Knowledge of Dentistry Students about the Risks of Electronic Cigarettes for Oral Health

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Conhecimento de Acadêmicos de Odontologia sobre os Riscos do Cigarro Eletrônico para a Saúde Bucal

Conocimiento de Estudiantes de Odontología sobre los Riesgos del Cigarrillo Electrónico para la Salud Bucal

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ABSTRACT

Introduction: The electronic cigarette (EC) has emerged as an alternative to reduce conventional cigarette smoking. **Objective:** To analyze the knowledge dentistry students have about the risks of EC use on oral health. **Method:** Cross-sectional, descriptive-exploratory epidemiological study. A structured questionnaire was administered to students enrolled from the first to the tenth semester in the dentistry course at the "*Universidade Estadual do Sudoeste da Bahia*", Jequié-BA campus. The data were tabulated and analyzed in Excel, and absolute and relative frequencies have been calculated. **Results:** Of the 196 students enrolled, 160 (81.6%) joined the study, with a mean age of 23.26 ± 4.42 years, and 157 (80.1%) were aware of EC. Among the students, 29 (14.8%) had tried conventional cigarettes and 58 (29.6%), EC. 26.5% assessed their knowledge of EC as low and 65.6% as intermediate. **Conclusion:** The level of knowledge the population investigated has on EC is insufficient, collected non-scientifically, and the topic was poorly addressed in the courses taken.

Key words: Electronic Nicotine Delivery Systems; Vaping; Cross-Sectional Studies/statistics & numerical data; Dental Health Surveys; Students, Dental/statistics & numerical data.

RESUMO

Introdução: O cigarro eletrônico (CE) surgiu como alternativa para reduzir o consumo do cigarro convencional. **Objetivo:** Analisar o conhecimento de acadêmicos de odontologia sobre os riscos do uso do CE à saúde bucal. **Método:** Estudo epidemiológico transversal de caráter descritivo-exploratório. Um questionário estruturado foi aplicado aos discentes matriculados do primeiro ao décimo semestre, do curso de odontologia, da Universidade Estadual do Sudoeste da Bahia, campus de Jequié-BA. Os dados foram tabulados e analisados no Excel e foram obtidas as frequências absolutas e relativas. **Resultados:** Dos 196 alunos matriculados, 160 (81,6%) participaram do estudo, com média de idade de 23,26 ± 4,42 anos e 157 (80,1%) já ouviram falar do CE. Entre os discentes, 29 (14,8%) experimentaram cigarro convencional e 58 (29,6%) CE, 26,5% informaram baixo conhecimento do CE e 65,6%, conhecimento intermediário. **Conclusão:** Na população avaliada, o nível de conhecimento acerca dos CE é insuficiente, foi obtido de forma não científica, e o tema foi pouco abordado pelas disciplinas cursadas.

Palavras-chave:
Sistemas Eletrônicos de Liberação de Nicotina; Vaping; Estudos Transversais/estatística & dados numéricos; Inquéritos de Saúde Bucal; Estudantes de Odontologia/estatística & dados numéricos.

RESUMEN

Introducción: El cigarrillo electrónico (CE) ha surgido como una alternativa para reducir el consumo de cigarrillos convencionales. **Objetivo:** Analizar el conocimiento de estudiantes de odontología sobre los riesgos del uso del CE para la salud bucal. **Método:** Estudio epidemiológico transversal de carácter descriptivo-exploratorio. Se administró un cuestionario estructurado a estudiantes matriculados desde el primer hasta el décimo semestre en el curso de odontología en la Universidad Estatal del Sudoeste de Bahía, campus de Jequié-BA. Los datos se tabularon y analizaron en Excel, obteniéndose frecuencias absolutas y relativas. **Resultados:** De 196 estudiantes matriculados, 160 (81,6%) participaron en el estudio, con una edad media de 23,26 ±4,42 años, y 157 (80,1%) habían oído hablar del CE. Entre los estudiantes, 29 (14,8%) habían probado cigarrillos convencionales y 58 (29,6%) CE. El 26,5% evaluó su conocimiento sobre el CE como bajo y el 65,6% como intermedio. **Conclusión:** En la población evaluada, el nivel de conocimiento sobre los CE es insuficiente, obtenido de manera no científica, y el tema fue poco abordado en las asignaturas cursadas.

Palabras clave: Sistemas Electrónicos de Liberación de Nicotina; Vapeo; Estudios Transversales/estadística & datos numéricos; Encuestas de Salud Bucal; Estudiantes de Odontología/estadística & datos numéricos.

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INTRODUCTION

Tobacco use causes avoidable diseases like cardiovascular and respiratory illnesses and some types of cancer[1]. Among more than 7,000 toxins, at least 70 are carcinogenic and provoke more than seven million deaths annually[2]. It is a risk factor for buccal health contributing to mouth cancer, periodontal diseases, halitosis, changes in the mucosa and pigmentation of teeth[3].

Smoking is a nicotine and time-dependent chronic disease, a habit initiated very early in the users lives[1]. Recently, an electronic device for tobacco use is being commercialized, initially perceived as a less damaging alternative than conventional cigarettes whose aim is to reduce smoking[4]. It consists of a container with a liquid solution containing nicotine, flavoring and other chemical compounds which, when heated by an atomizer create an aerosol inhaled by the user[5]. Nicotine salts, a key component of electronic cigarettes (EC) are formed by organic acids as sorbic, glycolic and ascorbic acids that potentialize the users' dependence[6].

Tobacco industry is a key player in promoting both the conventional and the electronic cigarette to attract young adults and ultimately stimulate addiction[7]. Studies show that the industry disseminate and minimize EC damages, encouraging young adults to try, which is closely related to the increased use in this population[8].

A considerable number of elementary and high school students have already tried EC, conventional cigarettes and cigars[9]. In Brazil, it is known as vaper or EC, in the format of pens and flash drives, a trend among adolescents and young adults[10]. Although the indicators of cigarette trying have remained stable, there was a remarkable increase of hookah, EC and other tobacco-based products use by Brazilian students calling for new regulatory measures[11,12].

EC is health-damaging due to toxic compounds and heavy metals found in the e-liquids and aerosols that can cause various levels of health risks after inhaling, dermal exposure and oral intake[13].

The chronic use may lead to dependence, dyspnea, chest pain and increased risk of hypoxemia[14] and cardiovascular risks as atherosclerosis, hypertension, arrythmias, myocardial infarction and cardiac failure[15], increase of sympathetic tone, vascular rigidity, endothelial dysfunction[16], outbreaks of pulmonary lesions and high levels of carcinogenic and toxic substances[17], further to severe risks as burns, lacerations and bruises on the user's face[18].

The passive exposure to EC aerosols can cause various health problems. Experiments revealed that 30 minutes of passive exposure can provoke immediate changes on the respiratory mechanic and biomarkers exhaled resulting from deposition and evaporation in the human lungs[19].

Despite public policies of tobacco control implemented in Brazil in the last decades, the use of EC has risen among young adults[20], because of misleading information suggesting they are less health-damaging than traditional cigarettes[21], further to illegal trade practices, which adds complexity to its control[22]. The National Health Surveillance Agency (Anvisa)[23] banned the sale, importation, advertising and marketing of EC because of poor scientific evidences proving the safety and efficacy against tobacco use[11,12].

The objective of the present study is to analyze the knowledge dentistry students have on the risk of EC to oral and general health based on its damaging effects.

METHOD

Cross-sectional, descriptive-exploratory epidemiological study carried out in August 2023 with dentistry graduation students of "*Universidade Estadual do Sudoeste da Bahia*" (Uesb), campus Jequié, Bahia, approved by the Institutional Review Board (IRB), report number 6025176 (CAAE (submission for ethical review: 68765223.4.0000.0055) in compliance with Directive 466/2012[24] of the National Health Council.

The data were obtained by a 26-questions structured questionnaire proposed by Silva[25] and adapted by the investigators with the following information (sociodemographics, tobacco and EC trying and use and knowledge on EC).

Initially, the investigator contacted the students' representative of each one of ten classes of dentistry to identify the schedule and rooms where they will be present and find out the best day and time to apply the questionnaire. Authorization to enter the room and present the study objectives was asked to the teacher and those who accepted to join the study remained in the room and were handed a copy of the Informed Consent Form (ICF). After signing the ICF, a copy of the questionnaire was handed and responded in the room without time restraints.

Students attending one of ten semesters of Uesb dentistry course in August 2023, older than 18 years of age were enrolled in the study. Those who could not be found at the classes after three visits and did not agree to join were excluded. As soon as the questionnaires were responded, they left the room and handed the investigator the questionnaire and the signed ICF.

Data were tabulated, analyzed in an Excel spreadsheet and relative and absolute frequencies, measures of central tendency and dispersion were obtained.

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RESULTS

Of the 196 students enrolled in Uesb dentistry course, 160 (81.6%) accepted to join the study, 28 (14.3%) were excluded because they were not found in the class after three attempts and eight (4.1%) for being younger than 18 years-old of age.

A hundred and seventeen (73.1%) interviewees were women, in the age-range of 18-77 years-old and mean age of 23.26 ± 4.42 years.

Prevalence of trying EC and conventional cigarette were 36.2% and 18.1%, respectively, and of use of EC, 3.1%. Additionally, 15% of the interviewees would try EC should a friend offered.

Table 1 portrays Uesb dentistry students' knowledge on EC.

Table 1 has demonstrated that the students reported that EC is more health-damaging than conventional cigarette, contains nicotine and influences the use of conventional cigarette, it is more socially acceptable with general health risks and increases the risk of cancer. However, they were unaware that sale is banned by Anvisa, it does not help conventional cigarette smoking cessation, that the aerosol causes health damages to second-hand smoker and its nicotine content.

They have also reported that the dentist needs to expand their knowledge on EC and that the theme needs to be best addressed in the curriculum.

Table 2 reveals the student's knowledge on EC.

As shown in Table 2, the student's knowledge is intermediate with predominance of Internet and media as source of information, emphasizing the tendency of the interviewees to search for knowledge in less reliable or non-scientific channels.

DISCUSSION

The present study investigated the knowledge dentistry students of a public university in rural Bahia have on EC, initially introduced as a less damaging alternative to traditional tobacco use as they could potentially be less harmful to health[4]. However, the nicotine content may, in certain cases, be equal or greater than conventional cigarette[26].

The prevalence of trying EC by the students was considerably high, nearly 2-fold compared with conventional cigarette, but these results can be associated with curiosity or poor perception of the young adults who are the majority of the population investigated about EC associated risks. This age group perceives EC as less harmful and are more propense to use them[27] and are more interested in nicotine electronic devices, suggesting

Table 1. Uesb dentistry students' knowledge on electronic cigarette and how it is addressed in the university curriculum. Jequié-BA, 2023

Variables	Categories	n	%
Is EC more health-damaging than conventional cigarette?	More damaging	89	55.6
	Less damaging	9	5.6
	Equally damaging	53	33.1
	Risk-free	-	-
	Don't know	9	5.6
EC is approved in Brazil	Yes	48	30
	No	68	42.5
	Don't know	43	26.8
EC helps smoking cessation of conventional cigarette	Yes	24	15
	No	62	38.75
	Don't know	74	46.25
EC aerosol is health-damaging to second-hand smoker	Yes	101	63.1
	No	4	2.5
	Don't know	55	34.3
EC contains nicotine	Yes	97	60.6
	No	21	13.1
	Don't know	41	25.6
EC nicotine content compared with conventional cigarette is	Higher	46	28.75
	Similar	7	4.3
	Lower	9	5.6
	Don't know	93	58.1
EC has influence on conventional cigarette use	Yes	99	61.8
	No	8	5
	Don't know	51	31.8
EC is more socially accepted	Yes	138	86.25
	No	7	4.3
	Don't know	15	9.3
Are you aware of what makes a person use EC?	Yes	59	36.8
	No	101	63.1
Is EC damaging to the general health?	Yes	154	96.25
	No	1	0.6
	Don't know	5	3.1
Does EC increase the risk of cancer?	Yes	132	82.5
	Don't know	28	17.5
Is it important for dentistry students to be aware of EC?	Yes	156	97.5
	No	2	1.25
	Don't know	2	1.25
Has any school discipline addressed EC?	Yes	17	10.6
	No	137	85.6
	Don't know	5	3.1

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Table 2. Students' knowledge and means utilized to acquire information on EC. Jequié-BA, 2023

Variables	Categories	n	%
What is your level of knowledge on EC?	Low	41	25.6
	Intermediate	105	65.6
	Advanced	12	7.5
	Does not know	2	1.25
Where had you acquired the information on EC?	Scientific literature	36	22.5
	Media	64	40
	Professional opinion	38	23.7
	Internet	85	53.1
	Does not know	6	3.7
	Others	6	3.7

a possible gateway effect to start smoking, although evidences of a direct connection are yet limited[28].

A small percent of Uesb students (3.1%) uses EC, suggesting that although trying is high, it did not lead to regular use. Another international study identified high prevalence of EC, similar to what was noticed in Thailand where 4.2% of 1,986 dentistry students were regular users of EC[29]. These findings may indicate that in some regions, the use of EC by dentistry students is relatively rare, possibly because of more awareness of health harms associated to its use.

A higher prevalence of EC use was found in Riyadh, Saudi Arabia, where 26% of the 400 dentistry students investigated have already used and of these, 21% continued to use[30]. This scenario may reflect cultural, social and economic differences influencing the student's behavior on that matter.

Studies indicate that EC use patterns vary according to socioeconomic level and increase over time, while exposure to information and social environment affect the intent to use[31]. In addition, sex, race, sexual orientation and socioeconomic status shape the perception of health risks, emphasizing the necessity of customized interventions to specific contexts to prevent and reduce the use of EC by the young population[32].

Interestingly, a considerable percent of Uesb dentistry students affirmed they would try EC if a friend offered them, highlighting the relevance of social influence on trying substances, especially within an academic setting where social media play a key role in their lives. Smoking among adolescents is influenced by fellow smokers, exposure to information on EC and living with relatives who smoke too[33].

In addition, social ties with other users affect the perception of risk and willingness to quit smoking[34]. Factors such as sex, education, lifestyle and emotions also shape the use of conventional and electronic cigarettes within a university setting in addition to social rules, expectations of results and personal motivations also important to understand the use of nicotine-delivery electronic devices, emphasizing the necessity of multidisciplinary approaches to reduce the use[35].

The prevalence of dentistry students with knowledge on EC investigated herein was comparable to a multinational survey involving 20 dentistry colleges in 11 countries[36], where 90.8% of the 5,697 participants claimed they have heard about EC[36]. This information indicates that the knowledge on EC is extensively disclosed among dentistry students in many countries. Remarkably, the main source of information found in the study was Internet and other media. Social networks have also stood out as an important channel of information in a multinational study (26%)[36]. This finding highlights the importance of digital media in disseminating information among future professionals. The media significantly influences the public opinion and governmental policies, drawing attention to the necessity of counting with cohesive media coverage for improved effectiveness while informing the population[37].

A small percentage of dentistry students affirms that the classes they attended addressed EC-related damages, suggesting that there might be a gap requiring changes in the curriculum to include specific information, given that a significant number of students obtains information from non-academic sources. Although dentistry students beliefs and attitudes on EC are acceptable, their knowledge is unsatisfactory and the curriculum should be improved[36]. Most of the final-year graduation students feel they are unprepared to advise patients on the use of these devices[38], showing the current gap among attitudes and knowledge on EC, highlighting the necessity of integrating this theme more effectively in future curricula[39].

Uesb dentistry students were unaware that Anvisa (the National Health Surveillance Agency)[23] banned in 2024 the advertising, importation, marketing and sale of EC; this reveals an important curriculum gap, bringing up the necessity of including more information about health public policies, a potential hurdle for the future practice of these students, as the knowledge of laws is important to advise patients and ensure safe practices.

Notwithstanding the advances of oral health policies, the focus on public health in dentistry is still limited with scarce scholar publications addressing this subject[40]. It is essential to know the legislation and public health policies to advance health equity and ensure access to scientific evidence-based care for all the individuals in the course of their lives[41].

This is one of the few studies addressing this theme in Brazil. As some students might not have been willing

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to share their habits and beliefs due to its potentially sensitive content, this a possible limitation of the study. The sample is small, although representative of the course, which suggests that future studies involving more students from different universities are carried out to best reflect the national scenario.

CONCLUSION

Uesb dentistry students are poorly knowledgeable about the risks of EC for oral and general health. These findings reveal the necessity of broadening the discussion of this theme in the curriculum to encourage the identification of risks, policies of use of EC and the elaboration of strategies of oral health promotion, including diagnosis and treatment of pathologies associated with its use.

This would help future health professionals to offer proper treatment to the patients with a safer and educative approach.

CONTRIBUTIONS

Erika Pires dos Santos contributed to the study design, acquisition, analysis and interpretation of the data and wording of the manuscript. Mateus Cardoso Oliveira contributed to the acquisition, analysis and interpretation of the data and wording of the manuscript. Cezar Augusto Casotti contributed to the study design, acquisition, analysis and interpretation of the data, wording and critical review. All the authors approved the final version to be published.

DECLARATION OF CONFLICT OF INTERESTS

There is no conflict of interests to declare.

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