

RESEARCH ARTICLE

Vaping as a smoking cessation tool: Attitudes of pharmacy students—A quantitative study

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Keywords

Electronic nicotine delivery system
Nicotine replacement therapy
Student
Pharmacy
Smoking cessation
Vaping

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Abstract

Background: Vaping is increasingly promoted as a smoking cessation aid, providing nicotine without the harms of conventional cigarettes. This study examined pharmacy students' perceptions of its effectiveness and safety. **Methods:** An exploratory quantitative study was conducted using an online questionnaire distributed to students in the Pharmacy Programme at the School of Pharmacy and Biomolecular Sciences. **Results:** A total of 55 participants completed the online survey. Most students (61.8%) viewed vaping positively as a smoking cessation tool. Only 27.3% thought e-cigarettes were more effective than nicotine replacement therapy, with 49.1% disagreeing and 23.6% neutral. 61.8% supported combining e-cigarettes with cessation services; 20% were negative, 18.2% neutral. Some attitudes were associated with prior vaping and pharmacy experience. Knowledge gaps: 90.9% wrongly reported or didn't know adverse effects are reportable via the Yellow Card Scheme (60.0% "don't know," 30.9% incorrect), and 58.2% were unaware of licensed e-cigarettes. Regarding regulation, 49.1% said e-cigarettes aren't strictly regulated in the UK, 29.1% didn't know. **Conclusion:** Pharmacy students generally had positive attitudes toward vaping but lacked sufficient knowledge. Updating the curriculum with evidence, regulation, and counselling details could help. The impact of any educational programme should be evaluated prospectively.

Introduction

Smoking remains a major global health concern, contributing to preventable deaths and numerous health conditions, including cardiovascular disease, respiratory illnesses, and cancers. According to the World Health Organization's 2025 report, tobacco kills more than 7 million people each year, including an estimated 1.6 million non-smokers who are exposed to second-hand smoke (WHO, 2025). In response, public health organisations and governments have implemented tobacco control initiatives aimed at reducing smoking prevalence and supporting cessation. Effective smoking cessation strategies combine education on health risks, counselling, and pharmacological interventions such as nicotine replacement therapy (NRT), varenicline, and

bupropion, which have demonstrated success in improving quit rates (Onwuzo *et al.*, 2024).

Recently, electronic cigarettes (e-cigarettes) or vaping have emerged as alternative tools for smoking cessation. Vaping simulates smoking while reducing exposure to harmful compounds, making it a potentially less harmful option than traditional cigarettes (Ashour, 2023). The most recent Cochrane systematic review (Lindson *et al.*, 2025) provides high-certainty evidence that nicotine e-cigarettes increase quit rates compared to nicotine replacement therapy and moderate-certainty evidence that they increase quit rates compared to e-cigarettes without nicotine. However, e-cigarettes remain controversial due to concerns about long-term safety, potential addiction, and re-normalisation of smoking behaviours (Alotaybi *et al.*, 2022).

Recent studies indicate that pharmacist-led interventions significantly improve smoking cessation outcomes and patient satisfaction, highlighting their critical role in both short- and long-term abstinence (McDuffie *et al.*, 2022). With the growing workload on general practitioners (GPs), there is a pressing need for pharmacists to take on greater clinical responsibilities, such as managing chronic conditions and providing support for smoking cessation (Abuelhana *et al.*, 2025). Pharmacy students' views on e-cigarettes as smoking cessation aids differ worldwide, with some recognising their potential benefits and others expressing scepticism.

This study explores Liverpool John Moores University pharmacy students' perceptions of vaping as a cessation tool, focusing on attitudes, knowledge, and implications for clinical practice. The findings aim to fill a current research gap and inform curriculum development and evidence-based training.

Methods

Research design and setting

A cross-sectional, quantitative online survey design was employed. The target population was pharmacy students enrolled at Liverpool John Moores University (LJMU) during the 2022–2023 academic year, across Levels 4–7 of the MPharm programme (Level 4 corresponds to the first year of study and Level 7 to the final, integrated master's year, following the UK Framework for Higher Education Qualifications). This study was conducted over the period 19 April to 19 May 2023. Data collection took place at the end of the academic year, overlapping with examination and assessment periods for many students, which is considered further in the limitations.

Participants

Participants were pharmacy students enrolled at LJMU during the 2022–2023 academic year. All were aged 18 years or older, currently undertaking the pharmacy programme, and had voluntarily agreed to share their views on vaping as a smoking cessation aid. The survey link was distributed by a gatekeeper within the School of Pharmacy and Biomolecular Sciences to all students currently enrolled on the Pharmacy Programme, without restriction by year of study.

Sample size

There were 514 students registered on the programme who met the inclusion criteria. A small number may not

have received the survey invitation (for example, students on leave of absence); therefore, the exact invitation denominator is unavailable. Fifty-five students participated, corresponding to a maximum response rate of 10.7% and an approximate response rate of 10%. No reminder emails were sent, and no incentives were offered. For this study, a target of 50 responses was considered realistic, balancing feasibility with the need for meaningful data. While not statistically representative of all pharmacy students, this sample size provided valuable preliminary insights into attitudes toward vaping.

Study instrument

The survey was specifically developed for this study to assess the knowledge, attitudes, and behaviours of pharmacy students regarding using vaping as a smoking cessation tool (see Appendix A). Existing validated tools did not fully capture the unique aspects of the target population or research objectives within the UK regulatory context. The instrument development followed established guidelines for survey design and content validation (Elangovan & Sundaravel, 2021).

The questionnaire was designed based on a comprehensive literature review to identify key themes related to pharmacy students' perceptions of e-cigarettes as smoking cessation aids, with questions drafted in multiple-choice and Likert-scale formats (Bhandari, 2021). The research supervisors and subject-matter experts reviewed the initial item pool to ensure clarity, relevance, and appropriateness of content.

The research supervisors and a pharmacist researcher reviewed the draft questionnaire for clarity, relevance, and completion time. No formal assessment of content validity, construct validity or reliability was undertaken.

The questionnaire comprised five sections. Section 1 collected demographic information, including age, gender, year of study, vaping experience, and pharmacy work experience (6 questions: multiple-choice, yes/no, and current/past use). Section 2 assessed prior training exposure with 2 yes/no questions on education or training related to vaping. Section 3 evaluated attitudes toward vaping as a smoking cessation aid using 7 statements on a 5-point Likert scale, later dichotomised for inferential analysis, with "agree" (combining "strongly agree" and "somewhat agree") contrasted against a single "disagree/neutral" category (combining "neutral," "somewhat disagree," and "strongly disagree"). This recoding was applied consistently to all binary chi-square comparisons in Table IV. Retail pharmacy experience was analysed as a three-category variable (currently working, previously worked, never worked), reflecting a nominal rather than ordinal structure,

which is why the corresponding tests in Table IV have two degrees of freedom rather than one. Section 4 measured knowledge of UK vaping regulations through 4 statements with “Yes,” “No,” or “Don’t know” options. Finally, Section 5 explored overall perceptions, including willingness to recommend vaping in future practice, using 4 yes/no questions.

The questionnaire was designed following recent guidance to minimise respondent fatigue: questions were concise, and the estimated completion time kept to less than 10 minutes to maintain engagement (Ghafourifard, 2024). It was distributed electronically via email, and participation was voluntary. An information sheet was provided on the first page, and informed consent was obtained electronically prior to beginning the survey.

Ethical approval

Ethical approval was obtained from the LJMU Public Health Institute Research Ethics Committee (Reference: PHIPGT2068, approval date: 18 April 2023). The study adhered to the Declaration of Helsinki and institutional ethical guidelines.

Data analysis

Survey responses were exported from JISC to Microsoft Excel, cleaned, and analysed using SPSS® (IBM, 2019). Descriptive statistics, including frequencies, percentages, and means, were used to summarise demographics and overall responses. Cross-tabulations and Pearson's chi-square tests (χ^2) were performed to examine associations between categorical variables, such as demographics and attitudes toward vaping, with significance set at $p < 0.05$. The full contingency tables, expected cell counts, chi-square assumption checks, effect sizes and confidence intervals for the exploratory association analyses are provided in Appendix B.

Results

Demographic characteristics and vaping experience

Of the 55 participants, most (90.9%, $n=50$) were aged 18–24, and most were female (83.6%, $n=46$). Participants were distributed across academic levels 4–7, with the largest groups at Level 4 (34.0%, $n=19$) and Level 7 (29.1%, $n=16$) (Table I).

Vaping experience was common: 67.3% ($n=37$) had ever vaped, and 56.4% ($n=31$) had vaped in the past six months. There was no significant association between vaping experience and gender ($\chi^2 = 0.002$, $df = 1$, $p = 0.966$) (Table I).

Table I: Gender & vaping experience

Gender	Ever vaped n (%)	Never vaped n (%)	Total
Male	6 (66.7)	3 (33.3)	9
Female	31 (67.4)	15 (32.6)	46
Total	37 (67.3)	18 (32.7)	55

Student exposure to pharmacy practice and vaping education

Retail pharmacy experience and vaping-related education varied by academic level (Table II). All Level 6 students currently worked in retail pharmacy, compared with 21.1–40% of students at other levels. Exposure to vaping education was low across all levels, both within the university (0–12.5%, $n=0$ –2) and outside the university (6.3–20.0%, $n=1$ –2).

Table II: Students' experience and education in vaping

Study level	Currently working, n/N (%)	Previously worked, n/N (%)	Never worked, n/N (%)	Received university vaping materials, n/N (%)	Received training outside university, n/N (%)
Level 4 ($n = 19$)	4/19 (21.1%)	3/19 (15.8%)	12/19 (63.2%)	1/19 (5.3%)	2/19 (10.5%)
Level 5 ($n = 10$)	4/10 (40.0%)	3/10 (30.0%)	3/10 (30.0%)	1/10 (10.0%)	2/10 (20.0%)
Level 6 ($n = 10$)	10/10 (100.0%)	0/10 (0.0%)	0/10 (0.0%)	0/10 (0.0%)	1/10 (10.0%)
Level 7 ($n = 16$)	6/16 (37.5%)	6/16 (37.5%)	4/16 (25.0%)	2/16 (12.5%)	1/16 (6.3%)

Students' attitudes toward vaping as a smoking cessation tool

Most students viewed e-cigarettes positively as a cessation aid: 61.8% (n=34) agreed or strongly agreed they are helpful, and a similar proportion (61.8%, n=34) supported combining e-cigarettes with behavioural support. Fewer (27.3%, n=15) considered e-cigarettes

more effective than nicotine replacement therapy (NRT), with almost half (49.1%, n=27) disagreeing (Table III). A related item found that 56.3% (n=31) agreed or strongly agreed that e-cigarettes are an effective smoking cessation aid in general, 23.6% (n=13) were neutral, and 20.0% (n=11) disagreed or strongly disagreed.

Table III: Students' attitudes about vaping

Response	E-cigarettes helpful for cessation/harm reduction	E-cigarettes are an effective cessation aid	E-cigarettes more effective than NRT	Combining e-cigarettes with support is more effective
Strongly Agree	12.7% (n = 7)	12.7% (n = 7)	9.1% (n = 5)	18.2% (n = 10)
Agree	49.1% (n = 27)	43.6% (n = 24)	18.2% (n = 10)	43.6% (n = 24)
Neutral	18.2% (n = 10)	23.6% (n = 13)	23.6% (n = 13)	18.2% (n = 10)
Disagree	10.9% (n = 6)	10.9% (n = 6)	32.7% (n = 18)	14.5% (n = 8)
Strongly disagree	9.1% (n = 5)	9.1% (n = 5)	16.4% (n = 9)	5.5% (n = 3)

Factors associated with students' attitudes

Table IV summarises associations between student characteristics and attitudes. Prior vaping was associated with support for combining e-cigarettes with cessation services ($\chi^2 = 5.960$, $df = 1$, $p = 0.015$), and recent vaping (past six months) was associated with viewing e-cigarettes as more effective than NRT (χ^2

$= 4.685$, $df = 1$, $p = 0.030$). Retail pharmacy experience was associated with more favourable attitudes toward e-cigarettes generally ($\chi^2 = 8.201$, $df = 2$, $p = 0.017$). No other tested associations, including prior vaping experience with general helpfulness, and university or external training with attitudes, reached significance (Table IV).

Table IV: Factors associated with pharmacy students' attitudes

Factor	Outcome measured	χ^2	df	p-value	Significant?	Notes
Students' prior vaping	E-cigarettes helpful as smoking cessation/harm reduction	0.445	1	0.505	No	No significant association
Students' prior vaping	Combining e-cigarettes with cessation services	5.960	1	0.015	Yes	Prior vaping associated with positive attitude
Students' prior vaping	E-cigarettes more effective than NRT	3.524	1	0.061	No	Not significant
Students' recent vaping (last 6 months)	E-cigarettes more effective than NRT	4.685	1	0.030	Yes	Recent vaping associated with positive attitude about comparison with NRT
Students' experience in retail pharmacy	E-cigarettes helpful as smoking cessation/harm reduction	8.201	2	0.017	Yes	Pharmacy experience associated with positive attitude
Students' experience in retail pharmacy	E-cigarettes more effective than NRT	2.560	2	0.278	No	Not significant
Prior university training	E-cigarettes helpful as smoking cessation/harm reduction	0.255	1	0.613	No	Not significant
Prior training outside university	E-cigarettes helpful as smoking cessation/harm reduction	0.670	1	0.796	No	Not significant

Pharmacy students' knowledge of UK vaping regulations

Knowledge gaps were substantial across all four regulatory items assessed. Regarding the Yellow Card Scheme, 90.9% of students either answered incorrectly or did not know that adverse effects can be reported this way (60.0% "don't know," 30.9% incorrect). Similarly, 58.2% did not know whether medically

licensed e-cigarette products were available in the UK at the time of the survey, and 29.1% did not know whether e-cigarettes are strictly regulated for safety and quality (Table V). Regarding availability of e-cigarettes through the NHS or on prescription, half of students (50.9%, $n=28$) did not know the answer, 34.5% ($n=19$) correctly indicated that they were not available, and 14.5% ($n=8$) indicated that they were available.

Table V: Students' knowledge on vaping regulation

Knowledge item	Correct, n (%)	Incorrect, n (%)	Don't know, n (%)
Not currently available on the NHS or by prescription	19 (34.5%)	8 (14.5%)	28 (50.9%)
Adverse effects can be reported via the Yellow Card Scheme	5 (9.1%)	17 (30.9%)	33 (60.0%)
Medically licensed e-cigarette products are not currently available in the UK	14 (25.5%)	9 (16.4%)	32 (58.2%)
E-cigarettes are strictly regulated for safety and quality in the UK	12 (21.8%)	27 (49.1%)	16 (29.1%)

Association between attitudes and willingness to recommend vaping

When asked whether they would recommend e-cigarettes to help patients quit smoking, only 34.6% ($n=19$) agreed, while 41.9% ($n=23$) disagreed. Support

was higher (50.9%, $n=28$) for recommending e-cigarettes specifically to patients who had failed conventional cessation methods. A majority (67.2%, $n=37$) felt there was insufficient high-quality evidence for e-cigarettes as a cessation tool (Table VI).

Table VI: Association between attitudes and willingness to recommend vaping

Question	Strongly agree (n, %)	Agree (n, %)	Neutral (n, %)	Disagree (n, %)	Strongly disagree (n, %)	Total N
Recommend e-cigarettes for quitting smoking	5, 9.1%	14, 25.5%	13, 23.6%	9, 16.4%	14, 25.5%	55
Recommend e-cigarettes to smokers who failed conventional cessation methods	4, 7.3%	24, 43.6%	9, 16.4%	12, 21.8%	6, 10.9%	55
Opinion on limited high-quality evidence for e-cigarettes as cessation aid	24, 43.6%	13, 23.6%	12, 21.8%	2, 3.6%	4, 7.3%	55

No significant association was found between retail pharmacy experience and willingness to recommend e-cigarettes ($\chi^2 = 0.174$, $df = 2$, $p = 0.916$). No statistically significant association was identified between previous

vaping experience and willingness to recommend e-cigarettes ($\chi^2 = 3.782$, $df = 1$, $p = 0.052$), although the estimate was imprecise and should be explored in a larger study (Table VII).

Table VII: Association between students' work experience, vaping experience, and their likelihood to recommend e-cigarettes for smoking cessation

Background	Agree n (%)	Disagree/Neutral n (%)	Total (N)	χ^2	df	p-value
Retail pharmacy experience				0.174	2	0.916
Current	9 (37.5%)	15 (62.5 %)	24			
Past	4 (33.3%)	8 (66.7 %)	12			
None	6 (31.6%)	13 (68.4 %)	19			
Vaping experience				3.782	1	0.052
Ever vaped	16 (43.2%)	21 (56.8 %)	37			
Never vaped	3 (16.7%)	15 (83.3 %)	18			
Total	19 (34.5%)	36 (65.5 %)	55			

Students' views on professional training and the pharmacist's advisory role

Nearly all students agreed that pharmacists (90.9%, n=50) and pharmacy students (90.9%, n=50) need specific guidelines or training on vaping (Table VIII). All

students (100%, n=55) agreed that pharmacists should provide advice on smoking cessation, and all students (100%, n=55) agreed that pharmacists should provide health-related advice on vaping specifically.

Table VIII: Students' views on professional training needs and the pharmacist's advisory role

Statement	Yes: n (%)	No: n (%)
Pharmacists need specific guidelines/training about vaping	50 (90.9%)	5 (9.1%)
Pharmacy students need specific information/training about vaping	50 (90.9%)	5 (9.1%)
Pharmacists should provide advice on smoking cessation to patients	55 (100.0%)	0 (0.0%)
Pharmacists should provide health-related advice on vaping to patients	55 (100.0%)	0 (0.0%)

Discussion

The findings of this study reveal that about two-thirds of students (67.3%) reported ever using e-cigarettes, with over half (56.4%) having vaped in the previous six months. A small number of students, specifically six, had experimented with e-cigarettes but were no longer current users, reasons for discontinuation were not captured in this survey. No significant association was observed between vaping experience and gender in our sample. Research examining sex differences in e-cigarette use has shown mixed findings across different populations and time periods. While some studies have reported higher prevalence among males (Al Muhaisen *et al.*, 2022), a comprehensive systematic review of 115 studies from 2018-2023 found considerable variability in sex differences, with patterns varying by geographic region, age group, and outcome measured (Alam & Silveyra, 2023). Recent evidence from the United States suggests gender gaps in youth e-cigarette use may be narrowing, with rates converging between males and females (Seidenberg *et al.*, 2017). The lack of gender difference in our UK-based sample may reflect cultural, regulatory, or institutional factors specific to the study population.

Attitudes toward E-cigarettes for smoking cessation

Overall, students demonstrated generally positive attitudes toward e-cigarettes as smoking cessation tools, with 61.8% agreeing with their utility. This aligns with evidence from the Office for Health Improvement and Disparities' 2022 vaping review (McNeill *et al.*, 2022) and the latest Cochrane systematic review (Lindson *et al.*, 2025), which provides high-certainty evidence that e-cigarettes are effective smoking cessation tools, with superior quit rates compared to nicotine replacement therapy.

However, these attitudes diverge from international findings; for instance, studies in Saudi Arabia (Alzahrani *et al.*, 2021) and Indonesia (Lorensia *et al.*, 2022) report lower endorsement rates, often due to concerns about health risks or passive exposure, highlighting the influence of social, regulatory, and cultural contexts.

Notably, only 27.3% of participants considered e-cigarettes more effective than nicotine replacement therapy (NRT), which contrasts with systematic reviews suggesting superior cessation outcomes for e-cigarettes (Lindson *et al.*, 2025). This disconnect between research evidence and student perceptions highlights an important educational gap. Nevertheless, 61.8% supported combining e-cigarettes with behavioural support, consistent with evidence that multimodal cessation strategies improve quit rates (Lindson *et al.*, 2025).

Factors associated with attitudes

The study found no significant association between prior vaping experience and attitudes toward e-cigarettes as cessation tools, although students who had vaped within the last six months were more likely to perceive e-cigarettes as more effective than NRT for smoking cessation, consistent with an association between recent experience and current perceptions, though this cannot establish direction or causality.

Similarly, exposure to vaping-related education, whether within or outside the university, was not significantly associated with attitudes. This finding may reflect genuinely limited educational exposure, or it may be influenced by recall bias in students' self-reported training history (see Limitations); the present data cannot distinguish between these explanations.

Pharmacy work experience was associated with more positive attitudes toward e-cigarettes as cessation tools. One possible explanation is that pharmacy work

experience exposes students to patients' informal accounts of vaping for smoking cessation, though this was not directly measured in the present study and requires further investigation. However, this professional exposure did not affect views on the comparative effectiveness of e-cigarettes versus NRT, indicating that experiential learning may be associated with attitudes but not specific product knowledge.

Knowledge gaps

Despite these generally positive perceptions, knowledge gaps were notable. Over 90% of students were unaware that e-cigarette users can report adverse effects via the UK Yellow Card Scheme, and nearly three-quarters did not know the regulatory status of medically licensed e-cigarette products in the UK or that consumer e-cigarettes are subject to strict regulation for safety and quality under the Tobacco and Related Products Regulations 2016.

Such gaps may lead to underestimation of regulatory protections or uncertainty about product safety. These findings are consistent with knowledge gaps reported in studies from Thailand (Thongsutt *et al.*, 2023) and Saudi Arabia (Alwhaibi *et al.*, 2022), though they contrast with higher regulatory awareness reported in Indonesia (Lorensia *et al.*, 2022), where e-cigarette regulations differ substantially. UK-specific studies examining pharmacy students' or pharmacists' knowledge of e-cigarette regulations remain limited, highlighting a need for further research in this area.

Future professional practice

When considering future professional practice, only 34.6% of students indicated they would recommend e-cigarettes to patients, although 50.9% would consider them for smokers who had failed conventional methods. This cautious stance likely reflects concerns about limited high-quality evidence, acknowledged by 67.2% of respondents, and mirrors broader hesitancy among healthcare professionals (Barrett & Aldamkhi, 2021; Lorensia *et al.*, 2022).

No significant associations were found between personal vaping experience or pharmacy work experience and willingness to recommend e-cigarettes, suggesting that professional advice is guided more by ethical considerations, clinical guidelines, and evidence-based practice than by personal beliefs. No statistically significant association was identified between previous vaping experience and willingness to recommend e-cigarettes, although the estimate was imprecise and should be explored in a larger study.

These findings underscore the complex and sometimes contradictory attitudes of pharmacy students, who may

recognise the effectiveness and relative safety of e-cigarettes yet remain reluctant to recommend them professionally. Similar patterns of ambivalence have been documented in other healthcare professional groups. For example, studies of physicians and nurses have shown that while many acknowledge the harm-reduction potential of e-cigarettes, concerns about long-term safety, dual use, and potential gateway effects temper their willingness to actively recommend them (Kandra *et al.*, 2014).

This disconnect likely reflects multiple factors: uncertainty regarding ethical responsibilities, insufficient training on current evidence, concerns about normalising nicotine use, and the need for clearer regulatory guidance and professional practice standards. Addressing these barriers requires coordinated efforts across multiple levels: curriculum reform, continuing professional development, clearer guidance from professional bodies, and ongoing research to address remaining evidence gaps.

Support for training and professional guidance

Despite their cautious attitudes toward personally recommending e-cigarettes, students showed near-unanimous support for structured training: 90.9% believed both pharmacists and pharmacy students need specific guidance on vaping, and all students agreed pharmacists should be actively advising patients on both smoking cessation and vaping specifically. This apparent contrast, hesitancy to recommend personally, but strong endorsement of the pharmacist's role in advising, suggests that students' reluctance stems more from a perceived knowledge or evidence gap than from scepticism about pharmacists' responsibility in this area. This finding directly supports the curriculum recommendations made in Section 6.

Limitations

This study has several limitations. The sample size was small ($n = 55$) and the response rate was low (approximately 10%; maximum 10.7% of the 514 eligible students), limiting statistical power and representativeness. Non-responders could not be characterised. Data collection occurred during end-of-year examinations and assessment deadlines, which may also have reduced participation. Participation was voluntary and the survey specifically concerned vaping, so students with personal experience of or interest in vaping may have been more likely to respond, introducing voluntary-response and self-selection bias. The high proportion of respondents reporting vaping experience may therefore reflect disproportionate participation by such students, and the reported vaping percentages should not be interpreted as prevalence

estimates for all LJMU pharmacy students or pharmacy students elsewhere.

Additionally, reliance on self-reported data introduces potential recall and social desirability biases. Self-reported exposure to vaping-related education is vulnerable to recall bias in both directions: students may fail to recall content that was taught or may recall exposure that did not occur. The questionnaire was developed for this study and was not formally validated; no reliability statistics were calculated. The regulatory knowledge item concerning medically licensed e-cigarette products was potentially ambiguous because 'currently available' could be interpreted as regulatory authorisation or commercial availability. Collapsing neutral responses into the disagree category for binary analyses may have obscured meaningful distinctions between negative and ambivalent responses; treating neutral as a separate category or using ordinal methods may yield different results. Several exploratory chi-square analyses involved small expected cell counts, and at least ten association tests were conducted without a formal multiple-comparison adjustment, increasing the risk of Type I error; inferential findings should therefore be interpreted as exploratory rather than confirmatory. The cross-sectional design cannot establish causal relationships or changes over time. Data were collected in April-May 2023, whereas some evidence used to interpret the findings, including the 2025 Cochrane review, was published later. Finally, this was a single-institution study, limiting applicability beyond LJMU.

Despite these limitations, the study has notable strengths, including participation from students across different academic levels and the reporting of descriptive findings across the questionnaire domains. As one of the first UK studies examining pharmacy students' attitudes toward e-cigarettes as a smoking cessation tool, it addresses a gap in the literature and provides preliminary insights for curriculum development and future research.

Conclusion

This study highlights that while pharmacy students generally hold positive attitudes toward e-cigarettes as smoking cessation aids, significant knowledge gaps remain, particularly regarding UK regulations, adverse event reporting, and the strength of current evidence. These gaps may reduce students' confidence in providing informed patient advice, despite growing evidence supporting e-cigarettes as effective cessation tools.

To address these issues, pharmacy education should integrate up-to-date, evidence-based teaching on e-cigarettes, covering their effectiveness, safety, regulatory framework, and counselling strategies. Interactive learning methods such as case discussions, simulations, and role-play can enhance understanding and confidence. Professional bodies should also consider whether existing guidance on vaping and smoking cessation adequately addresses pharmacy practice; this single-site, exploratory survey cannot on its own establish a national policy need but may usefully inform local curriculum discussions.

Future research should involve larger, multi-site and longitudinal studies to explore cultural and regulatory influences, assess the impact of educational interventions, and examine how personal vaping experience shapes professional attitudes. By aligning education, policy, and research, the profession can better equip future pharmacists to deliver accurate, evidence-informed advice and contribute effectively to smoking cessation and public health improvement.

Acknowledgements

The author extends sincere gratitude to Gordon Hay and Zoe Swithenbank for their invaluable support and guidance throughout this project. Special thanks are also given to Rose Khatri, the programme leader, and the entire programme team for their encouragement and reassurance. Finally, heartfelt appreciation is expressed to family and friends for their unwavering support, which has been a constant source of comfort and motivation.

Conflict of interest

The authors declare no conflict of interest.

Source of funding

The authors did not receive any funding.

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Appendix A: Survey questions

Demographic Questions

What is your age?

18 to 24

25 years or older

What is your gender?

Male

Female

Other

Prefer not to say

What year of study are you in?

Level 4

Level 5

Level 6

Level 7

Have you ever vaped?

Yes

No

Have you vaped in the last six months?

Yes

No

Have you ever worked in a retail pharmacy?

Yes – currently working in a retail pharmacy

Yes – but not currently

No

Previous Training

Have you had any lectures or other learning material in your University Programme so far about vaping/E-cigarettes?

Yes

No

Have you had any other training (outside of the University) about vaping/E-cigarettes?

Yes

No

Views on vaping as a smoking cessation tool

	Strongly agree	Somewhat agree	Neutral	Somewhat disagree	Strongly disagree
E-cigarettes are helpful as a smoking cessation aid and/or harm reduction strategy					
E-cigarettes are an effective smoking cessation aid					
E-cigarettes are more effective as a smoking cessation aid than nicotine replacement therapy (NRT) products such as nicotine gum or transdermal patches					
It is better to recommend e-cigarettes to smokers who failed to quit with conventional smoking cessation treatment					
Combining e-cigarettes with cessation services such as behavioural support would be more effective					
I would recommend e-cigarettes to my clients/patients to help them quit tobacco smoking					
There is a lack of high-quality evidence on the efficacy and effectiveness of e-cigarettes as a smoking cessation aid, or to reduce smoking					

Regulation in the UK

Instructions: Please choose the option in each statement that you find the most relevant

	Yes	No	Don't know
E-cigarettes are not currently available from the NHS or on prescription			
E-cigarettes are strictly regulated for safety and quality in the UK			
Medically licensed e-cigarettes products are not currently available in the UK			
E-cigarette users can report via the Yellow Card Scheme if suspecting a side effect from using e-cigarettes			

Attitudes about vaping

Do you think pharmacists need to receive specific guidelines or training about vaping?

Yes

No

Do you think pharmacy students need to be provided with specific information or training as part of their studies?

Yes

No

Do you think pharmacist should be providing advice on smoking cessation to their clients/patients?

Yes

No

Do you think pharmacists should be providing health-related advice on vaping to their clients/patients?

Yes

No

Appendix B: Additional results**Analysis 1****Factor:** Students' prior vaping**Outcome:** E-cigarettes helpful as smoking cessation/harm reduction

Outcome	Agree Observed (expected)	Neutral/disagree Observed (expected)	Total
Factor			
Yes	24 (22.9)	13 (14.1)	37
No	10 (11.1)	8 (6.9)	18
Total	34	21	55

X² test assumptions met - Yes**Cramér's V**

Value = 0.09

Approximate significance = 0.505

95% Confidence Interval = 0.008 – 0.359

Analysis 2**Factor:** Students' prior vaping**Outcome:** Combining e-cigarettes with cessation services

Outcome	Agree Observed (expected)	Neutral/disagree Observed (expected)	Total
Factor			
Yes	27 (22.9)	10 (14.1)	37
No	7 (11.1)	11 (6.9)	18
Total	34	21	55

X² test assumptions met - Yes**Cramér's V**

Value = 0.329

Approximate significance = 0.015

95% Confidence Interval = 0.007 – 0.583

Analysis 3**Factor:** Students' prior vaping**Outcome:** E-cigarettes more effective than NRT

Outcome	Agree Observed (expected)	Neutral/disagree Observed (expected)	Total
Factor			
Yes	13 (10.1)	24 (26.9)	37
No	2 (4.9)	16 (13.1)	18
Total	15	40	55

X² test assumptions met – No – minimum expected cell size 4.9)

Cramér's V

Value = 0.253

Approximate significance = 0.061

95% Confidence Interval = 0.023 – 0.465

Analysis 4**Factor:** Students' recent vaping (last 6 months)**Outcome:** E-cigarettes more effective than NRT

Outcome	Agree Observed (expected)	Neutral/disagree Observed (expected)	Total
Factor			
Yes	12 (8.5)	19 (22.5)	31
No	3 (6.5)	21 (17.5)	24
Total	15	40	55

X² test assumptions met - Yes**Cramér's V**

Value = 0.292

Approximate significance = 0.030

95% Confidence Interval = 0.033 – 0.515

Analysis 5**Factor:** Students' experience in retail pharmacy**Outcome:** E-cigarettes helpful as smoking cessation/harm reduction

Outcome	Agree Observed (expected)	Neutral/disagree Observed (expected)	Total
Factor			
Yes	19 (14.8)	5 (9.2)	24
Yes – not currently	8 (7.4)	4 (4.6)	12
No	7 (11.7)	12 (7.3)	19
Total	34	21	55

X² test assumptions met – No – minimum expected cell size is 3.27**Cramér's V**

Value = 0.386

Approximate significance = 0.017

95% Confidence Interval = 0.175 – 0.638

Analysis 6**Factor:** Students' experience in retail pharmacy**Outcome:** E-cigarettes more effective than NRT

Outcome	Agree Observed (expected)	Neutral/disagree Observed (expected)	Total
Factor			
Yes	9 (6.5)	15 (17.5)	24
Yes – not currently	3 (3.3)	9 (8.7)	12
No	3 (5.2)	16 (13.8)	19
Total	15	40	55

X² test assumptions met - Yes**Cramér's V**

Value = 0.09

Approximate significance = 0.505

95% Confidence Interval = 0.008 – 0.359

Analysis 7**Factor:** Prior university training**Outcome:** E-cigarettes helpful as smoking cessation/harm reduction

Outcome	Agree Observed (expected)	Neutral/disagree Observed (expected)	Total
Factor			
Yes	2 (2.5)	2 (1.5)	4
No	32 (31.5)	19 (19.5)	51
Total	34	21	55

X² test assumptions met - No**Cramér's V**

Value = 0.068

Approximate significance = 0.613

95% Confidence Interval = 0.006 – 0.342

Analysis 8**Factor:** Prior training outside university**Outcome:** E-cigarettes helpful as smoking cessation/harm reduction

Outcome	Agree Observed (expected)	Neutral/disagree Observed (expected)	Total
Factor			
Yes	4 (3.7)	2 (2.3)	6
No	30 (30.3)	19 (18.7)	49
Total	34	21	55

X² test assumptions met - No**Cramér's V**

Value = 0.035

Approximate significance = 0.796

95% Confidence Interval = 0.006 – 0.286