

Review Article

Status of tobacco and electronic nicotine delivery systems use among health science students in low- and middle-income countries: A scoping review

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Abstract

Background

The prevalence of tobacco use is high among health science students in low- and middle-income countries. This population participates in tobacco and nicotine delivery systems prevention strategies. We sought to determine the status of tobacco and nicotine delivery systems used among health sciences students in low- and middle-income countries.

Methods

A scoping review was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. We included original research articles published in the last 10 years in indexed journals, written in Spanish and English, that focused on populations of healthcare students in low- and middle-income countries and provided information on the use of tobacco or nicotine delivery systems. Eleven databases were searched, and data were extracted using inductive analysis and thematic synthesis.

Results

Thirty-four articles were reviewed. Asia was the continent that produced the most literature on the subject, and most studies had a quantitative cross-sectional methodological design. Information on social and cultural issues related to drug use, mental health, healthcare, smoking cessation, and policies and programs is presented in narrative form.

Conclusions

Little information exists about the social and cultural aspects associated with the use of nicotine delivery systems, and the needs of health science students in this regard. This issue requires research through participatory, qualitative, or mixed-method approaches, focusing on analyzing participants' needs and identifying ways to transform their reality.

BACKGROUND

Tobacco use is a global public health problem that affects all populations, regardless of gender, race, economic status, or age group.¹ In the case of young people, this problem is even more worrisome because they may accumulate a

longer exposure time than people who start smoking later in life. In addition, a wide variety of tobacco products, such as electronic nicotine delivery systems (ENDS), are openly advertised by different media, including new electronic cigarettes (e-cigarettes), vapes, and water pipes, which are growing in popularity due to the belief that they are harmless to health. In some cases, the use of these electronic de-

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vices is promoted as a less toxic alternative to traditional cigarettes in smoking cessation programs.²

The World Health Organization (WHO) reports that 80% of the current 1.1 billion smokers live in low- and middle-income countries and suffer the highest burden of morbidity and mortality related to toxic exposure to smoke, especially in the 15–24 age range, where there are about 155 million smokers.^{1,3}

The problem of tobacco use particularly affects the university population, where academic demands, stress, and the coexistence of mental disorders such as anxiety and depression can precipitate the onset of tobacco use in a bidirectional relation.⁴ Special attention should be given to programs in health fields where smoking prevalence is high, ranging from 30% to 40%, despite the knowledge of the negative health consequences of long-term exposure to tobacco smoke.³ This could affect their professional performance, undermine their perception and appreciation by patients, and even affect their quality of life.⁵

In this sense, it is crucial to investigate the issue of ENDS use among healthcare students, taking into account sociodemographic, psychological, and environmental factors.^{5,6} Although there is sufficient literature and evidence on tobacco use among students, the issue of ENDS use—currently a relevant topic for health sciences students—remains a research gap. Therefore, this scoping review aims to analyze the situation of tobacco and ENDS use among health science students in low- and middle-income countries.

METHODS

A scoping review was performed according to the PRISMA Extension for Scoping Reviews (PRISMA-ScR) guideline.⁷ This methodology makes it possible to review the literature to identify the types of evidence available in a field of knowledge, clarify key concepts in the literature related to the object of study, examine how research is conducted on the topic of interest, and synthesize and analyze knowledge gaps.^{8,9} The PRISMA-ScR checklist was filled out (**Supplementary Material 1**), and the review protocol was registered in OSF HOME.¹⁰

DATA SOURCES AND SEARCH STRATEGY

Eleven databases (**Figure 1**) were searched from February 2024 to May 2024 in Bogotá. Search strategies were developed using Health Sciences Descriptors (DeCS) and Medical Subject Headings (MESH), as well as Boolean operators (“AND,” “OR,” “NOT”).⁹ Each database’s search strategies and terms are detailed in **Supplementary Material 2**.

ELIGIBILITY CRITERIA AND SELECTION OF RECORDS

We included records of original research articles published in the last 10 years, quantitative and qualitative studies published in indexed journals, written in Spanish and English, involving undergraduate and graduate healthcare students in low- and middle-income countries (the studies

were selected based on country classifications provided by the World Bank¹¹), documenting information on tobacco or ENDS use, and consistent with the research objective.

We excluded studies that were not original research published in indexed journals, documents not available in full text, those addressing the use of other psychoactive substances without specifying tobacco or ENDS, documents from high-income countries, literature older than 10 years, and those lacking sufficient information on the topic under review.

The selection process began by removing duplicates using the Rayyan platform.¹² Three reviewers then independently screened titles and abstracts, applying the inclusion and exclusion criteria. In cases of disagreement, the reviewers discussed the discrepancies to reach a consensus. Finally, the selected articles were read in full to determine their inclusion in the analysis.

DATA EXTRACTION AND SYNTHESIS

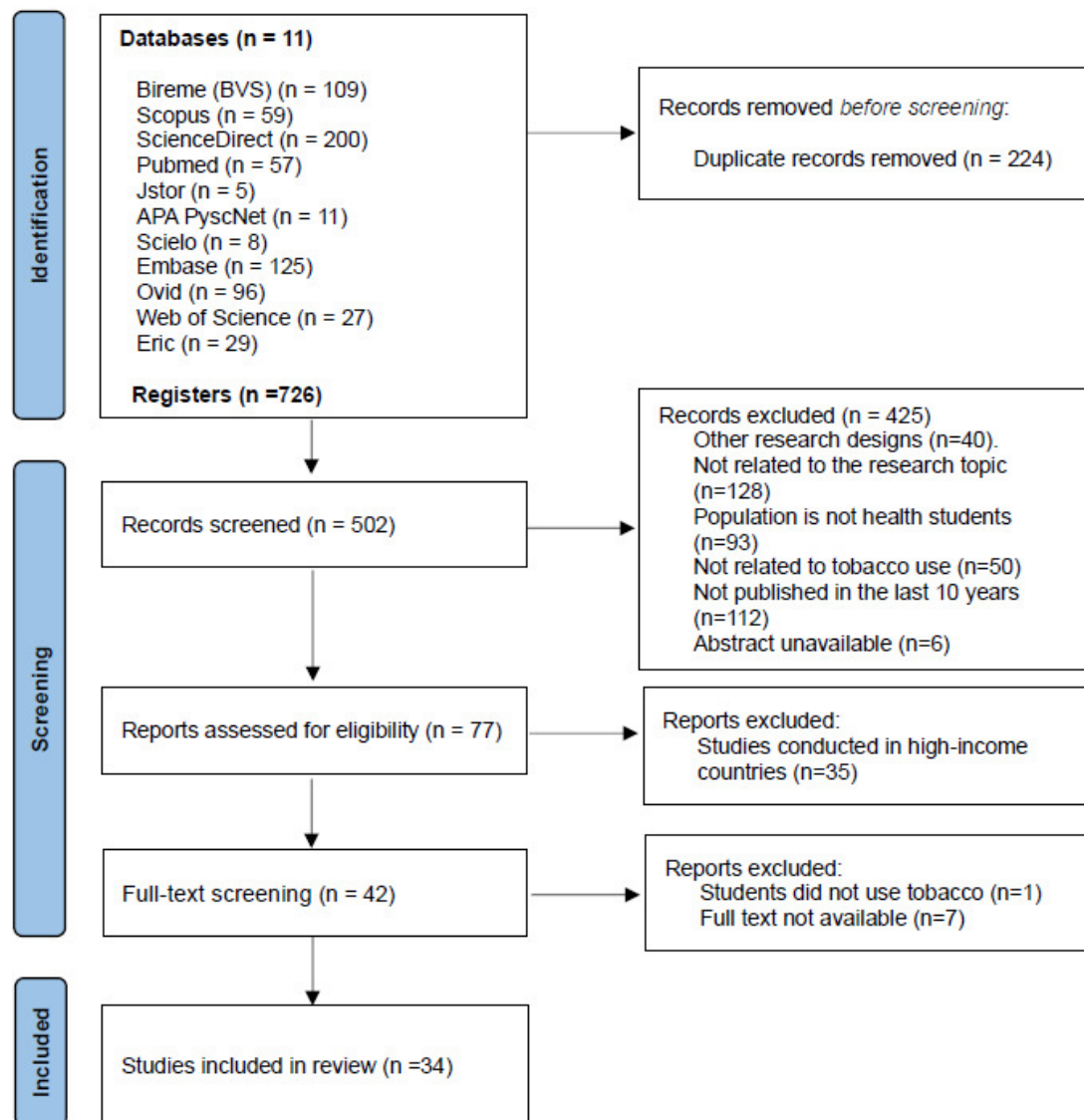
Data were extracted using a documentary Excel matrix in which five reviewers recorded publication details, methodological data, and information on the type, frequency, and intensity of tobacco and ENDS use. Sociodemographic aspects, social and cultural settings of tobacco and ENDS use, mental health, health effects, cessation of use, and policy and program recommendations were also captured. Descriptive statistics were used to summarize the information collected in the matrix, while inductive analysis and thematic synthesis were used to present the results in narrative form. All authors reviewed and discussed the preliminary results to reach a consensus on the key findings.

RESULTS

The PRISMA flowchart^{7,9} showing the results found in each database, with the process for excluding articles, is seen in **Figure 1**. **Table 1** presents the number of articles found, along with their bibliographic references, for each of the topics extracted during the data analysis. The studies provided data from a total of 125,528 health science students who used tobacco or ENDS in low- and middle-income countries. **Table 2** shows the bibliometric and sociodemographic characteristics of the reviewed studies. **Supplementary Material 3** contains a summarized overview of specific information from each article (sample, study type, and type of consumption). The above highlights that the number of articles identified in this review that address the sociocultural and psychological aspects related to ENDS use is small compared to those focusing on traditional tobacco use.

SOCIAL AND CULTURAL ENVIRONMENTS RELATED TO TOBACCO AND ENDS USE

Men are more likely to be smokers than women.^{13–27} According to two studies conducted in Asia, there is a negative sociocultural perception of this habit among women.^{24,28}

Figure 1 Flowchart of the process for identifying studies via databases and registers**Figure 1.** Flowchart of the process for identifying studies via databases and registers

Tobacco use is more prevalent among students in higher university semesters^{15-17,24} and older age groups.^{13,14,20,23}

Studies in Iran and Egypt found higher rates of tobacco use in university dormitories^{18,29} and urban areas.¹⁸ However, studies in India showed no significant association between tobacco use and students' place of origin (rural or urban)³⁰ or their living arrangements, such as hostels or dormitories.^{30,31}

In studies conducted in Iran, Tunisia, and Egypt, students from higher or middle social classes were more likely to use tobacco^{23,29} or have more available pocket money.¹⁸ However, in a study conducted in Malaysia, parents with lower annual incomes were more likely to smoke than parents with higher annual incomes.³²

Tobacco use is higher among students who come from families where a family member smokes regularly,^{13,14,21,}

^{22,24,27,30,31,33-39} those who prefer to use tobacco at home,^{20,23} or those who are exposed to environmental tobacco smoke (smoke produced by burning cigarettes in public places).^{13,19,22}

Students are more likely to use tobacco if they report having much free time,²¹ choose a university major for non-humanitarian reasons,²³ are enrolled in public sector institutes,¹⁶ or experience academic difficulties.^{21,23}

Motivations for using tobacco and related products included curiosity (31.4%), social trends,³⁰ friends and fun,^{13,14,24,31,33-35} peer pressure,³⁶ easy access, fatigue reduction, peer approval,³³ and media influence.¹⁴ Among the reasons students reported for continuing to smoke were peer insistence and the pleasure derived from smoking.³¹

MENTAL HEALTH AND TOBACCO AND ENDS USE

Several articles have noted that students often resort to smoking to manage academic stress and anxiety.^{17,24,27,33,36-38} In Egypt, most women and men do not believe that smoking increases their attractiveness; however, a percentage reported feeling sexier, more adult, and consider holding a cigarette to be a pleasure.¹⁸ On the other hand, studies conducted in Ethiopia, Serbia, and Tunisia found a correlation between smoking and low self-esteem, highlighting the complex relationship between self-image and smoking.^{17,21,23} In Palestine and Jordan,^{35,39} body image and smoking were also found to be related. A percentage of students regularly check their body shape to detect physical changes or changes that may occur,³⁹ and they believe that smoking water pipes helps them stay slim, especially among nursing and medical students.³⁵

In Palestine, it has been observed that non-smoking students tend to have more efficient spiritual growth and more effective stress management skills compared to smokers. Similarly, non-smoking students were found to be significantly more involved in developing interpersonal relationships than smoking students.³⁹ In Malaysia, certain personality traits such as scrupulousness (organization and care) and extraversion (sociability) have been identified as influencing health behaviours and smoking, with significant differences between smokers and non-smokers. In this sense, cigarette smokers are more scrupulous than non-smokers, while users of e-cigarettes and water pipes are less extraverted.³²

In Brazil, smokers were reported to experience a sense of well-being, relaxation, and excitement as reasons for using tobacco,³⁴ while in India, reasons for continued smoking often include habituation.³¹ In Jordan, Argentina, and Mexico, dependence was found to vary in intensity among smokers. Daily waterpipe smokers are significantly more likely to develop dependence.^{35,40,41}

HEALTH EFFECTS OF TOBACCO AND ENDS USE

The studies revealed that perceptions regarding the health risks associated with ENDS vary significantly. On one hand, some people view ENDS as safe alternatives for consumption; on the other hand, others believe they are more dangerous than traditional cigarettes.^{15,25,35}

In the studies that measured perceptions of risk and negative consequences of tobacco use, it is clear that students have this knowledge and believe that tobacco is linked to diseases such as cancer and that it is also dangerous for passive smokers.^{18,26,38,42,43} The cardiovascular risks of tobacco use are also mentioned, as well as Chronic Obstructive Pulmonary Disease (COPD), asthma, and conditions during pregnancy.^{16,28,35} Students indicated they gained this knowledge not only from their curriculum but also from various media sources.⁴⁴ In a study conducted in Palestine, there were no significant differences in healthy habits between smokers and non-smokers.³⁹

In a study conducted in Argentina, a group of student smokers presented an obstructive pattern in spirometry with a significant association between smoking and alter-

ations in spirometry tests.⁴⁰ Contrary to this, in studies conducted in Ethiopia and Palestine, the majority of participants reported no chronic physical illnesses and good health.^{17,39}

ASPECTS RELATED TO THE CESSATION OF TOBACCO AND ENDS

The literature review showed that less than 15% of health science students successfully quit smoking.^{16,22,35} The percentage of students who wanted to quit smoking ranged from 47% to 72%,^{18,22,23,40,42} and 52% to 60% had made multiple attempts to quit smoking.^{13,18} However, some students were comfortable with their smoking habit and minimized the perceived risk compared with the consequences for their health. Between 17.5% and 21% of respondents were not ready to quit smoking.^{23,42}

Regarding smoking cessation therapies, the authors of the studies point out that the desire to quit smoking is the main driver for using ENDS as an alternative to traditional tobacco, followed by those who consider them less harmful or harmless. The latter do not associate ENDS with health issues such as COPD or cancer, which creates a false sense of security.^{16,25}

Most of the information on how to quit smoking comes from family or friends, which is revealing given that the information from health professionals should be more representative.^{13,22} A multi-center study involving 70 countries found that health science students in developing countries receive inadequate information on smoking cessation techniques, as reflected in the number of students who smoke and the unsuccessful results of smoking cessation campaigns.²⁸

POLICIES AND PROGRAMS FOR THE PREVENTION OF TOBACCO AND ENDS USE

Non-smoking students were more likely to agree that health professionals should serve as role models^{15,24} and that smoking should not be done in front of patients.²⁴ In contrast, student smokers of cigarettes and other tobacco products may struggle to see themselves as role models, which could negatively impact their ability to help patients quit^{14,24,45,46} and their own motivation to quit smoking.^{24,46} Furthermore, students' awareness of campus smoking policies (clinic and campus bans) was associated with increased self-recognition as role models⁴⁶

Most students who participated in the studies believe that physicians should always advise patients to quit smoking for two reasons: first, because advice to quit smoking is more acceptable when it comes from physicians, especially if they are non-smokers; and second, because they recognize that health professionals are role models for their patients. Cigarette smoking among medical students is, therefore, a cause for concern.^{15,18,19,24,27,45,46} The studies also point to the need for special training in smoking cessation counselling for medical students, apropos of their role as health care professionals.¹⁹ Students reported learning about the harmful effects of tobacco during their university

training and acknowledged the importance of documenting tobacco use in patients' medical records.^{14,26}

A high percentage of participants in the studies reviewed agree with attitudes and measures that encourage smoking cessation, such as banning smoking in enclosed public places, banning the sale of cigarettes to children and adolescents, banning all advertising of tobacco products, or banning smoking in restaurants, bars, nightclubs, or workplaces.^{14,18,42,45} Studies recommend that bans on tobacco advertising and restrictions on youth consumption be applied to ENDS until more evidence of their health effects is available.^{15,16} Special attention is given to publications on ENDS, which in some settings are considered as substitutes for conventional cigarettes and even as valid strategies for smoking cessation, which is currently not recommended as exposure to nicotine and the habit are maintained.²⁵

The studies reviewed share common points regarding tobacco use in the university setting. Education and family well-being are considered preventive factors for tobacco use, alongside the promotion of self-esteem and physical activity, especially given the recognized link between tobacco use and mental health.^{17,29,38} There is a general concern to prevent tobacco use among future health professionals. This concern is reflected in a variety of measures, ranging from early inclusion in the curriculum of the harmful effects of smoking, cessation strategies, and service provision to bans on smoking and tobacco advertising on university campuses and in clinical settings.^{20,21,40,44} The results also show that health school curricula are weak in stopping or preventing tobacco use and that medical knowledge does not prevent smoking initiation or habit. Therefore, it is necessary to expand efforts to prevent tobacco use into the social fabric and to provide psychological support.^{23,30,33}

The studies recommend broadening and deepening research on the phenomenon among young health students. They suggest enhancing curricula not only by incorporating content on health risks but also by fostering the development of behavioural counselling skills and pharmacotherapy for smoking cessation. Additionally, they emphasize strengthening family support and forming multidisciplinary teams to design and implement interventions and personalized, multidimensional programs to prevent smoking. The recommendations also highlight the importance of adhering to and reviewing current legislation, strengthening key policies outlined in the WHO Framework Convention on Tobacco Control (MPOWER measures), and integrating smoking cessation alternatives into health systems and programs.^{13,28,32,34,43,46}

DISCUSSION

The search for information did not identify any literature reviews that met all the inclusion criteria set for this review; therefore, this study contributes to the body of knowledge on this topic. However, we did find literature reviews that focused on university students in general.⁴⁷⁻⁴⁹ The results of these reviews are similar to the present review

On the other hand, the literature reviewed also provides complementary elements. For example, there are limited recreational activities for students,⁴⁹ and although tobacco use begins at school, before entering university,^{47,48} the prevalence found is higher among university students⁴⁸ and even higher among health science students.⁴⁷

The main substances used are legal ones, such as alcohol and tobacco.^{47,49} However, quitting smoking becomes more difficult when alcohol, cannabis, or cocaine are also used.⁴⁷ These polysubstance use habits are typical among university students in the upper years compared to first-year students.^{47,49}

This review provides valuable insights into tobacco and ENDS use among health sciences students. While some factors, such as peer influence and stress, appear to be associated with both tobacco and ENDS use, differences were also observed. For instance, perceptions of harm and cessation behaviors may vary between conventional cigarette users and ENDS users. These nuances are important for informing targeted interventions. However, there is a clear need for further research specifically focused on the social, cultural, and psychological factors associated with ENDS use. This is particularly important given the evolving landscape of nicotine delivery systems and the potential differences in usage patterns and perceptions compared to traditional tobacco products.

An important factor to consider in the research is the influence of the global tobacco industry. It spends considerable amounts of money each year to promote tobacco use through various media and keeps affordable prices to make its product accessible to all people and a much easier habit to maintain compared to other substance use habits.⁴⁷

Only one qualitative study focused on the use of psychoactive substances, including tobacco.³⁸ The limited number of qualitative studies included in this review highlights a significant gap in the literature. Nevertheless, qualitative research is a fundamental tool in the health field, as it allows for the exploration of sociocultural aspects and the development of interventions tailored to the participants' context.⁵⁰ Qualitative research is essential for gaining a deeper understanding of the social, cultural, and psychological contexts of tobacco and ENDS use among health sciences students. Future research should prioritize qualitative methodologies to explore students' experiences, beliefs, and motivations related to substance use, which could contribute to the development of more effective interventions.

This research has limitations, as the keywords were selected based on the objective. This narrowed the scope of articles related to the impact of public policies on reducing tobacco consumption, the influence of the market on students' behaviours and subjectivities, and mental health interventions aimed at preventing and reducing tobacco use.

This review included only articles published in English and Spanish. This may have excluded relevant studies published in other languages, potentially affecting the comprehensiveness of the findings. It is suggested that future reviews consider including a broader range of languages.

Table 1. Articles grouped by topics related to tobacco and ENDS use among health science students in low- and middle-income countries

Aspects related to tobacco and ENDS use	Description	Number of articles and references n = 34
Social and cultural environment related to tobacco and ENDS use	Sociodemographic variables, social media, use of other psychoactive substances and tobacco derivatives, use in university settings, protective factors, and motivations for use	n= 22 13-25,27-36,45
Mental health	Stress and anxiety, self-esteem and self-image, interpersonal relationships and personality traits, well-being and dependence	n = 18 17,18,21,23-25,27, 31-41
Health effects	Knowledge of the health harms of tobacco and ENDS use and risk perception	n=18 15-18,24-28,35, 36,38-40,42-44
Aspects related to cessation of tobacco and ENDS use	Knowledge of ways to quit tobacco and ENDS use	n= 17 13,14,16,18-20,22, 23,25-28,35,36,40, 42,46
Policies and programs	Recommendations for developing and strengthening tobacco and ENDS use prevention policies and programs	n= 31 13-30,32-34,38, 40,42-46

Source: Authors' compilation. 2024

The included studies exhibited heterogeneity in their methodological designs (predominantly quantitative cross-sectional studies with one qualitative study), data collection methods, and definitions of key variables such as “smoker” and “tobacco use”. This variability was taken into account during the synthesis process, but limits comparability and the generalizability of the findings. This should be considered when interpreting the results of this review.

This scoping review did not include a formal assessment of the methodological quality of the individual studies. This was due to the broad nature of the scoping review methodology, which prioritizes mapping the existing literature over a detailed evaluation of study quality. However, this should be considered a limitation when interpreting the findings. It implies that the review may have included studies with varying degrees of methodological rigor, which could affect the reliability and validity of the results. Future reviews should consider incorporating a quality assessment to provide a more critical appraisal of the evidence.

CONCLUSIONS

From a public health perspective, it is important to improve prevention and promotion efforts aimed at discouraging the use of tobacco derivatives that are socially accepted, such as ENDS. According to students' sociocultural and psychological context, it is necessary to improve communication tools and dissemination of information on addiction and the negative health effects of these devices.

Prevention policies and programs should include social and psychological support, healthy study habits, academic stress management tools, and tobacco-free social and recreational spaces. The curriculum should include not only information on the health hazards of tobacco and its derivatives but also issues about cessation of tobacco and

ENDS and soft skills training for students to enhance emotional intelligence, empathy with patients and self-esteem. The national health system should also provide students with free access to health services that meet the needs identified in this scoping review.

It is necessary to develop multidisciplinary studies with participatory, qualitative, or mixed approaches, analyzing the participants' needs and the forms oriented to the transformation of reality. The objective is to contribute to comprehensive policies beyond the prohibitionist and individualized approach, with a critical and collective perspective that considers students' mental health and the actions of the tobacco companies' market.

CONTRIBUTORS

All authors participated equally in the preparation of the manuscript and approved its final version.

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COMPETING INTERESTS

The authors declare no conflict of interest.

ETHICS APPROVAL

Not required for this article type.

Table 2. Bibliometric and sociodemographic characteristics of the reviewed studies

Publication years	n	%
2014 - 2018	17	50.0
2019 - 2023	17	50.0
Research design		
Quantitative cross-sectional	32	94.1
Quantitative analytical cohort	1	2.9
Qualitative phenomenological approach	1	2.9
Study location		
Africa	3	8.8
Asia	18	52.9
Latin America	10	29.4
Europe	3	8.8
Population		
Medical students	16	47.1
Nursing students	2	5.9
Dental students	3	8.8
Students from multiple disciplines ^a	13	38.2
Sample size quantitative studies ^b		
113 - 300	12	35.2
301 - 600	10	29.4
601 - 107527	11	32.4
Type of use		
Conventional cigarette	19	55.9
E-cigarette	1	2.9
Conventional and e-cigarettes	2	5.9
Conventional cigarette and other tobacco products (water pipe, chewing tobacco)	12	35.3
Age of initiation (years)		
<15	2	15.4
15 -19	10	76.9
> 20	1	7.7
Cigarettes per day		
1-14	8	61.5
15-20	4	30.8
> 20	1	7.7
Prevalence of conventional cigarette use		
< 32%	19	63.0
32- 63%	9	30.0
64 - 94	2	7.0
Prevalence of e-cigarette use		
<8%	2	67.0
8 - 16%	1	33.0
Prevalence of mixed use (conventional cigarette, e-cigarette or water pipe)		
< 10%	2	67.0
10- 20%	1	33.0

a.Studies that included students from various health disciplines such as medicine, dentistry, nursing, nutrition, physical therapy, obstetrics, kinesiology, public health, health informatics, midwifery, health. administration, pharmacy, paramedical sciences, and other healthcare programs. b. The sample for the qualitative study consisted of eight participants. Source: Authors' compilation, 2024.

DATA AVAILABILITY

Data are available on request.

AI STATEMENT

No generative AI or AI-assisted technology was used to generate this manuscript or its content.

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SUPPLEMENTARY MATERIALS

Supplementary material 1

Download: <https://cjrt.ca/article/142508-status-of-tobacco-and-electronic-nicotine-delivery-systems-use-among-health-science-students-in-low-and-middle-income-countries-a-scoping-review/attachment/295299.pdf>

Supplementary material 2

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Supplementary material 3

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