth,[9] higher risk of cavities (dental caries)[1,2] and potentially periodontal disease[3,10,11] and even oral cancer.[4,12] Additionally, the vasoconstrictive effect of nicotine may limit blood flow to the gums, making gum disease more likely and delaying healing following dental procedures.[9]

Tackling the oral health risks posed by e-cigarettes will require a multi-level prevention strategy. This review aims to bring attention to the various prevention strategies on four levels: primordial prevention (preventing initiation of e-cigarette use); primary prevention (preventing users from developing oral diseases); secondary prevention (early detection and intervention); and tertiary prevention (taking care of advanced oral diseases). We will also talk about the idea of quaternary prevention, which is that we should also be avoiding unnecessary interventions. This full review synthesizes the existing evidence on the impact of e-cigarettes on oral health, includes an evaluation of existing and emerging prevention strategies, identifies knowledge gaps, and provides recommendations for future research and public health interventions.

METHODS

A review was conducted to identify and synthesize the relevant research literature. We performed a extensive search of three electronic databases (PubMed, Scopus, and Web of Science) for studies published in English from 2017 to 2025. The search strategy

employed keywords and Medical Subject Headings (MeSH) terms: "e-cigarettes," "electronic cigarettes," "vaping," "oral health," "periodontitis," "dental caries," "oral cancer," "gingivitis," "primordial prevention," "primary prevention," "secondary prevention," "tertiary prevention," "quaternary prevention," "smoking cessation." The search was limited to studies involving human participants that associated with between e-cigarette use and oral health outcomes, including potential prevention strategies. Studies that used only traditional cigarettes, that were conducted in animals, or that were reviews and did not directly address the research question were excluded. The articles included in this review were subjected to a screening process to assess their quality and eliminate any potentially unreliable evidence.

Different level of prevention

Primordial Prevention

on people with advanced stages of oral diseases, reducing disability and improving the quality of life among those with a dise

Primordial prevention is about creating the environments or conditions favorable to low risks of disease initiation.[1] Primordial prevention, in the context of e-cigarettes and oral health, means that person never starts using e-cigarettes in the first place, especially the youth, who are being targeted for such prevention.[1,9,12] These include broad public health campaigns, permitted to alert the public about the potential harms of e-cigarette use[1,9,13] and also drawing attention to their long-term risks for oral health.[1,4,9] Such campaigns should specifically focus on vulnerable groups, especially in adolescents and young adults, utilizing appropriate communication strategies that appeal to their health-seeking behavior and comprehension.[7,14] In order to support effective primordial prevention, policy-level measures must be pursued to control e-cigarette advertising and marketing,[1,9,5,15] limit access, and implement comprehensive tobacco control policies that include e-cigarettes,[6,16] The overall aim is to establish a social environment where the initiation of e-cigarette usage is discouraged and healthy substitutes are encouraged.

Primary Prevention

Primary prevention aims at disease prevention in individuals at risk,[13] For e-cigarette users, oral health protective strategies (as primary prevention) are implemented on a general basis to counteract the harmful consequences of vaping.[1,9,13] This may involve implementing educational initiatives designed to raise awareness among e-cigarette users about the unique oral health risks related to e-cigarette use. [1,9,13] Dental professionals are in a unique position to facilitate this process,[1,9] as they are crucial in providing one-on-one counseling and assistance for patients to stop using e-cigarettes .[1,9,17] Besides, dissemination of information regarding the risks of e-cigarette use and healthy behaviors can spread through community-based education programs[18]

Secondary Prevention

Secondary prevention is early detection and intervention to stop the progression of disease.[3] For e-cigarette consumption and oral health-related studies, secondary prevention refers to the discovery and treatment of early stages of oral disease for e-cigarette consumers to prevent irreversible effect.[3] This necessitates periodic oral examinations, including periodontal screenings, aimed at identifying early stages of gingivitis,[13] periodontal disease,[3,11] and other oral lesions[19] related to members of the oral cavity adapted to the use of e-cigarette. Proper screening tools and diagnostic methods in dental practice is essential for early detection. Affected tissues, in turn, can be addressed by timely intervention (e.g., active therapeutic management through non-surgical periodontal therapy,[11] preventing disease development and maintaining oral health. Early identification and treatments are essential to minimize ongoing harm and promote better patient prognoses.

Tertiary Prevention

Tertiary prevention focuses ase.[3] Tertiary prevention assists e-cigarette users with advanced conditions to organize and restore existing damage in order to prevent disease progression and enhance oral function and esthetics.[3] A multidisciplinary strategy may be implemented with a team approach involving periodontists, prosthodontists, oral surgeons, and various specialists addressing complex oral health problems such as severe periodontal disease, tooth loss, oral lesions.[9,19] Treatment options to restore the lost supporting structures may require periodontal surgery, placement of the dental implant progenitors, restorative dentistry and other rehabilitative procedures.[3,20] In order to preserve oral health and counteract the recurrence of oral diseases in recovering users, long-term oral care plans are essential.[3]

Quaternary Prevention

Another approach, called quaternary prevention, aims to prevent overmedicalization, prevent unnecessary, or excessive intervention, and promote respect for autonomy.[21] In terms of e-cigarette usage and oral health, this requires abstaining from overtreatment or excessively aggressive treatment of mild oral conditions.[21] It also highlights the need for shared decision-making between the dental care provider and patient for individual patients, taking into account patient preferences and values while including evidence-based recommendations.[21] Vaping, oral health, oral health complaints, ethical considerations preventive measures will be distributed linearly according to the needs of the individual so they will neither sacrifice unnecessary control nor risk harm from unnecessary intervention.

DISCUSSION

The literature review demonstrates a considerable association between e cigarette use and different oral health problems.[1,3,4,9,10] The developments emphasize the need for an integrated prevention agenda — primordial, primary, secondary, and tertiary prevention — while paying close attention to principles of quaternary prevention. At the same time, the complexity of the issue demands a coordinated response involving dental professionals, public health officials, policymakers, and researchers as intelligence stakeholders.

There are various challenges to implementing prevention strategies at all levels. For example, in the case of primordial prevention of this issue, it will necessitate continuous public health campaigns and policy changes that are likely to be obstructed by industry influence and public perception.[1,5] Effective education and counseling are the cornerstones of primary prevention,[1,9,13] and these services require training and resources for oral healthcare providers. This highlights the need for improved access and affordability of healthcare to facilitate secondary prevention in the form of regular oral examinations and timely intervention.[3,11] Tertiary prevention is

complex and expensive,[3] necessitating specialized experience and infrastructure. Quaternary prevention demands a measure of balance between prophylactic participation, respect for patient autonomy[21] and thus strong communication skills accompanied by ethical input.There are still important knowledge gaps about the long-term effects of e-cigarette use on oral health.[1,3,9,22] Epidemiological evidence of longitudinal studies with clear definitions of e-cigarette use are required in order to fully clarify the causal relationships of e-cigarette use and individual oral diseases. More research is also needed on the effectiveness of various prevention strategies, especially those focused on specific populations (i.e., adolescents, young adults). There is a need for research that investigates the messaging strategies that determination work best in communicating that e-cigarettes are not safer than flammable cigarettes.[7] However, the interaction between e-cigarette consumption, oral microbiome alterations, and onset of oral diseases is another key gap of knowledge that requires to be fully addressed in future studies.

CONCLUSION

This literature review has demonstrated that e-cigarettes pose a significant and increasing risk to oral health. Evidence consistently indicates that vaping is related to numerous oral health issues including tooth decay, gum disease, gingivitis, and possibly oral cancer. Primordial, primary, secondary and tertiary prevention strategies within a comprehensive prevention framework but ethically, consideration of quaternary prevention (to avoid over-treatment) are the required approaches to limit these risks. These findings highlight the important role of the dental professionals in educating, counseling, and providing preventive interventions to e-cigarette users. To be effective prevention strategies have to use a multi-faceted approach, utilizing public health campaigns, policy changes, and individualized patient care. This means implementing restrictions on e-cigarette marketing, limiting access for adolescents, and supporting comprehensive tobacco control legislation. Healthcare providers need to be properly trained to inform patients about all related risks of e-cigarette use and provide evidence-based cessation support. Researcher need to further explore the long-term impacts of e-cigarette on oral health and assess the most effective prevention methods. Collaborative action between all of these stakeholders is needed to establish a healthier future free from the harmful impact of e-cigarette uses on oral health. We need an urgent call to action to combat this alarming public health threat.

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