

# RELATIONSHIP OF GENERAL TOBACCO PRODUCTS & E-CIGARETTES ON ORAL HEALTH: CONSIDERABLE RISKS INCLUDING ORAL CANCER AND PERIODONTITIS

Charlie Jin Woo Park, Dr. Douglas Walker

## **ABSTRACT**

*The purpose of this literature review is to investigate the effects of e-cigarettes on oral health in young adults, highlighting the considerable risks associated with tobacco smoking, such as oral cancer and periodontitis. E-cigarettes first gained popularity in 2006 and are now used by over 40 million people worldwide; however, their impact on oral health and whether they have similar oral health risks as traditional tobacco products is not well understood. This study consolidates findings from basic science, microbiology, clinical research, and epidemiological studies to investigate potential oral health consequences of e-cigarette use. It also highlights the crucial role of dental professionals in educating patients and advocating for tobacco cessation, despite the challenges introduced by the novelty of e-cigarettes and existing research biases.*

*For this study, a comprehensive literature search was conducted using PubMed to identify studies focused on tobacco smoking and vaping and its influence on dental health of young adults aged 20 to 30. Initially, 30,000 papers were found, and after filtering, 14 relevant studies were included in the review.*

*The studies reviewed indicates a correlation between vaping and an increased risk of dental caries. It points out the urgent need for more comprehensive studies to understand the long-term effects of vaping on oral health. While traditional tobacco use's negative impact on oral health is well-documented, this review underscores that e-cigarettes also pose significant risks, highlighting the importance of ongoing research and education in the dental community to navigate the evolving landscape of tobacco use and its implications for oral health.*

## **KEYWORDS**

*E-cigarettes, Tobacco products, Oral health, Young adults, Oral cancer, Periodontitis, Dental caries, Gum disease, Vaping, Smoking, Dental health, Nicotine, Dental professionals, Tobacco cessation*

## **1. INTRODUCTION**

This research review critically examines the impact of traditional tobacco products and e-cigarettes on oral health in young adults, highlighting the significant risks tobacco smoking poses to oral diseases, such as oral cancer and periodontitis, as identified by the US Surgeon General in 2014. E-cigarettes first emerged between 2006 and 2009, and are now used by over 40 million individuals worldwide, generating an industry worth over US \$19.3 billion annually. As a result, the debate over their oral health effects has intensified and there is a critical need to research potential oral health impacts in young adults. This review synthesizes evidence across basic

science studies, microbiological and clinical research, and epidemiological studies to address potential oral health implications of tobacco products in young adults. Furthermore, it underscores the pivotal role of dental professionals in mitigating these risks through patient education, health screenings, and advocating for tobacco cessation, amidst challenges posed by the novelty of e-cigarettes and biases within research disciplines.

In this review, we critically assess and synthesize the existing literature on the oral health impacts of smoking cigarettes, using smokeless tobacco, and vaping e-cigarettes in young

adults. It aims to clarify the complexities and direct comparisons of these products with respect to their harmful effects on oral tissues. This comprehensive review is crucial for insight into current clinical guidelines and educational strategies in dental practice, especially given the rapid evolution of e-cigarette technology and its popularity among younger populations. While oral health effects of tobacco exposures in long-term users is well understood, data is limited on tobacco use exposures in younger individuals with a shorter use history.

By detailing the specific oral health outcomes associated with each mode of tobacco use, this review seeks to emphasize the urgent need for tailored public health interventions.

For instance, while the detrimental effects of traditional cigarette smoke on oral mucosa and periodontal health are well-documented, emerging evidence suggests that e-cigarettes may also foster significant oral health risks, such as promoting dental caries, mucosal lesions, and gum inflammation. These findings prompt a reassessment of how dental professionals approach tobacco cessation, advocating for a broader understanding and a proactive stance in patient education about the risks of all tobacco products. This review not only enriches the academic discourse by consolidating diverse studies but also serves as a crucial resource for dental health practitioners aiming to advocate for and implement more effective tobacco cessation programs in their practices.

## 2. METHODS

To identify relevant studies, a comprehensive literature search was conducted using PubMed, employing a variety of key terms aimed at exploring the impact of smoking and vaping on dental health among young adults aged 20 to 30. The search strategy was formulated around the question of how smoking behaviors, including the use of e-cigarettes, cigars, and other tobacco products, affect dental health in this age group.

Specifically, the key terms included combinations of "Oral Health," "Dental Health," "Gum Disease," "Oral Cancer," "Dental Caries," "Tooth Decay" with "E-Cigarette," "Vaping," "Smoking," "Cigar," "Tobacco," "Nicotine," and terms related to the chemicals in e-cigarettes like "Chemicals from E-Cigarettes," "E-Cigarette Chemicals," "Vaping Chemicals," "Oral Health Effects," "Dental Health Effects." The focus was on young adults who engage in smoking or vaping, recognizing the significant uptick in e-cigarette use among this demographic, particularly those previously non-smokers, and the general lack of awareness regarding the oral health risks posed by these practices. This population often overlooks the potential dangers to dental health, underscoring the necessity for enhanced educational efforts and communication strategies from dental professionals. Additionally, the research differentiates between smoked tobacco products, which involve the burning or heating of tobacco, and smokeless tobacco (ST), highlighting the diverse range of products and their method of nicotine and chemical absorption through mucous membranes, as documented by the National Cancer Institute and Centers for Disease Control and Prevention in 2014.

Identified studies fitting the search criteria were evaluated for inclusion in the review by screening abstracts, and if selected, a full study review was completed. A large portion of the studies contained the keywords "Oral Health" or "Dental Health" followed by key terms related to tobacco use, such as "Nicotine," "E-Cigarettes," "Smoking," "Cigar," "Tobacco," and "Vaping." Some studies contained these keywords but focused on different topics, so they were classified as relevant (1) or not relevant (0).

### 3. RESULTS

A total of 30,000 papers were initially found. After filtering for relevance and quality, 14 studies were included in the review.

The goal of this review was to evaluate studies on oral health implications from e-cigarette use in young adults. Emerging evidence suggests that the use of e-cigarettes may introduce unique challenges in dental care, particularly concerning the development of dental caries. The specific composition of vaping liquids, including their interaction with oral tissues, presents a complex scenario for dental professionals, emphasizing the necessity for a deeper exploration into the potential oral health implications of vaping.

Although e-cigarettes are frequently touted as a less harmful alternative to traditional tobacco products, this study underscores that they are not devoid of risk. Preliminary research indicates a correlation between e-cigarette use and various oral health issues, such as tooth decay and periodontal disease, pointing to the urgent need for longitudinal studies to elucidate the long-term effects of vaping on oral health.

In contrast, the detrimental impact of traditional tobacco products on oral health is extensively documented, with a consensus on the adverse outcomes ranging from oral cancer and periodontal disease to tooth loss and other oral conditions. The decision to quit using tobacco products is universally acknowledged as beneficial for improving oral health outcomes.

Lastly, this discussion highlights a critical gap in current knowledge regarding the oral health consequences of vaping and calls for comprehensive research efforts. It also points to the importance of dental professionals staying abreast of the latest research findings to effectively counsel their patients on the risks associated with both traditional tobacco products and e-cigarettes. As the landscape of tobacco use continues to evolve, so too

must our understanding of its implications for oral health, ensuring that dental care strategies are informed by the most current evidence available.

Table 1. Journals Before and After Keyword Filtering

# of Journals Before Keyword Filtering	# of Journals After Filtering	Keywords added for Filtering/(Total)
0	30745	6 / (6)
30745	30091	2 / (8)
30091	25540	6 / (14)
52	14	4 / (18)
14		

## 4. DISCUSSION

The findings from the 14 studies included in this review provide significant insights into the oral health effects of e-cigarettes on young adults. Emerging evidence suggests that the use of e-cigarettes introduces unique challenges in dental care, particularly concerning the development of dental caries. Irusa [5] highlights the correlation between vaping and an increased risk of dental caries, which was crucial in understanding that vaping should be considered a risk factor in dental evaluations. This finding emphasizes the necessity for dental professionals to be aware of these risks when advising patients [5].

Moreover, the studies by Irusa et al. [5,6] and Frazier [4] provided detailed observations on the biochemical impacts of vaping liquids and the adoption of intraoral appliances in dental practice, respectively. These insights were instrumental in framing the discussion around how the composition of vaping liquids interacts with oral tissues, leading to biofilm buildup and enamel demineralization [6]. Frazier's [4] work on intraoral appliances highlighted the technological advancements in dental practices, which can potentially be leveraged to better understand and mitigate the impacts of vaping on oral health.

The review of emerging science by Tomar et al. [8] on the impact of traditional tobacco products on oral health provided a comparative backdrop, showing the well-documented adverse outcomes such as oral cancer and periodontal disease associated with conventional smoking. This comparison underscored the necessity of including both e-cigarettes and traditional tobacco products in the discussion to provide a comprehensive overview of tobacco's impact on oral health [8].

Rouabhia's [7] comprehensive review of the effects of e-cigarettes on oral health, which compared them to combustible cigarettes, was pivotal in assessing e-cigarettes as a nicotine delivery method. This comparison helped in understanding the potential harm-reduction claims of e-cigarettes while also highlighting their oral health risks. The necessity for further research into the safety of e-cigarettes and their perceived health benefits was a key takeaway from this study [7].

The work by Andrikopoulos et al. [2] on Electronic Nicotine Delivery Systems (ENDS) provided a critical examination of the assumption that ENDS are safe alternatives to traditional smoking. This study was essential in highlighting the preliminary nature of existing clinical studies on the toxic effects of ENDS aerosols on oral cells and the urgent need for comprehensive research to understand their long-term impacts on periodontal health [2].

Chaffee et al. [3] in their Population Assessment of Tobacco and Health (PATH) study provided valuable epidemiological data, which helped in understanding the relationships between tobacco use and adverse oral health conditions. The methodological approach of using survey-weighted multivariable logistic regression offered robust insights into how different tobacco products impact oral health at a population level [3].

The combined insights from these studies were instrumental in highlighting the critical gaps in current knowledge regarding the oral health consequences of e-cigarettes. They underscore the need for comprehensive and longitudinal research efforts to elucidate the long-term effects of vaping on oral health. The role of dental professionals is crucial in staying updated with the latest research findings to counsel patients effectively on the risks associated with both traditional tobacco products and e-cigarettes.

Overall, the studies reviewed helped in consolidating a broad spectrum of data, ranging from clinical observations and biochemical analyses to epidemiological studies, thus providing a comprehensive understanding of the impact of e-cigarettes on oral health in young adults. This review highlights the dynamic nature of tobacco use and its implications for oral health, ensuring that dental care strategies are informed by the most current evidence available.

## 5. CONCLUSION

In conclusion, the meticulous selection of keywords and the application of precise filtering criteria significantly enhanced the efficiency of the literature search process in this research review. By establishing and implementing focused search parameters within the PubMed database, the study effectively reduced an overwhelming initial pool of approximately 30,000 articles to a manageable and highly relevant set of 14 publications. This deliberate approach not only streamlined the review process but also ensured that the studies selected were directly pertinent to investigating the effects of smoking and vaping on oral health among young adults. This method underscores the importance of careful planning and precise execution in research methodologies. By maintaining scientific rigor and enhancing the relevance of the findings, this approach optimizes resource utilization and sets a solid foundation for future research. It highlights the necessity for continued research and well-informed public health strategies in the dynamic field of tobacco use and its oral health implications.

## REFERENCES

- [1] Ajiboye, A. S., Gordon, J. S., Fox, C. H., & Garcia, R. I. (2019). Oral health effects of tobacco products: Science and regulatory policy. *Journal of Dental Research*, 98(11), 1168–1172.
- [2] Isik Andrikopoulos, G., Farsalinos, K., & Poulas, K. (2019). Electronic Nicotine Delivery Systems (ENDS) and Their Relevance in Oral Health. *Toxics*, 7(4), 61.
- [3] Chaffee, B. W., Lauten, K., Sharma, E., Everard, C. D., Duffy, K., Park-Lee, E., Taylor, E., Tolliver, E., Watkins-Bryant, T., Iafolla, T., Compton, W. M., Kimmel, H. L., Hyland, A., & Silveira, M. L. (2022). Oral Health in the Population Assessment of Tobacco and Health Study. *Journal of dental research*, 101(9), 1046–1054.
- [4] Frazier, K., Cevidanes, L., Pannu, D. S., León, M. R., Urquhart, O., & Council on Scientific Affairs (2022). Intraoral appliance use in dental practice: An American Dental Association Clinical Evaluators Panel survey. *Journal of the American Dental Association* (1939), 153(12), 1189–1190.e2.
- [5] Irua, K. F., Finkelman, M., Magnuson, B., Donovan, T., & Eisen, S. E. (2022). A comparison of the caries risk between patients who use vapes or electronic cigarettes and those who do not: A cross-sectional study. *Journal of the American Dental Association* (1939), 153(12), 1179–1183.
- [6] Irua, K. F., Vence, B., & Donovan, T. (2020). Potential oral health effects of e-cigarettes and vaping: A review and case reports. *Journal of Esthetic and Restorative Dentistry*, 32(3), 260–264.
- [7] Rouabhia M. (2020). Impact of Electronic Cigarettes on Oral Health: a Review. *Journal (Canadian Dental Association)*, 86, k7.
- [8] Tomar, S. L., Hecht, S. S., Jaspers, I., Gregory, R. L., & Stepanov, I. (2019). Oral Health Effects of Combusted and Smokeless Tobacco Products. *Advances in dental research*, 30(1), 4–10.

**AUTHORS**

**Charlie Jin Woo** Park Kinesiology B.S. University Of Illinois Urbana-Champaign (Uiuc).  
Preparing For Dental School. Nasm (National Academy Of Sports Medicine) Certified  
Personal Trainer, Ces, & Pes.



**Dr. Douglas Walker** Associate Professor In The Gangarosa Department Of  
Environmental Health At Emory University And Adjunct Assist

