Knowledge, Attitude, and Practice of Dental Students Regarding Electronic Cigarettes and Associated Factors

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Abstract- The use of electronic cigarettes (e-cigarettes) has surged globally and is frequently marketed as a safer alternative to traditional tobacco smoking. Nonetheless, the health implications of e-cigarettes remain debated, and their increasing popularity among youth and medical students raises concerns, particularly in countries with limited local research. This study aims to assess the knowledge, attitudes, and practices (KAP) regarding e-cigarettes among dental students at Ashur University in Iraq, while also examining correlations with demographic factors and smoking behavior. A cross-sectional study was conducted from January to March 2025 involving 104 dental students in their fourth and fifth years. The research team developed a structured, self-administered questionnaire based on previous studies to assess demographic data, smoking status, and knowledge (17 items), attitudes (13 items), and practices related to e-cigarettes. Data analysis utilized descriptive statistics and chi-square tests, with a P of ≤0.05 considered statistically significant. Of the 100 valid responses, 50% of participants were male, 69% were aged 20 years or younger, and 91% were unmarried. Nearly half (47%) reported being current smokers, with dual use being the most common pattern at 20%. Knowledge levels regarding e-cigarettes were generally high: 88% acknowledged their harmfulness, 69% recognized their addictive potential, and 50% associated them with cancer risk. In contrast, attitudes were more permissive, with 49% believing that e-cigarettes are less harmful than traditional tobacco, 65% considering them a better option for patients, and 61% supporting a ban on their use. Initiation of e-cigarette use was significantly linked to the smoking habits of peers and family (P<0.001). Social media was identified as the primary source of information, cited by 51% of respondents. No significant associations were found between knowledge or attitudes and demographic factors such as age, gender, or income. Dental students at Ashur University demonstrated a solid understanding of e-cigarettes but held permissive attitudes toward their use, indicating misconceptions about their safety. To address these gaps and enhance preventive measures, awareness programs and integration of this topic into the curriculum are essential.

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Introduction

Electronic cigarettes (e-cigarettes or vapes) are battery-powered devices that vaporize e-liquid to deliver nicotine and other substances. Initially introduced as alternatives to traditional smoking, their popularity has surged, particularly among youth and young adults. By 2014, the use of e-cigarettes among U.S. adolescents had surpassed that of traditional cigarettes, raising public health concerns (1). Similar trends have been reported globally, with studies noting a higher prevalence among university students compared with the general population (2).

Although some proponents suggest that e-cigarettes

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can aid in smoking cessation, the evidence is mixed. Some studies indicate a decrease in tobacco use among certain users, while others point to ongoing nicotine dependence, dual use of e-cigarettes and traditional cigarettes, and the initiation of vaping among non-smokers. The health risks associated with e-cigarettes are significant, with reported links to lung injuries, cardiovascular issues, immune dysfunction, and potential carcinogenic effects (3).

The global proliferation of electronic cigarettes (e-cigarettes) has introduced a complex public health challenge. Initially marketed as a safer alternative to combustible tobacco, their health risks—particularly concerning the cardiovascular and pulmonary systems—are increasingly evident (4). This surge in use is especially pronounced among young adults and students, including those in the medical and dental fields, raising concerns about their potential role as a gateway to nicotine addiction (5). In regions such as Iraq, however, there is a significant scarcity of local epidemiological data on this phenomenon, making context-specific assessments critical for informed public health responses and targeted educational interventions (5).

Future healthcare professionals, especially dental students, have a unique opportunity to influence patient behaviors related to tobacco and nicotine product use. Their knowledge, attitudes, and practices (KAP) regarding e-cigarettes significantly affect both their effectiveness in clinical counseling and their own health decisions. While studies in other regions have identified gaps in knowledge and concerning usage patterns among health students, the cultural, social, and regulatory context in Iraq may create different KAP profiles. Therefore, investigating these factors is crucial for tailoring dental curricula and campus health policies to effectively address this emerging issue among the next generation of oral health practitioners (6,7).

Tobacco use has historically been high in the Middle East, yet research on e-cigarettes remains limited. Iraq, with its blend of traditional and modern influences, provides a crucial setting for this type of investigation. Medical students are particularly noteworthy, as their knowledge and attitudes significantly influence their personal behaviors and their future counseling of patients.

This study aims to assess the knowledge, attitudes, and practices (KAP) of medical students regarding e-cigarettes at Ashur University and to explore the relationship between these factors and various demographic or lifestyle characteristics. By focusing on dental students at Ashur University in Iraq, this research intends to address the existing gap in knowledge concerning e-cigarettes. A cross-sectional design was used to quantify understanding, attitudes, and self-reported practices related to e-cigarette use within this population. Additionally, the study analyzed the associations between KAP scores and demographic variables, including years of study, as well as personal and familial smoking habits. This foundational dataset will be valuable for guiding future preventive strategies and educational reforms in 2025.

Materials and Methods

Study design and setting

A descriptive cross-sectional study with an analytical component was conducted at the College of Dentistry, Ashur University, Baghdad, between January and March 2025.

Study sample

The study sample consisted of fourth- and fifth-year dental students. A convenience sample of 104 students was invited to participate.

Data collection tool

A structured questionnaire, adapted from validated instruments in previous studies, was designed and reviewed by faculty experts. It comprises five sections:

1. **Demographics:** age, gender, marital status.
2. **Smoking history:** type, frequency, initiation age, and quit attempts.
3. **Knowledge:** 17 items on e-cigarette content, risks, and regulations.
4. **Attitudes:** 13 items on perceptions of harm, addictiveness, patient use, and regulation.
5. **Practices:** personal use, reasons for use, and sources of information.

Responses were measured using categorical and Likert-type scales. The questionnaire was distributed electronically via Google Forms through class representatives.

Approval was obtained from the Scientific Committee of the College of Dentistry at Ashur University. Participation was voluntary, and informed consent was implied upon submission of the survey.

Data analysis

Data were analyzed using SPSS version 25. Descriptive statistics were used to summarize frequencies

and percentages. Chi-square tests were conducted to examine associations between demographic and smoking factors and KAP scores, with the significance level set at $P \leq 0.05$.

Results

Demographic characteristics

Of the 104 distributed questionnaires, 100 were valid (response rate: 96%). Among the participants, 50% were male, 69% were aged ≤20 years, and 91% were unmarried.

Smoking behavior

Nearly half (47%) were current smokers: 20% were dual users, 14% were tobacco-only users, and 13% were e-cigarette-only users. Most smokers reported initiating use within the past two years.

Knowledge

1. 88% agreed e-cigarettes are harmful.
2. 69% recognized their addictiveness.
3. 50% acknowledged cancer risk.
4. 59% believed e-cigarettes reduce passive smoking exposure.
5. Only 28% knew about FDA non-approval for cessation.

Attitudes

1. 49% viewed e-cigarettes as less harmful than tobacco.
2. 65% agreed they are a better alternative for patients.
3. 61% supported banning e-cigarettes.
4. 75% felt confident counseling patients about e-cigarettes.

Practices

1. **Motivations for use:** stress relief (47%), pleasure (43%), cost (23%), avoidance of public bans (28%).
2. **Sources of information:** social media (51%), dental school (17%), advertisements (19%).
3. **Quit intentions:** 41% of users expressed desire to quit, while 50% remained neutral.

Associations

- No significant association between knowledge or attitude and demographic factors (age, gender, marital status, or income).
- Family and peer smoking was strongly correlated with initiation ($P<0.001$).

The study found that 47% of participants were current smokers, with 20% identified as dual users. Statistical analysis revealed significant demographic differences ($P<0.0001$). Among males, 76% (38 out of 50) smoked, primarily as dual users (18%) or tobacco-only smokers (12%). In contrast, only 18% (9 out of 50) of females smoked. Younger participants (aged 20 years or younger) exhibited higher smoking rates at 48% (33 out of 69) compared with older individuals, whose rate was 45% (14 out of 31). Although marital status was significant, the unmarried group comprised 91% of the sample (Table 1).

Table 1. Current status on usage pattern of E-cigarette or tobacco cigarette by participants according to demographic & marital state

Tested factors	All participants	Currently smoker (N=47)				*P*
		Never smoke	Tobacco only	E-cigarette only	Dual user	
	100	53(53)	14(14)	13(13)	20(20)	
Gender						
Male	50(50)	12(12)	12(12)	8(8)	18(18)	<0.0001
Female	50(50)	41(41)	2(2)	5(5)	2(2)	
Age group						
≤20years	69(69)	36(36)	9(9)	7(7)	17(17)	<0.0001
>20years	31(31)	17(17)	5(5)	6(6)	3(3)	
Material status						
Married	9(9)	4(4)	1(1)	1(1)	3(3)	<0.0001
Unmarried	91(91)	49(49)	13(13)	12(12)	17(17)	

$P \leq 0.05$ was considered statistically significant

The data indicates significant differences in preferences for the timing of e-cigarette education among user groups ($P=0.05$). Most participants (70.2%) felt that schools were the ideal setting for such education, a

sentiment particularly prevalent among dual users (19 out of 20). In contrast, most current tobacco-only smokers (11 out of 14) preferred receiving education at the university level. Only three participants believed that such education was unnecessary. Additionally, daily usage patterns showed significance (*P*=0.05), with 43 users consuming e-cigarettes or tobacco cigarettes fewer than 20 times per day (Table 2).

Table 2. Practice of participants toward E-cigarette

where did you learn about e-cigarettes?	Suggested answers	Currently smoker (N=47)	Tobacco only N (%) 14(29.7)	E-cigarette only N (%) 13(27.7)	Dual user N (%) 20(42.6)	*P*
What is, in your opinion, the best time to be educated about the harmful effects of e-cigarettes	At university	11	8	2	1	0.05
	At school	33	5	9	19	
	no need	3	1	2	0	
How long have you been using e-cigarettes/tobacco cigarettes?	< 1 year	19	7	5	7	0.09
	1–2 months ago	5	1	2	2	
	> 2 years ago	23	6	6	11	
On average, how many times per day do you use e-cigarettes/tobacco cigarettes?	Not-daily	4	1	2	1	0.05
	< 20 times a day	37	5	10	19	
	≥ 20 times a day	6	8	1	0	
How soon after waking-up do you start using your e-cigarettes/tobacco cigarettes?	Immediately after waking-up	22	9	1	12	0.07
	After 1-2 hours	9	0	6	3	
	It varies	16	5	6	5	

$P \leq 0.05$ was considered statistically significant

The data reveal that student participants strongly support dental education on e-cigarettes, with 80% agreeing that it is essential (*P*=0.05). Confidence in discussing the harms of both tobacco (78%) and e-cigarettes (75%) was high, and both findings were statistically significant (*P*=0.01). However, only 46% believed that e-cigarettes are effective for smoking cessation (*P*=0.05), and a majority (61%) favored banning e-cigarettes, a result that is highly significant (*P*<0.0001). These findings suggest a strong recognition of professional responsibility, paired with considerable skepticism regarding the utility and safety of e-cigarettes (Table 3).

Table 3. Attitude of participants toward E-cigarette

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		N(%)	Never smoke N(%)	Tobacco only N(%)	E-cigarette only N(%)	Dual user N(%)	
	100		53(53)	14(14)	13(13)	20(20)	
As a student, I feel confident about my ability to discuss the harmful effects of tobacco cigarettes use with my patients.	Agree	78	39	12	9	18	0.01
	Disagree	8	3	2	2	2	
	Neutral	14	11	1	2	0	
As a student, I feel confident about my ability to discuss the harmful effects e-cigarette use with my patients.	Agree	75	35	12	11	17	0.01
	Disagree	8	5	1	1	1	
	Neutral	17	13	1	1	2	
Do you believe e-cigarettes are a helpful aid for smoking cessation?	Agree	46	10	10	11	16	0.05
	Disagree	26	21	2	1	2	
	Neutral	28	23	2	1	2	
Is it essential for a dentist to be educated about e-cigarettes?	Agree	80	38	13	12	17	0.05
	Disagree	9	7	0	1	1	
	Neutral	11	8	1	0	2	
Should e-cigarettes be banned?	Agree	61	33	7	9	10	<0.0001
	Disagree	18	4	5	3	7	
	Neutral	21	16	2	1	3	

$P \leq 0.05$ was considered statistically significant

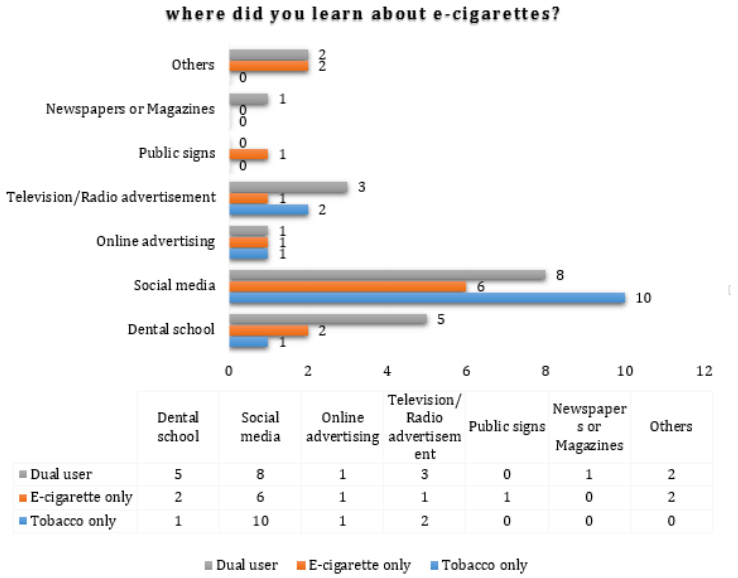
The data revealed significant differences in participants' beliefs about when education on the harms of e-cigarettes should take place (P = 0.05). Most participants (33 in total) preferred that this education be provided in schools, with 19 out of 20 dual users sharing this perspective. Additionally, regarding usage frequency, most participants (37 in total) reported smoking fewer than 20 times per day (P = 0.05). However, the duration of use did not demonstrate a statistically significant difference among the groups (P = 0.09) (Table 4).

Table 4. Practice of participants toward E-cigarette

where did you learn about e-cigarettes?	Suggested answers	Currently smoker (N=47)	Tobacco only N(%) 14(29.7)	E-cigarette only N(%) 13(27.7)	Dual user N(%) 20(42.6)	*P*
What is, in your opinion, the best time to be educated about the harmful effects of e-cigarettes	At university	11	8	2	1	0.05
	At school	33	5	9	19	
	no need	3	1	2	0	
How long have you been using e-cigarettes/tobacco cigarettes?	< 1 year	19	7	5	7	0.09
	1–2 months ago	5	1	2	2	
	> 2 years ago	23	6	6	11	
On average, how many times per day do you use e-cigarettes/tobacco cigarettes?	Not-daily	4	1	2	1	0.05
	< 20 times a day	37	8	10	19	
	≥ 20 times a day	6	5	1	0	
How soon after waking-up do you start using your e-cigarettes/tobacco cigarettes?	Immediately after waking-up	22	9	1	12	0.07
	After 1-2 hours	9	0	6	3	
	It varies	16	5	6	5	

P≤0.05 was considered statistically significant

The provided figure, a stacked bar chart, illustrates how individuals learned about e-cigarettes. The largest segment, labeled "Others," accounts for nearly half of the responses, suggesting a variety of unspecified sources such as word of mouth or personal observation. Traditional media, including "Newspapers or Magazines" and "Television/Radio advertisements," represent a moderate portion of the data, while digital channels such as "Online advertising" and "Social media" demonstrate a significant and growing influence. Additionally, "Dental school" appears as a minor but distinct educational source. The chart categorizes respondents based on usage: "Dual user" (both e-cigarettes and tobacco), "E-cigarette only," and "Tobacco only." This categorization indicates that information sources vary among these groups, with dual users representing the most prevalent category. Overall, the figure highlights the complex and evolving landscape of e-cigarette awareness (Figure 1).



	Dental school	Social media	Online advertising	Television/ Radio advertisement	Public signs	Newspapers or Magazines	Others
Dual user	5	8	1	3	0	1	2
E-cigarette only	2	6	1	1	1	0	2
Tobacco only	1	10	1	2	0	0	0

Figure 1. Source of information about E-cigarette

Based on the data from Table 5, the primary reason for initiating e-cigarette use among the 47 current smokers was to protect their own health, with 25 (53.2%) rating it as important, particularly among dual users (14/25). Enjoying various flavors was the most cited important reason overall (33/47, 70.2%). However, none of the reasons showed a statistically significant association with user type (tobacco-only, e-cigarette-only, or dual user), as all p-values exceeded 0.05 (Table 5).

Table 5. Reason for initiating e-sigarettes

What was the reason for initiating e-cigarettes use?	Currently smoker (N= 47)	N	Tobacco only N(%) 14(29.7)	E-cigarette only N(%) 13(27.7)	Dual user N(%) 20(42.6)	
To protect my own health by reducing smoking or trying to quit smoking	Not important	16	7	5	4	0.09
	Important	25	5	6	14	
	Not sure	6	2	2	2	
To protect my family members from secondhand smoke exposure	Not important	11	3	7	1	0.06
	Important	32	9	5	18	
	Not sure	4	2	1	1	
To avoid smoking ban in public places	Not important	14	10	1	3	0.05
	Important	28	1	11	16	
	Not sure	5	3	1	1	
Due to ecomic reasons (e-cigarettes are cheaper)	Not important	19	6	9	4	0.05
	Important	23	8	1	14	
	Not sure	5	0	3	2	
To enjoy the various flavors of e-liquids	Not important	5	1	2	2	0.02
	Important	33	6	9	18	
	Not sure	9	7	2	0	

P≤0.05 was considered statistically significant

Discussion

This study revealed a concerning prevalence of smoking and e-cigarette use among medical students despite high levels of knowledge. The coexistence of good knowledge and permissive attitudes reflects the global paradox observed in many regions. Compared with international studies, the findings are consistent: Nigerian and Austrian medical students demonstrated similar levels of knowledge while maintaining permissive or

neutral attitudes (2). Conversely, Chinese students showed lower awareness, possibly due to cultural and regulatory differences (8). The dominance of social media as an information source underscores the role of unregulated digital marketing in shaping student perceptions. This aligns with previous evidence that exposure to social media increases the likelihood of e-cigarette initiation among young adults.

The absence of gender- or age-based differences in knowledge and attitudes contrasts with findings from Saudi Arabia, where female students exhibited more negative attitudes. This discrepancy may reflect cultural variations. Additionally, the high prevalence of dual use suggests that e-cigarettes are not replacing but rather complementing traditional tobacco use. This pattern increases health risks, as recent studies have linked dual use to cardiovascular and respiratory complications (9).

The current finding that 47% of participants are current smokers, with a striking prevalence of 76% among males, reflects broader global trends of high tobacco use in specific demographic groups. The notably high rate of dual use (20%) supports research by Wang *et al.,* which identified dual use as a common pattern in transitioning nicotine markets. Significant demographic disparities (P<0.0001), particularly the increased smoking rates among younger participants (≤20 years), further reinforce established evidence that youth represent a critical risk group for nicotine product initiation, as highlighted by the WHO Global Youth Tobacco Surveys (2020) (10).

The current findings are consistent with previous research identifying adolescence as a crucial period for nicotine prevention. The strong preference for school-based education among dual users (19 out of 20) supports earlier studies on youth receptivity to preventive messaging before nicotine dependence develops. In contrast, the preference for university-level education among most tobacco-only smokers (11 out of 14) may reflect more established usage patterns, which aligns with studies showing that intervention effectiveness decreases among entrenched smokers. Additionally, the significant pattern of daily use (P=0.05) highlights the well-established association between frequency of use and the severity of dependence (11,12).

The present results show strong student support for dental education on e-cigarettes (80%) and high confidence in discussing their harm, aligning with previous research emphasizing the need for curricular integration. However, significant skepticism regarding the cessation utility of e-cigarettes (46%) and majority support for a ban (61%) contrast with some studies reporting more favorable student perceptions. This difference highlights a more critical and risk-aware perspective emerging among newer cohorts. The preference for earlier education at the school level further underscores a demand for proactive public health training (13,14).

The finding that health protection (53.2%) and flavor variety (70.2%) are primary motivators for initiating e-cigarette use aligns with prior research, which has identified harm reduction and sensory appeal as key factors among adults. However, the heavy reliance on informal sources such as “Others” for information contrasts with studies highlighting the role of formal public health messaging, indicating a gap in structured education and the potential for misinformation (15,16).

In conclusion, this study of 100 students found a high smoking prevalence of 47%, with dual use being the most common pattern at 20%. Demographic factors significantly influenced smoking habits, as 76% of males and 48% of participants aged 20 years or younger identified as smokers. Although knowledge of the harms of smoking was high (88%), misconceptions remained, with 59% believing that e-cigarettes reduce passive exposure. Attitudes toward smoking were mixed: while 75% felt confident in counseling patients, 61% supported a smoking ban. Importantly, smoking initiation was strongly associated with family and peer influence ($P < 0.001$), underscoring the need for targeted early education.

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