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Risk perception and electronic cigarette use among nursing students at a public university in Mexico

Percepción de riesgo y consumo de cigarro electrónico en estudiantes de enfermería de una universidad pública de México

Percepção de risco e uso de cigarro eletrônico entre estudantes de enfermagem de uma universidade pública no México

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ABSTRACT

Introduction: Electronic cigarette consumption is an emerging public health problem, since this modality is attractive to users, a low-risk perception towards these devices predisposes to consumption, a risk group are nursing students. **Objective:** To determine the relationship between risk perception and electronic cigarette use among nursing students at a public university in Monterrey, Nuevo Leon, Mexico. **Materials and methods:** Descriptive and correlational cross-sectional study, using non-probabilistic convenience sampling, the sample consisted of 50 participants over 18 years of age who signed informed consent. **Results:** 60 % of the participants reported using electronic cigarettes at some time in their lives and 14 % in the last week. The age of onset of use was 18.4 years ($SD = 1.7$), women presented higher use in the last month (Tau-b = -0.26; $p < 0,05$). There was a significant negative relationship between risk perception and electronic cigarette consumption ($r_s = -0.13$; $p < 0,05$). **Conclusion:** It is necessary to consider risk perception in future studies and in nursing education to prevent the use of electronic cigarettes.

Keywords: Electronic cigarette; risk; perception; nursing students. (Source: DeCS, Bireme).

Sustainable development goals: Health and well-being. (Source: SDG, WHO).

RESUMEN

Introducción: El consumo de cigarro electrónico es un problema emergente de salud pública, puesto que esta modalidad resulta atractiva para los usuarios, una baja percepción de riesgo hacia estos dispositivos predispone al consumo, un grupo de riesgo son los estudiantes de enfermería. **Objetivo:** Determinar la relación entre la percepción de riesgo y el consumo de cigarro electrónico en estudiantes de enfermería de una universidad pública de Monterrey, Nuevo León, México. **Materiales y métodos:** Estudio descriptivo y correlacional de corte transversal, se empleó un muestreo no probabilístico por conveniencia, la muestra fue de 50 participantes mayores de 18 años que firmaron consentimiento informado. **Resultados:** El 60 % de los participantes refirió utilizar cigarro electrónico alguna vez en la vida y el 14 % en la última semana. La edad de inicio de consumo fue a los 18,4 años ($DE = 1,7$), las mujeres presentaron mayor consumo en el último mes (Tau-b = -0,26; $p < 0,05$). Se evidenció una relación negativa significativa entre la percepción de riesgo y el consumo de cigarro electrónico ($r_s = -0,13$; $p < 0,05$). **Conclusión:** Es necesario considerar la percepción del riesgo en estudios futuros y en la formación de enfermería para prevenir el uso de cigarro electrónico.

Palabras clave: Cigarro electrónico; riesgo; percepción; estudiantes de enfermería. (Fuente: DeCS, Bireme).

Objetivos de desarrollo sostenible: Salud y bienestar. (Fuente: ODS, ONU).

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RESUMO

Introdução: O uso de cigarros eletrônicos é um problema emergente de saúde pública, pois essa modalidade é atrativa para os usuários, e a baixa percepção de risco em relação a esses dispositivos os predispõe ao consumo, um grupo de risco são os estudantes de enfermagem. **Objetivo:** Determinar a relação entre a percepção de risco e o uso de cigarros eletrônicos entre estudantes de enfermagem de uma universidade pública em Monterrey, Nuevo León, México. **Materiais e métodos:** Estudo descritivo e correlacional de corte transversal, utilizando amostragem não probabilística por conveniência, a amostra foi de 50 participantes maiores de 18 anos que assinaram termo de consentimento livre e esclarecido. **Resultados:** Sessenta por cento dos participantes relataram ter usado cigarros eletrônicos em algum momento da vida, e 14% relataram ter usado na última semana. A idade em que usaram cigarros eletrônicos pela primeira vez foi 18,4 anos ($DP = 1,7$), com as mulheres relatando níveis mais elevados de uso no último mês (Tau-b = -0,26; $p < 0,05$). Uma relação negativa significativa foi evidente entre a percepção de risco e o uso de cigarros eletrônicos ($r_s = -0,13$; $p < 0,05$). **Conclusões:** A percepção de risco precisa ser considerada em estudos futuros e no treinamento de enfermagem para prevenir o uso de cigarros eletrônicos.

Palavras-chave: Cigarro eletrônico; risco; percepção; estudantes de enfermagem. (Fonte: DeCS, Bireme).

Metas de desenvolvimento sustentável: Saúde e bem-estar. (Fonte: MDS, OMS).

INTRODUCTION

Electronic cigarette (EC) consumption is an emerging public health problem, since this modality is attractive to users, in addition to the excessive publicity given to vaping devices with misleading advertisements about less damage to health than conventional cigarettes and a wide variety of available flavors[1,2]. Recently, the latest generation of EC combines technology with consumption by integrating touch screens and fingerprints in the cartridges that allow answering phone calls, playing audio, establishing Bluetooth connection and playing games[3]. This novelty is perceived as the consumption of EC to be both modern and attractive, thus minimizing the appreciation of health consequences[4].

According to data from the World Health Organization (WHO)[5], in 2023 in the region of the Americas, 5.4% of young people used vaping devices, the organization points out that people who consume at an early age are three times more likely to smoke conventional cigarettes in the future. This situation is not at odds in Mexico, the National Health and Nutrition Survey (ENSANUT) reported that the prevalence of vape device use in young people was 2.6% (about 500,000), being higher in men than in women, 3% and 2.1%, respectively[6]. Specifically in the State of Nuevo Leon, it was reported that 7,305 youths used EC and 74,392 youths consumed tobacco at some time in their lives by means of EC[7].

In Mexico, the constitutional reform that prohibits the commercialization of EC has recently come into force[8], however, the sale and purchase of these devices is becoming more and more frequent in the market illegally[9], and even young people have the facility to acquire them in most establishments, which increases the risk of consumption and potentiates the consequences[10]. Among the health problems attributed to EC consumption in young people are the risk of nicotine and marijuana dependence, increased risk of asthmatic crises, EVALI (lung injury associated with the use of cancer (ducts), lung infections, chronic bronchitis, decreased lung function, and other respiratory pathologies such as pneumonia, airway irritation and exacerbation of pre-existing lung diseases, headache, cough, pharyngitis, dyspnea, hypertension, economic problems, cognitive impairment, school concentration problems, future illicit drug use, dual tobacco use and long-term risk of developing lung cancer[11,12].

Young university students in the health sciences, specifically nursing students, represent a population vulnerable to EC consumption, due to factors such as their age (youth), academic stress, internship periods, peer influence, socialization, sensation seeking, family problems, and a low perceived risk[13,14]. Precisely, a low perceived risk may predispose to EC use. This is defined as the way in which an individual interprets and understands the level of harm or safety associated with the use of electronic nicotine or marijuana systems compared to conventional cigarettes, which influences the decision to consume or avoid this behavior[14,15].

Specific research in nursing students indicates that when it is perceived that using EC is less harmful compared to conventional cigarettes (positive risk perception), the probability of consumption increases[11,16,17]. Most of the studies found have been developed in countries such as Chile, the United States and Indonesia, in Mexico, the available evidence is limited, so this research was an opportunity to address this knowledge gap.

Nursing students are emerging as future health professionals with a key role in promoting the adoption of healthy lifestyles, such as the non-consumption of tobacco and marijuana through EC. However, being young, this group is not exempt from presenting this risk behavior. The results of this study could serve as a scientific basis in the development of future nursing interventions to sensitize students to the importance of putting into practice the information given to patients. Therefore, the objective of this study was to determine the relationship between risk perception and consumption of EC in nursing students at a public university in Monterrey, Nuevo Leon, Mexico.

MATERIALS AND METHODS

Type of study

Descriptive and correlational cross-sectional study.

Population and sample

The population of interest was nursing students from a public university in Monterrey, Nuevo Leon. A non-probabilistic convenience sampling was used; a general invitation was made to the students of the selected university in the nursing area and those who expressed willingness to participate in the research and who were present during data collection were included. The sample was estimated considering a confidence interval of 95% and a margin of error of 5%. A total of 50 nursing students over 18 years of age and of no sex distinction were obtained.

Instrument and data collection

To collect the information, the Franks *et al*.[16] EC Risk Perception Questionnaire was used in paper and pencil format, originally designed in English, later adapted to Spanish and validated in young university students in Mexico by Armendáriz-García *et al*.[11] The questionnaire consists of 15 questions with Likert-type responses, with five options; 1 = Strongly disagree, 2 = Disagree, 3 Neither agree nor disagree, 4 = Agree and 5 = Strongly agree. The questions are divided into three subscales; 1. Smoking cessation (questions 1-3), 2. Reduction of perceived harm (questions 4-8) and 3. Preferred EC regulations (questions 9-15). Seven items are reversed questions (7, 9, 10, 11, 12, 13 and 14), so that 1 = Strongly agree, 5 = Strongly disagree. The overall score of the questionnaire is a minimum of 15 points and a maximum of 75 points, which is interpreted as the higher the score, the lower the risk perception. In this study it reported adequate internal reliability with a Cronbach's $\alpha = 0.92$. To profile the participants, a questionnaire was applied to collect personal data (age, age at initiation of vaping, sex, academic semester, vaping sessions and preferred flavor) and prevalence of EC use (global: lifetime EC use, lapsed: last year, current: last month, and instantaneous: last week).

Statistical analysis

The Statistical Package for the Social Sciences (SPSS) version 27 for Windows was used to analyze the data. In the descriptive analysis, frequencies and percentages were obtained, the Shapiro-Wilk test allowed rejection of the hypothesis of normality of the data ($p < 0.05$), for which non-parametric statistical tests were used in the inferential analysis; a point estimate with 95% confidence interval was performed, as well as Kendall's Tau-b test to determine the differences of quadratic categorical variables (ties), Spearman's Correlation Coefficient allowed establishing the relationship between the numerical variables.

Ethical aspects

Approval was obtained from the Research Ethics Committee of the Faculty of Nursing of the Universidad Autonoma de Nuevo Leon with registration number FAEN-L-2063, thus complying with the stipulations of the Regulations of the General Health Law on Research on Human Subjects of 1987 in its latest reform of 2014[18]. Informed consent was requested, and the confidentiality of the information was assured.

RESULTS

The mean age of the participants was 20.1 years (*SD* = 1,7), 70% were women and were in the third semester of their bachelor's degree in nursing (60%). On average, they started using vaping at 18.4 years (*SD* = 1,7), 25% of the participants preferred mint-flavored vaping. As for the number of vaping sessions in a day, most of them corresponded to 2 to 4 vaping sessions (33.3%) and the mean EC perception score was 34.48 points.

Forty-four percent of the participants reported total disagreement that EC is effective for smoking cessation. At least half of the students strongly disagreed that vaping causes less harm than smoking and 48% strongly agreed that EC aerosol has a harmful effect on health. Nearly three-quarters of the participants (72%) strongly agreed that EC should not be sold to minors and that these devices should be subject to legal regulations (46%) (Table 1).

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Items *n* = 50	Strongly disagree		Disa-gree-ment		Neither agree nor disagree		Agreed		Totally agree	
	f	%	*f*	%	*f*	%	*f*	%	*f*	%
Smoking cessation subscale										
1. Is EC effective in aiding smoking cessation	22	44	14	28	6	12	3	6	5	10
2. I consider EC as a smoking cessation option	25	50	11	22	6	12	2	4	6	12
3. ECs are more effective than nicotine replacement or therapy products	19	38	13	26	10	20	2	4	6	12
Perceived harm reduction subscale										
4. EC vaping is less harmful than smoking	25	50	9	18	7	14	1	2	8	16
5. The consequences of EC are less severe than smoking tobacco	23	46	7	14	11	22	1	2	8	16
6. The EC does not contain carcinogenic ingredients	20	40	10	20	9	18	4	8	7	14
7. EC aerosol may affect health	11	22	3	6	3	6	9	18	24	48
8. EC aerosol is less risky than second-hand smoke from tobacco	14	28	11	22	16	32	2	4	7	14
Subscale of preferred EC regulations										
9. EC should not be sold to minors	7	14	2	4	2	4	3	6	36	72
10. ECs should be subject to le-gal regulations just like to-bacco cigarettes	7	14	5	10	13	26	2	4	23	46
11. The Federal Commission for the Protection against Health Risks (COFEPRIS) should have the authority to regulate ECs as well as tobacco cigarettes	9	18	4	8	6	12	5	10	26	52
12. EC should be taxed the same as tobacco cigarettes	10	20	5	10	14	28	6	12	15	30
13. EC producers should dis-close all ingredients in their products	11	22	2	4	1	2	6	12	30	60
14. EC advertising on television and radio should be re-stricted to the following	5	10	3	6	14	28	6	12	22	44
15. EC companies should be allowed to provide free sam-ple EC	19	38	1	2	15	30	2	4	13	26

Table 1.
Frequencies and proportions of perceived risk to EC in nursing students

n: Sample.
***f*:** Frequency.

It was found that 60% of the participants consumed EC once in their lifetime (95% CI, 46, 74), in the last year 48% (95% CI, 34, 62), in the last month 32% (95% CI, 19, 45) and in the last seven days 14% (95% CI, 04, 24), as shown in Table 2.

Variable *n* = 50	No		Yes		95% IC	
	f	%	*f*	%	*LL*	*UL*
Global prevalence	20	40.0	30	60.0	46	74
Lapse prevalence	26	52.0	24	48.0	34	62
Current prevalence	34	68.0	16	32.0	19	45
Instantaneous prevalence	43	86.0	7	14.0	04	24

Table 2.
Global, lapsed, current and instantaneous prevalence of electronic cigarette use

Global prevalence: : Lifetime use of EC.
Lapse prevalence: Last year.
Current prevalence: Last month.
Instantaneous prevalence: Last week.
***n*:** Sample.
***f*:** Frequency.
CI 95%: 95% confidence interval for affirmative responses.
***LL*:** Lower limit.
***UL*:** Upper limit.

Table 3 shows that women presented greater consumption of EC than men in global, lapse, current and instantaneous prevalence. However, this difference was statistically significant only in current prevalence (Tau-b = -0.26, $p < 0.05$).

Table 3.
Prevalence of electronic cigarette consumption by sex

***n*:** Sample.
***f*:** Frequency.
Tau-b: Kendall's Tau-b.
***p*:** Significance.

Prevalence	Women		Men		Tau-b	*p*
***n* = 50**	***f***	**%**	***f***	**%**		
Global prevalence						
No	11	31.4	9	60.0	-0.26	0.06
Yes	24	68.6	6	40.0		
Lapse prevalence						
No	16	45.7	10	66.7	-0.19	0.16
Yes	19	54.3	5	33.3		
Current prevalence						
No	21	60.0	13	86.7	-0.26	0.03
Yes	14	40.0	2	13.3		
Instantaneous prevalence						
No	30	85.7	13	86.7	-0.01	0.9
Yes	5	14.3	2	13.3		

Age of initiation to vaping showed a significant negative relationship with risk perception ($r_s = -0.52$, $p < 0.01$). This suggests that a lower risk perception is associated with an earlier age of onset. A significant negative relationship was also found between risk perception and EC consumption, measured by the number of vape sessions in a day ($r_s = -0.13$, $p < 0.05$). That is, lower risk perception is related to higher consumption (Table 4).

Table 4.
Spearman correlation coefficient for numerical variables

***n*:** Sample.
** $p < 0.01$.
* $p < 0.05$.

Variable *n*= 50	1	2	3	4
1. Age	1			
2. Age of onset	0.66**	1		
3. Vaping sessions	-0.11	-0.21	1	
4. Risk perception	-0.38**	-0.52**	-0.13*	1

DISCUSSION

This research addressed the relationship between risk perception and consumption of EC in 50 nursing students in Nuevo Leon, Mexico. On average, the participants were 20 years old; this result is similar to that reported by Pangestu and Akhmad[17] in Indonesian students, this may be explained by the fact that the age for entering university is 18 years old, in this study most of the participants were in their third academic semester. Regarding sex, the majority were women, which coincides with that reported by Armendáris-García *et al.*[11] and Castillo *et al.*[19], this may be due to the fact that the nursing career has traditionally been studied by women, although this trend has been changing in recent year[20].

It was observed that at least a quarter of the students who consume EC opt for menthol flavors, this differs from what was reported by Armendáris-García *et al.*[11] who found that students from Chihuahua are inclined to use EC with fruit flavors, this difference is possibly due to the availability of EC according to the season and climates of the different states. It was found that most of them vape from two to four times per day, which is lower than that reported

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in the previously mentioned study, where participants reported vaping between 11 to 20 times per day[11]. This difference can be explained by the fact that the study in Chihuahua included students of older ages than those in this study, as well as the measurement of the number of vaping sessions is subjective, since most EC users do not know that a vaping session begins when inhaling from the EC and ends when removing the device from the mouth, and unconsciously perform repeated inhalations.

The mean score obtained on the perception of risk of EC consumption was 34.48 out of 75 points, where the lowest score means a high perception of risk. Thus, it is evident that there is indeed a high perception of risk. This is consistent with what has been found in other research on students in Mexico and the United States[11,21] where it is argued that nursing students, being part of the health sector, develop competencies in health promotion and disease prevention, including a deep knowledge of the harmful effects of substance use. This curriculum emphasizes the importance of scientific evidence and critical thinking in assessing health risks, which could explain the greater awareness of the dangers of vaping compared to other populations. However, this result differs from that found in Indonesia[17].

These differences may be attributed to the fact that the latest generations of vapers incorporate elements such as touch screens and fingerprint recognition that could be perceived as novel and attractive, minimizing the perception of their health risks. It should be noted that the Indonesian study[17] encompasses a cultural environment different from that of Latin America, which could introduce a confounding factor, since trends or preferences in Asian youth or customs may differ greatly from those of the West. In addition, further research is required to determine the exact role of technology in vapers' risk perception, considering also the influence of marketing and other psychosocial factors.

The majority of participants strongly disagreed about the effectiveness of EC for smoking cessation, and that using vapes generates less harm than smoking in the traditional way. Approximately 50% of the students strongly agreed that EC aerosols are harmful to health and a higher proportion reported to strongly agree that EC should not be sold to minors and that the law should regulate their purchase and sale. These findings are consistent with those reported by Roma[21] who had as subjects nursing students in the United States and documented that participants perceived ECs to be addictive and harmful to health and agreed that health professionals should inform patients about the risks of consumption. Furthermore, this similarity suggests that nursing education may have a protective effect against misperceptions about EC, regardless of cultural context. However, it differs with the study by Pangestu and Akhmad[17] where nursing students were more positively perceived to believe that EC are less harmful than conventional cigarettes. This discrepancy could be explained by differences in public health policies and EC regulation between countries, as well as variations in information campaigns and availability of vape products.

Regarding prevalence of use, 60% of the students reported having used EC once in their lifetime, and of these, 14% reported having used them in the last week. These figures are higher than those reported in nursing students in the United States[21] and university students of health sciences in Chile[22], where the prevalence of lifetime use was 43.4% and 32.9%, respectively. A possible explanation for this difference could be related to contextual factors, such as greater accessibility and normalization of vaping in certain social environments, as well as differences in prevention and regulation campaigns between countries. For example, in Mexico and specifically in Nuevo Leon, despite the fact that the sale of vaping devices is regulated, there are numerous establishments near universities where these devices are sold without any restrictions[9].

In contrast to men, women presented greater consumption of EC in the four prevalence periods, which was significant for EC consumption in the last month, due to the fact that this study had a greater participation of women. Similarly, Roma[21] and Palmes *et al.*[23] reported similar findings because their study sample was mainly female. Contrary to these results, at the national level in Mexico, the ENSANUT[6] reported greater use of EC in men[24].

It is important to consider that there is a trend in the consumption of EC or other drugs among women, which attributes a social value of equality and empowerment, and encourages greater consumption among this specific group[24]. Armendáris-García *et al.*[11], Castillo *et al.*[19] and Wamamili *et al.*[25] express that there is a significant relationship between risk perception and EC use, a possible explanation for this finding is that a low-risk perception leads to a lower appreciation of the harmful consequences of EC, which facilitates the use of these devices. This underscores the importance of educational interventions that seek to increase risk perception among young people to prevent EC use.

This study has some important limitations. The small sample size may limit the generalizability of the results and contribute to wide confidence intervals, reflecting lower precision in the estimates. In addition, the convenience sampling used may generate biases and affect the representativeness of the findings. These limitations suggest the need for future research with larger samples and more rigorous sampling methods.

CONCLUSIONS

This study explored the relationship between risk perception and EC use in nursing students. It was found that 60% of the participants reported having used EC in their lifetime, with an average age of onset of 18.4 years. Females showed a higher consumption of EC in the last month compared to males. In addition, a significant relationship was observed between risk perception and EC use, suggesting that lower risk perception is associated with higher use. In general, the participants have a modernly high perception, which is explained by being university students in the health area. It is recommended to continue considering risk perception as a key variable in future studies on EC consumption.

In addition, the importance of designing nursing interventions aimed at reducing or preventing the use of these devices, in which the perception of risk is reinforced as a variable that could act as a protective factor, is highlighted. In this way, nursing students will be encouraged to exercise their role as health promoters, applying this approach in their own behaviors, such as the decision to abstain from consumption from their academic training stage. Likewise, it is suggested the inclusion in nursing curricula of learning units that address drug addiction prevention as a global public health problem, in order to provide future professionals with the necessary tools and competencies to promote health in society.

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