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The need to educate future dental professionals on E-cigarette effects

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Abstract

Objective: To compare knowledge and attitude of dental students in two countries towards E-cigarettes and their long-term effects.

Material and Methods: An anonymous cross-sectional survey, using self-administered questionnaires, was conducted amongst dental students from the University of California, Los Angeles School of Dentistry (UCLA) and Universidad Europea of Madrid (UE).

Results: There were significant differences in knowledge and perception of E-cigarettes between dental students from both countries. Three (3%) of the participants from UE sample smoked E-cigarettes every day, compared to none of the students from UCLA. Almost 54 (80%) students from UCLA claimed that they had never experimented with an E-cigarette, whereas 61 (65%) of UE sample reported not having experimented with E-cigarettes in the past. More than 15% of students in both populations were unsure of the potentially harmful effects of E-cigarette usage. A significantly higher proportion of the Spanish sample used conventional cigarettes compared to the US sample 53 (56%) compared to 36 (24%), $P < 0.001$. In addition, when compared to the UE sample, UCLA students rated E-cigarettes as being less harmful overall than tobacco $P < 0.001$. Furthermore, more than 86% of both populations indicated interest in learning more about the potential risks associated with E-cigarettes.

Conclusions: This survey indicated that students from one dental school in the United States of America (USA) and one in Spain lacked the knowledge to address the rising E-cigarette population usage and provide information regarding them to patients. Specific educational programmes on E-cigarette hazards and long-term effects on oral and systemic health should be implemented in dental curricula in both of these schools in order to stay receptive to the changing field of tobacco education.

KEYWORDS

dental students, education, electronic cigarettes, regulation

1 | INTRODUCTION

The E-cigarette, or electronic cigarette, was originally developed in China in 2003 and later introduced to the United States and European marketplace approximately 3 years later.¹ E-cigarettes form a component of the electronic nicotine delivery system (ENDS) industry which includes other similar devices such as vape pens, e-hookah, e-cigars and e-pipes, altogether comprising a 2-billion-dollar industry in the United States alone.² Recently, there has been rapid market penetration worldwide of E-cigarettes despite many unanswered questions about their safety, efficacy for harm reduction and smoking cessation, and total impact on public health.³

The use of E-cigarettes has increased amongst adolescents. The 2014 National Youth Tobacco Survey stated that current E-cigarette usage amongst high school students has increased from 4.5% in 2013 to 13.4% in the United States alone⁴ and it has been suggested to be associated with subsequent initiation of conventional combustible cigarette smoking. Health care providers who treat adolescents reported that E-cigarettes could be a gateway to other tobacco use.⁵

For adults, E-cigarettes are marketed as a possible smoking cessation tool that reduces harm by limiting exposure to combustible forms of tobacco (eg cigarettes, cigars, pipes and hookahs), and as a healthier and safer alternative to traditional cigarette smoking. However, neither of these claims has been supported by current research.⁶ The largely unsupervised marketing and manufacturing of E-cigarettes along with the striking lack of longitudinal studies proving the safety of long-term ENDS usage pose a very significant public health problem, making the rampant growth of E-cigarette popularity especially amongst adolescents a severe concern.²

In Europe, a recent Eurobarometer survey that included 27 901 EU citizens demonstrated that the consumption of E-cigarettes was slightly lower in Spain (1%) compared to the rest of Europe (2%).⁷ In addition, another study suggested that in the European population who responded to the survey 25% of the ones aged 15-24 had tried E-cigarettes compared to 22% of the same matched aged group in Spain. In the 25 to 39 aged cohort, 21% of the European sample and 18% of the Spanish surveyed population had tried E-cigarettes before.⁸ These results indicate a clear tendency of younger patients to be more likely to accept and experiment with such devices.

In the United States, a study published in 2015 from data extracted from the National Health Interview Survey revealed that 12.6% of adults in the United States had tried E-cigarettes at least once before. The researchers established that the prevalence of E-cigarettes usage in the United States was approximately 3.7%, which was more popular with current smokers or recent non-smokers. Additionally, of adults aged 45 and over who had never smoked conventional cigarettes before, less than 1% had tried an E-cigarette, whereas up to 9.7% of those aged between 18-24 had tried E-cigarettes before.⁹

The growing popularity of E-cigarettes without substantiated evidence confirming their safety has led to international concern

by various agencies such as the US Food and Drug Administration (FDA), World Health Organization (WHO) and various Health Ministries worldwide.¹⁰ Currently, the WHO urges countries to restrict the promotion and sale of E-cigarettes for two main reasons: (a) E-cigarettes have not been found to be a safe and effective means to aid in smoking cessation when compared to more researched methods such as the nicotine patch or gum and (b) recent studies have shown a number of adverse toxicities both in vivo and in vitro with regard to vapours produced by E-cigarettes from both nicotine and non-nicotine devices. These studies demonstrated an increase in inflammatory cytokines and oxidative stress in both human and mouse epithelial cells.^{11,12} E-cigarette adverse effects were also demonstrated on oral tissues, where investigators found that many of the flavouring agents used in E-cigarette liquids lead to an increase in oxidative/carbonyl stress and simultaneously stimulate the release of inflammatory cytokines in periodontal ligament fibroblasts, gingival epithelium progenitor pooled cells and 3D EpiGingival tissues of humans.^{13,14} In addition, E-cigarette aerosols caused DNA damage and stress induced cellular senescence in periodontal cells, which the authors speculate could increase the likelihood to develop periodontal disease in E-cigarette users.¹⁵ But to date, no investigators have reported the oral health effects of E-cigarettes.

In 2016, the FDA issued a final rule categorising all ENDS as "tobacco" products thus subjecting them to the same provisions and relevant regulatory requirements as traditional cigarettes. The Family Smoking Prevention and Tobacco Control Act (TCA) provided the FDA the authority to regulate all manufacturing, advertising, sale and distribution of ENDS in the United States. Similarly in Europe, growing concerns over the potential risks to the public due to E-cigarettes instigated the passing of Article 20¹⁰ of the Tobacco Product Directive (TPD) which regulates the quality and safety of E-cigarettes intended for the consumer marketplace.¹⁶

Due to the recent studies demonstrating the harmful effect of E-cigarettes on the oral cavity, the dental students at UCLA are given a three-hour lecture on E-cigarettes usage and potential oral and systemic health consequences. On the other hand, the Universidad Europea (UE) students are provided only general information about tobacco use without specific lectures focusing on E-cigarettes.

Due to the difference in curriculum content between both dental schools, this study aimed to compare and contrast dental students' perceptions, knowledge and beliefs regarding the usage of E-cigarettes between the Spanish and US dental schools. In addition, the specific regulations on the usage of these devices both in Europe and in the United States are reviewed and compared.

2 | MATERIALS AND METHOD

2.1 | Participants

Subsequent to approval from the Institutional Review Board (IRB), University of California, Los Angeles School of Dentistry (UCLA) #

14-000843 and from the Universidad Europea of Madrid (UE), internal code # CIPI/050/17, third- and fourth-year dental students from both schools were approached personally and directed to a secure website where the survey could be completed anonymously and students were informed that their responses were entirely confidential. The combined number of third- and fourth-year dental students at UCLA is 216 (108 in each class). The number of third- and fourth-year dental students at UE is 130. A total of 242 dental students volunteered to participate and successfully completed the administered survey, 148 of the students were from UCLA School of Dentistry and 94 from the Universidad Europea of Madrid (UE). Students' age ranged from 18 to 30 in the UE sample and from 23 to 29 in the UCLA sample.

2.2 | Questionnaire

This study aimed to obtain quantitative information on students' overall opinions regarding usage, knowledge and perception of E-cigarettes and assess the level of comfort and confidence student dentists had when discussing E-cigarettes usage with their respective patients. The 27 item survey was configured so that each question had to be answered in order to allow the student to proceed to the next question. Students had to respond to all questions as remaining questions depended on prior survey question responses. Therefore, for each student to successfully complete the survey, all questions had to have been answered in the order they were presented in order for the student to be able to submit their completed survey. The survey was designed to take not more than 10 minutes. Questions combined Likert Scale questionnaire items such as "How much do you agree with this statement: E-cigarettes can be a smoking cessation aid for quitting conventional cigarettes" with answer choices being "Strongly Disagree, Disagree, Not Sure, Agree, Strongly Agree", rank the choices style questions such as "Please rate these items on how harmful they are (1 being least harmful and 5 being most harmful) with answer choices including, "Tobacco, E-Cigs, Cigars and Hookah" and standard multiple choice questions, "Do you feel that you have enough knowledge about E-cigarettes concerning its effects on the oral cavity?" followed by answer choices, "Yes, No, Maybe and Unsure". The full survey is available at: <https://www.dropbox.com/s/djpa27i82qw6uyb/ECIG%20SURVEY%202018.pdf?dl=0>

2.3 | Data analysis and statistics

Relative frequencies and percentages were reported for categorical variables. Means and standard deviations were reported for continuous variables where appropriate. Chi-squared or Fisher's exact tests were used to compare categorical variables based on distributional assumptions. For multiple group comparisons, Kruskal-Wallis test was used. Ordinary least squares regression was used to adjust for demographic variables such as age, gender and nationality. All analyses were performed using R version 3.2.2. The outcomes of this study were mainly to assess:

TABLE 1 Comparison of tobacco use and perception of harm between Spanish and US samples

	Sample		P-value
	Spain	USA	
	94	148	
No. of tobacco products used N (%)			
0	30 (31.9%)	78 (52.7%)	0.0018
1	38 (40.4%)	32 (21.6%)	
2+	26 (27.7%)	38 (25.7%)	
Tobacco products used N (%)			
Cigarettes	53 (56.4%)	36 (24.3%)	<0.001
Pipe	8 (8.5%)	7 (4.7%)	0.3600
Smokeless/chewing	9 (9.6%)	18 (12.2%)	0.6791
Cigars	8 (8.5%)	7 (4.7%)	0.3600
Hookah	34 (36.2%)	61 (41.2%)	0.5167
Other	10 (10.6%)	6 (4.1%)	0.0816
Harm relative to tobacco N (%)			
Not harmful	2 (2.1%)	0 (0.0%)	0.0682
Less harmful	43 (45.7%)	59 (39.9%)	
Equally harmful	30 (31.9%)	62 (42.0%)	
More harmful	4 (4.3%)	1 (0.7%)	
Unsure	15 (16.0%)	24 (16.2%)	
How harmful are the following			
Cigarettes N (%)			
1-Not very	0 (0.0%)	4 (2.7%)	0.0012
2	2 (2.1%)	2 (1.4%)	
3	2 (2.1%)	20 (13.5%)	
4	32 (34.0%)	44 (29.7%)	
5-Very	58 (61.7%)	60 (40.5%)	
E-cigarettes N (%)			
1-Not very	5 (5.3%)	16 (10.8%)	<0.001
2	12 (12.8%)	40 (27.0%)	
3	35 (37.2%)	53 (35.8%)	
4	23 (24.5%)	24 (16.2%)	
5-Very	19 (20.2%)	2 (1.4%)	
Cigars N (%)			
1-Not very	0 (0.0%)	3 (2.0%)	0.0116
2	1 (1.1%)	14 (9.5%)	
3	13 (13.8%)	24 (16.2%)	
4	25 (26.6%)	38 (25.7%)	
5-Very	55 (58.5%)	61 (41.2%)	

A significantly higher proportion of the Spanish sample used cigarettes compared to the US sample (56% compared to 24%, $P = 0.001$). Compared to the Spanish sample, the US sample rated E-cigarettes less harmful overall ($P = 0.001$).

students' personal experiences with E-cigarettes, knowledge about E-cigarettes and students' assessment of their education on E-cigarettes.

3 | RESULTS

The overall response rate for UCLA dental students was 69% whilst for UE students, it was 72%. The response rate for each question was 100% as this was an online survey and students had to respond to each item of the questionnaire as completion of the remainder of the survey questions depended on prior survey question responses. The system would not allow students to submit the survey without completion of all items. Regarding student demographics, the Spanish students were 40 (43%) men and 54 (57%) women, whereas the US students were approximately 59 (40%) men and 89 (60%) women.

With regard to current or past usage of conventional cigarettes, 53 (56%) of the students from the Spanish sample were either current or past conventional cigarette smokers compared to only 36 (24%) of the US surveyed students. Fifty-eight (64%) of the Spanish students compared to 105 (71%) of the US participants responded to not using any of the tobacco or tobacco-associated products in the past. Approximately 29 (33%) of the Spanish students and 18 (12%) of the US students responded that they had smoked conventional cigarettes first and then progressed to try E-cigarettes. Only 2 students from the UE and 3 students from UCLA (2%) reported that they had only exclusively smoked E-cigarettes in the past. (Table 1).

Data extracted from the Spanish sample revealed that 3 (3%) of the participants smoked an E-cigarette everyday, whilst none of the surveyed students from UCLA reported daily use. Additionally, almost 118 (80%) of the students from UCLA and 61 (64%) from UE affirmed that they never experimented with an E-cigarette in the past. Students from both schools who had used tobacco products in the past were more likely to have used E-cigarettes as well ($P = 0.001$). Moreover, students who had used tobacco products in the past rated E-cigarettes less harmful than those who did not use tobacco products ($P = 0.0087$) (Table 1).

In addition, students who currently smoke conventional cigarettes reported a significantly greater exposure to information on E-cigarettes. Importantly, variances were seen in terms of the prevalence of different types of tobacco products used between the two populations. For example, the Spanish student population was more likely to have used conventional cigarettes, followed by hookah, cigars, smokeless tobacco, pipe or "other," respectively. In contrast, for

TABLE 2 Predilection of use of the different types of tobacco in both samples from most prevalent to least prevalent

UE	UCLA
Cigarettes	Hookah
Hookah	Cigarettes
Cigars	Cigars
Smokeless tobacco	Smokeless tobacco
Pipe	Pipe
Other	Other

US dental students, hookah was the most prevalent tobacco product, followed by conventional cigarettes, cigars, smokeless tobacco, pipe or "other." (Table 2).

3.1 | Student perceptions on harmful effects of E-cigarettes vs conventional tobacco usage

According to the data analysis, 43 (47%) of the UE students believed that E-cigarettes were less harmful overall than conventional cigarettes compared to 58 (39%) of the UCLA students. In contrast, 30 (31%) of the UE students agreed with the statement: "The E-cigarette is equally as harmful as the conventional cigarette" compared to 62 (42%) of UCLA students, whilst 15 students from UE and 22 from UCLA, representing more than (15%) of students in both populations, marked that they were "Unsure."

When studying the harmful effect of tobacco-associated products, UCLA students ranked cigars and conventional cigarettes as the most harmful. On the other hand, UE students rated conventional cigarettes as the most harmful followed by cigars. (Table 3).

In addition, 60 (64%) of the Spanish students referred to being physically around another person using an E-cigarette in the past 30 days compared to only 65 (44%) of the US sample. Approximately half of the students from both sample populations 40 from UE and 80 from UCLA believed that there were second-hand smoking effects as a result of E-cigarette usage. Conversely, 14 (15%) UE and 7 (5%) UCLA students believed there were no adverse second-hand effects of E-cigarettes. However, approximately half of the students from both populations, 40 from UE and

	1	2	3	4	5
UCLA N = 148					
Tobacco	5 (3.17%)	2 (1.46%)	21 (14.49%)	47 (31.65%)	62 (41.78%)
E-CIGS	19 (12.70%)	43 (29.20%)	58 (39.13%)	25 (17.27%)	2 (1.37%)
Cigars	5 (3.17%)	15 (10.22%)	26 (17.39%)	40 (27.34%)	63 (42.47%)
UE N = 94					
Tobacco	0 (0.00%)	2 (2.10%)	2 (2.20%)	32 (34.40%)	58 (61.30%)
E-CIGS	5 (5.40%)	12 (12.90%)	35 (37.60%)	23 (24.70%)	18 (19.40%)
Cigars	0 (0.00%)	1 (1.00%)	13 (14.00%)	25 (26.90%)	54 (58.10%)

TABLE 3 Student ratings on perceived degree of harm of tobacco-associated products (1 being the least harmful and 5 being the most harmful)

77 from UCLA, were unsure if any harmful second-hand smoking effect existed pertaining to inhaling the E-cigarette vapour of another smoker.

3.2 | E-cigarettes information sources

More than the 80% of students from both universities (80 from UE and 118 from UCLA) affirmed that they had read or heard about E-cigarettes in the past 30 days from various media outlets. Spanish participants reported receiving information about E-cigarettes predominantly through social media or word of mouth, whilst the sources of information for US participants were more dispersed (Table 4). Fifty-seven (61%) UE students claimed they were likely to seek information regarding E-cigarettes first from social media, followed by friends, university/government run websites, medical advice websites and lastly their healthcare provider, respectively. In contrast, the UCLA students indicated they would likely seek information predominately from both friends and social media equally, followed, respectively, by their university/government run websites, healthcare providers and listed E-cigarettes websites as their last resource of choice. Approximately 50% of both samples (46 from UE and 75 from UCLA) recalled hearing in the media that E-cigarettes are riskier than people think.

3.3 | E-cigarettes as a smoking cessation aid

Forty-nine Spanish students, which comprises half of the sample, had heard from various sources that E-cigarettes are a great potential tool for smoking cessation compared to only 28 (19%) US dental students having heard the same misperception. Thirty-eight (41%) of the Spanish sample and 70 (47%) of the US sample agreed that E-cigarettes could be a smoking cessation aid for quitting conventional cigarettes and approximately a third of both populations were "Unsure" about this claim, 31 from UE and 49 from UCLA. The Spanish students who rated E-cigarettes "More Harmful" were significantly less likely to recommend them as cessation therapy when adjusting for sex, age, nationality and tobacco use ($P = 0.009$). Conversely, 42 (45%) of the Spanish sample and 73 (50%) of the US sample agreed that E-cigarettes could act as a gateway drug which eventually can lead to smoking conventional cigarettes.

TABLE 4 E-cigarettes information acquisition

Where do you typically receive information about E-CIGS	UE N = 94	UCLA N = 148
E-cigarette Websites	14 (15.20%)	7 (4.60%)
University or Government Run Websites	9 (9.8%)	20 (13.81%)
Medical advice Websites (eg Medscape)	17 (19.60%)	14 (9.62%)
On-line Discussion Forums	15 (16.30%)	7 (4.60%)
Social Media (eg Facebook, YouTube, Twitter)	57 (61%)	43 (29.29%)
Word-of-mouth	47 (51.10)	43 (29.29%)
Health Care Providers	10 (10.90)	13 (8.79%)

3.4 | Regulations

Almost 90% of both samples surveyed referred to not knowing if their respective Universities had an official policy on E-cigarette use. In relation to the regulations for each country, students were asked regarding the legal age they could purchase E-cigarettes. Data analysis revealed that 68 (73%) of the Spanish sample and 95 (64%) of the US sample did not know the correct legal age for buying E-cigarettes.

3.5 | Student knowledge regarding E-cigarette toxicity in the oral cavity

Students were asked if they thought they had enough knowledge concerning the effects of E-cigarettes on the oral cavity. Seventy-four (78%) of the Spanish students and 101 (68%) of the US students answered "No" to this question whilst only 6 from UE and 9 from UCLA, comprising (6%) of both populations believed they had enough knowledge regarding E-cigarettes. Nine (48%) of the Spanish sample answered that they would feel "Somewhat Uncomfortable" in giving information about E-cigarettes concerning their safety and long-term effects in the oral cavity to patients, whilst only 56 (38%) of students from the US sample reported they would feel "Somewhat Comfortable" educating patients about E-cigarette toxicity. The majority of the surveyed students from both populations, and 81 (86%) and 133 (90%) from the Spanish student and US student samples, respectively, answered that they would like to receive more information about E-cigarettes.

4 | DISCUSSION

This cross-sectional survey consisted of dental students from one dental school in the United States and one in Spain to determine students' knowledge, attitudes/beliefs, concerns, practices and personal assessment on their E-cigarette education. The overarching goal was to identify educational gaps, if any, with regard to tobacco education in these two schools. This study found that a significantly higher proportion of students from the Spanish sample used conventional cigarettes compared to students from the US sample. In addition, more Spanish students responded that they had smoked conventional cigarettes first and then progressed to try E-cigarettes

compared to those from the US sample. Only 2 from UE and 3 from UCLA, (2%) of the students from both dental populations, reported that they had only exclusively smoked E-cigarettes in the past. These data are consistent with results published by other investigators demonstrating that most smokers switched to E-cigarettes after having smoked conventional cigarettes for years, as a long-term replacement for conventional smoking. Those making this transition perceived E-cigarettes as the healthier alternative to conventional cigarettes justifying why past tobacco users were more likely to use E-cigarettes than nonsmokers.¹²

Moreover, students who had used tobacco products in the past rated E-cigarettes less harmful than those who did not use tobacco products. In addition, students who currently smoke reported a significantly greater exposure to information on E-cigarettes which is in accordance with other studies findings that current smokers of conventional cigarettes had more knowledge regarding E-cigarettes and their respective overall usage. Perhaps this knowledge was due in part to their personal efforts to investigate and learn about E-cigarettes in an attempt to seek an alternative to smoking conventional cigarettes or as a tool for smoking cessation overall.⁸ Another study found that adult smokers in the US viewed E-cigarette use as less likely to produce lung and oral cancer or cardiovascular disease when compared to smoking regular cigarettes.¹⁷

The prevalence of E-cigarette use amongst US adults has increased in recent years, particularly amongst current and former cigarettes smokers. More specifically, in 2014, an estimated 3.7% of US adults, including 15.9% of current cigarette smokers and 22.0% of former cigarette smokers, reported currently using E-cigarettes every day or on some days.¹⁸

In both populations, more than 84 from UE and 121 from UCLA, (80%) of students from both samples, confirmed that they received E-cigarettes information in the past 30 days from various media outlets. This correlates with other studies demonstrating that online searches for E-cigarettes have become significantly greater than searches for other alternative smoking devices in the United States, Australia, the UK and Canada. In fact, E-cigarette queries in the United States were 550% greater than snus (a moist chewing tobacco product) and 300% greater than nicotine replacement therapy.¹⁹ Students from the Spanish sample were more likely to believe that E-cigarettes were overall less harmful than conventional cigarette as compared to the US students. On the other hand, less Spanish students believed in the statement "The E-cigarette is equally as harmful as the conventional cigarette" compared to the US students. Similar results were published by a Spanish study where authors found that 47% of the study population thought that E-cigarettes were less harmful than conventional cigarettes with the majority of the participants having gained their information regarding E-cigarettes through traditional media outlets.²⁰ Based on the results of the study, the authors concluded that the advertising of E-cigarettes should be regulated.

In the current study, 14 (15%) of the Spanish sample and 7 (5%) of the US sample believed there were no adverse second-hand effects of E-cigarettes. However, approximately half of the students

from both populations were unsure if any harmful second-hand smoking effect existed pertaining to inhaling the E-cigarette vapour of another smoker. On this note, the American Head and Neck Society (AHNS) Executive Council recently published a statement in July 2016 which reported that although E-cigarettes eliminate the combustion aspect of cigarettes, bystanders still are exposed to aerosols from the exhaled vapours which studies have confirmed can contain multiple toxins. Therefore, the effects of continued exposure to bystander vapour are questionable and should be further investigated.

The current study showed that students from these two schools are "Unsure" of the effects of E-cigarettes on the oral cavity or systemic health. Students also felt "Somewhat Uncomfortable" in giving information about E-cigarettes safety and long-term effects in the oral cavity to patients. This study highlights a critical need for increasing awareness, educational tools and evidence-based guidelines in the dental curriculum in these two schools to aid the dental students in directing patients appropriately. By implementing these education programmes into their dental curriculum, students will feel more confident in providing evidence-based information to their patients. The majority of students are likely to welcome the integration of this programme into their dental curriculum as 81 UE and 135 UCLA, (90%) of the total participants, were willing to receive more information about E-cigarettes. These results are in accordance with similar studies that confirm the need for specific educational programmes for dental students on the harmful effects of E-cigarettes in order for these students to be able to promote healthier behaviours amongst their colleagues, peers and patients.^{21,22}

Differences in student perspective can be attributed to global variances in accepted social norms of E-cigarette usage between the two countries. Similarities in ideology may arise due to the plethora of scientific knowledge available to both student populations who are encouraged to engage in critical thinking and evidence-based practice regardless of their education in the United States or in Spain.

Although there is no scientific evidence available that demonstrates E-cigarettes as an effective tool in ending conventional smoking habits, close to half of the dental students from both schools agreed that E-cigarettes could be a smoking cessation aid. The educational programmes in both schools need to emphasise that E-cigarettes should not be currently recommended as a smoking cessation aid both due to the lack of evidence with regard to its efficacy and more importantly because it has been proven toxic to multiple tissues including pulmonary and oral mucosa.^{13,20,23} Proper education should be given to dental students about the usage of E-cigarettes as dentists have a duty, as healthcare providers, to promote healthy behaviours and lifestyles. Dental curriculum should evolve as these new devices gain popularity with users in order to better prepare students with accurate information to properly educate their future patients.

The lack of knowledge from dental students in both schools regarding the regulatory policies on E-cigarettes pertaining to university policies and the legal age for purchasing E-cigarettes is concerning. Therefore, it is highly recommended that a health promotion

campaign should be carried out in both campuses in order to bridge the gap of information regarding the current policies about these devices within the students' respective universities.

5 | LIMITATIONS

Despite the above important findings, this study has some shortcomings. Although the survey was anonymous, it is possible many participants refrained from sharing their true beliefs, opinions or knowledge on the subject matter. Of note, bias is a known and expected limitation of this type of sampling as those responding may not be representative of the entire student populations from both countries. Additionally, the findings of this study are less generalisable as they represent responses from just two dental school's students, one from the United States and one from Europe and may not represent a broader population of dental students. In addition, questions regarding traditional cigarette, alternative tobacco or illicit drugs were not included in depth in order to have a focused study on E-cigarettes. Nevertheless, this information would likely have been informative and interesting to compare with our E-cigarette data and will be considered for future studies. Moreover, the sample size of this study is small, and future investigations should include a higher number of students from multiple different universities in order to establish an epidemiological profile representative of habits and perceptions of dental students both from the United States and Spain.

6 | CONCLUSIONS

In conclusion, the findings from our study on both student populations from UCLA and UE provide important information regarding dental students' knowledge and experience regarding E-cigarettes and identify gaps in tobacco-related education at these two schools. As the prevalence of E-cigarette use is likely to continue to increase, it is imperative that dental students in these two schools receive more education about this important public health issue in order to confidently counsel their patients regarding the potential adverse affects of E-cigarette usage and advocate alternative means of cessation therapy.

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CONFLICT OF INTERESTS

None.

INFORMED CONSENT

Informed consent was obtained from all participants being included in the study.

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