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The Importance of Education as a Prevention of Vaping in Adolescents: A Scoping Review

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ABSTRACT

The aim of this study was to map relevant literature regarding the role of education in preventing vaping in adolescence. This study used a scoping review approach guided by the PRISMA- ScR guidelines. A systematic search was conducted on databases such as PubMed, Scopus, and Web of Science for English language articles published between 2014 - 2024. The study selection process was conducted in two stages by independent reviewers, followed by narrative data extraction and synthesis. These results are findings that suggest that education, often delivered by health care providers (doctors, nurses), through a variety of methods (e.g., counseling, online surveys, social media, virtual reality games, lectures), is consistently effective in increasing adolescents' knowledge about the dangers of vaping and changing their risk perceptions. Educational and counseling support in primary care settings has been shown to be an important component of prevention strategies. The conclusion is that education is a vital component in preventing vaping initiation in adolescents, contributing significantly to increasing health literacy and forming negative attitudes towards the product. However, further in-depth research is needed on the long-term impact of education on actual vaping behavior and the development of more specific interventions for high-risk populations. Implementation of evidence-based education programs is highly recommended to protect the health of the younger generation.

INTRODUCTION

The use of e-cigarettes or vaping has emerged as a significant global public health crisis, especially among adolescents. The phenomenon is characterized by a drastic increase in prevalence, often driven by the misperception that vaping is a safer alternative to conventional cigarettes, as well as the appeal of a variety of flavors and innovative device designs (Miech et al., 2019). However, despite its appeal, growing scientific evidence suggests that vaping carries serious health risks, particularly for the developing adolescent brain (Felner & Calzo, 2023), (Kreski et al., 2023).

Based on previous research, the high nicotine content in most vaping products can cause severe dependence, affecting cognitive function, memory and concentration (Simpson et al., 2021). Furthermore, exposure to hazardous chemicals such as formaldehyde, propylene glycol, vegetable glycerin, and diacetyl in e-liquids has the potential to damage the lungs and cardiovascular system (Shahandeh et al., 2021), (Shahin et al.,2022). To the point of increasing the risk of chronic respiratory diseases, and posing a significant long-term threat to the health of the younger generation (Dubé et al., 2023).

Given the increasing prevalence and potential health impacts, the urgency to develop and implement effective vaping prevention strategies in adolescents is critical. Various approaches from previous research have been tested, ranging from strict product regulations, massive public awareness campaigns, to school-based interventions (Stockings et al., 2024). Among these strategies, education emerges as a fundamental pillar that has a great capacity to empower adolescents with the knowledge and skills necessary to make healthy choices (Shen, 2019), (Pettigrew et al., 2022). A comprehensive education program not only serves to convey scientific facts about the dangers of vaping, but also aims to debunk circulating myths, develop health literacy, strengthen resilience to peer pressure (Herrmann et al., 2024). Furthermore, develop a critical understanding of the marketing tactics used by the tobacco and vaping industries (Coen et al., 2023).

While the important role of education in vaping prevention is widely recognized, there is an urgent need to systematically identify, map, and synthesize the existing evidence on the effectiveness and implementation of such education programs. Many studies have been conducted in various contexts and with varying methodologies, but there has been no comprehensive review that broadly collects and analyzes the full range of relevant literature (Mylocopos et al., 2024).

Therefore, this study aims to conduct a scoping review to provide a comprehensive overview of the extent to which education has been investigated as a strategy for preventing vaping in adolescence. The results of this scoping review are expected to provide a solid foundation for designing more effective and evidence-based vaping prevention education programs in the future, as well as provide direction for further research agendas in an effort to protect adolescent health from the threat of vaping.

METHOD

This study adopted a systematic scoping review approach, aiming to identify, map, and synthesize relevant literature on the role of education in preventing vaping in adolescents. This scoping review design was chosen because of its ability to explore the breadth of available evidence on a relatively emerging topic, identify the nature and scope of research, and highlight existing knowledge gaps. The researcher will follow the PRISMA-ScR (PRISMA Extension for Scoping Reviews) guidelines (Tricco et al., 2018). To identify relevant literature, a systematic search will be conducted in major electronic databases including PubMed/MEDLINE, Scopus, Web of Science, CINAHL, PsycINFO, and ERIC. The search strategy will be formulated by combining keywords relevant to the concepts of vaping or e-cigarettes (vaping, e-cigarette), prevention (prevention, intervention), education (school-based), and adolescents (adolescent, youth).

Studies will be considered for inclusion in this scoping review if they meet the following criteria: (1) The primary focus of the study is on an education-based intervention or program designed to prevent or reduce vaping or e-cigarette use; (2) The target population of the study is adolescents (relevant age range, generally 11-19 years), school students, or other young populations; (3) The type of publication includes original research articles (e.g., quantitative, qualitative, mixed studies), systematic reviews, government reports, or guidelines available in full text; and (4) The publication is available in English (5) published between 2014 - 2024. Conversely, studies will be excluded if: (1) The main topic does not focus on education as a vaping prevention strategy; (2) The study population only involves adults (over 19 years); (3) The publication type is an opinion editorial, letter to the editor, or conference abstract without associated full-text publication; or (4) The full text of the study cannot be accessed or found.

Articles that have been successfully screened at the final stage will be synthesized narratively and descriptively. Key findings will be presented in summary tables, focusing on age, sample size, type of education, then identifying key concepts, and highlighting knowledge gaps to inform future research and practice.

RESULTS

Figure 1 below is the result of work using the PRISMA-ScR framework, the findings of articles based on the entire database are 2.041 articles. Selection based on title and abstract produced 863 articles, then selection of article content based on exclusion criteria produced 117 articles, the last selection is based on exclusion criteria produced 7 relevant articles.

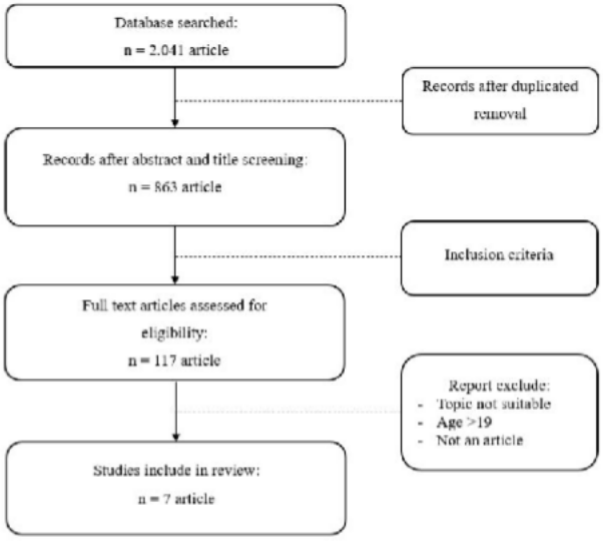

Figure 1. Research framework

Then, after the article is worthy of analysis, the next stage is analysis based on each article. Below is table 1 of article analysis.

Table 1. Results of review of eligible articles

Title (Author and year)	Age	Sample Size	Method of collecting data	Health Workers Involved	Educational Support
Healthcare providers'	11 - 17	561	Online survey	Family physician,	Providing preventive

beliefs and attitudes about electronic cigarettes and preventive counseling for adolescent patients (Pepper et al., 2014				pediatrician, nurse practitioner	care to adolescent s
Physicians' counseling of adolescents regarding E-cigarette use (Pepper et al., 2015)	11 - 12	776	Online survey	Pediatrician, family doctor	Regularly checked by a doctor
Pediatric primary healthcare providers' preferences, experiences and perceived barriers to discussing electronic cigarettes with adolescent patients (Peterson et al., 2018)	13 - 19	25	Skype, face to face	Family physician, pediatrician, nurse practitioner, physician assistant	Providing counseling to teenagers
Smoking cessation and counseling: A mixed methods study of pediatricians and parents (Simoneau et al., 2021)	surveys and 11.6±2.1	95	group discussions	Pediatrician	Providing counseling to teenagers
Screening and counseling for nicotine use in youth with diabetes (Chin et al., 2022)	10 - 16	64	Via email to the Pediatric Endocrine Association	Intern, practical nurse, physician assistant	Asking patients about e-cigarette use
Exploring General Practitioners' Knowledge, Attitudes, and	12 - 17	53	Online surveys via publicly available phone numbers and	General practitioners and general practitioner trainees	Providing care for children and adolescents

Practices towards E-Cigarette Use/Vaping in Children and Adolescents: A Pilot Cross-Sectional Study in Sydney (Singh et al., 2024)	email addresses

DISCUSSION

Findings from the reviewed studies consistently underscore the crucial role of health care providers, including family physicians, pediatricians, nurse practitioners, physician assistants, and general practitioners, in providing educational and counseling support related to preventing e-cigarette use in adolescents. Studies (Pepper et al., 2014; Pepper et al., 2015; Peterson et al., 2018; Simoneau et al., 2021; Gorukanti et al., 2022; Chin et al., 2022; Singh et al., 2024) showed that educational interventions were conducted through a variety of methods, such as online surveys, face-to-face or Skype interviews, and group discussions, with a focus on providing preventive care, screening, and counseling. This suggests that interaction with health workers in primary care settings is an important intervention point for anti-vaping education.

These findings are closely aligned with recommendations from leading health agencies. Owens et al. (2020), through the US Preventive Services Task Force (USPSTF) recommendation statement, explicitly recommends that primary care clinicians provide interventions, including brief education or counseling, to prevent initiation of tobacco use (including e-cigarettes) in school- aged children and adolescents. This consensus strengthens the argument that education, delivered by health care providers, has moderate benefits in preventing vaping. However, the USPSTF also notes that evidence for tobacco cessation interventions for those who are already smokers is inadequate, suggesting that the focus of prevention education should be on those who have never used.

The increasing prevalence of e-cigarette use among adolescents, as highlighted by Fan et al. (2023) in Jiangsu Province, China, underscores the urgency of educational interventions. Their study identified multiple risk factors for adolescent vaping, including experimentation with conventional cigarettes, gender, education level, pocket money, exposure to secondhand smoke, e- cigarette advertising, peer influence, and misperceptions about the social appeal of cigarette use. These findings further reinforce the importance of comprehensive health education to address these multiple risk factors. Educational programs need to be designed not only to increase knowledge about the dangers of vaping, but also to build skills to resist peer pressure and correct misperceptions about social behavior.

Adopting innovative and lifestyle-relevant educational delivery methods is also key to success. In addition to face-to-face or clinical counseling, literature shows the great potential of digital media. Lazard (2021) found that social media messages designed to educate adolescents about the dangers of e-cigarettes can significantly increase their knowledge and beliefs about these dangers, with high levels of message sharing among adolescents. In line with this, Weser et al. (2021) in two different studies, showed that virtual reality (VR) games such as "Invite Only VR" were effective in increasing adolescents' knowledge about e-cigarettes, understanding of nicotine addiction, and risk and social perceptions related to vaping.

While immediate behavioral changes (decreased use) may not be significant in the short term, these increases in knowledge and perception are important prerequisites for long-term behavioral change. Furthermore, the success of The Real Cost campaign in achieving high recall rates among US teens, particularly through digital media, as reported by Vereen et al. (2022), further strengthens that digital media is an effective platform for spreading prevention messages. On the other hand, local findings from Kusumastuti and Haeriyah (2021) showed that conventional methods such as health education with lectures and audio- visual media are also very effective in increasing adolescent knowledge about the dangers of e-cigarettes in the community. This indicates that a combination of approaches, both traditional and innovative-digital, can optimize the reach and impact of education.

Although this scoping review shows that education is a vital prevention strategy, there are still aspects that need further exploration. Shin (2021) highlights the need for more targeted approaches, such as trauma-informed prevention interventions, for youth with a history of childhood trauma, who are likely at higher risk for e-cigarette use. This suggests that educational programs need to be tailored not only in delivery methods, but also in content and approach for populations at high risk or with special needs. Gaps in the literature also include the lack of robust longitudinal research to assess the long-term impact of educational interventions on actual vaping behavior, as well as a deeper exploration of which educational curriculum components are most effective across different cultural and socioeconomic contexts.

Overall, the findings of this scoping review reaffirm the central role of education, particularly delivered by health professionals and supported by a variety of delivery modalities (including digital media and community-based interventions), as a key strategy in preventing adolescent vaping. However, further efforts are needed to develop tailored interventions, as well as more in- depth research to understand their long-term effectiveness and the most optimal mechanisms for achieving behavior change.

CONCLUSION

Our findings consistently show that education plays a central and crucial role in this effort. Educational interventions, often delivered by health care providers such as family physicians, pediatricians, and nurses, and implemented through a variety of modalities (including online surveys, face-to-face counseling, social media, and virtual reality games), have been shown to be effective in increasing adolescents' knowledge about the dangers of e-cigarettes, correcting risk perceptions, and forming more negative attitudes toward vaping. Although the prevalence of e-cigarette use among adolescents continues to increase and is influenced by multiple complex risk factors, appropriate health education can be a

significant bulwark. The reviewed literature highlights the need for tailored, innovative, and lifestyle-relevant educational programs to optimize reach and impact. However, there are gaps in the research, particularly regarding robust longitudinal studies to measure the long-term impact of educational interventions on actual vaping behaviors, as well as further exploration of tailored approaches for high- risk youth populations. The research also confirms that investment in evidence-based vaping prevention education programs is critical to protecting the health of young people. Recommendations include developing comprehensive curricula, leveraging digital technologies, and strengthening the role of health care providers as primary education agents in the community.

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CONFLICT OF INTEREST

The authors of this study declare that they have no conflicts with other authors

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