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Prevalence of Electronic Cigarette Use among University Students in the Kingdom of Saudi Arabia and Its Associated Factors

Mouaz Yousif[1], Raga Dawelbait[1], Arwa Almassri[1], Razan Osama[1] and Rusdi Abd Rashid[1,2]*

[1]*University of Malaya Centre of Addiction Sciences (UMCAS), Kuala Lumpur, Malaysia.*

[2]*Department of Psychological Medicine, Faculty of Medicine, Universiti Malaya, Kuala Lumpur, Malaysia.*

***Correspondence:**
Rusdi Abd Rashid, University of Malaya Centre of Addiction Sciences (UMCAS), Kuala Lumpur, Malaysia.

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ABSTRACT

Background: *Electronic cigarette (e-cigarette) use has risen sharply among young adults worldwide, and university students in Saudi Arabia are considered a population of particular vulnerability given dense peer networks, digital media exposure, and reduced direct oversight. Integrated, survey-based evidence combining prevalence estimation with demographic, social, and attitudinal correlates within a single Saudi university sample has remained comparatively limited.*

Objective: *This study estimated the prevalence of e-cigarette use among Saudi university students and tested five hypotheses concerning peer influence, social-media exposure, perceived harm/addiction risk, perceived policy enforcement, and family influence.*

Methods: *A cross-sectional, bilingual (Arabic/English) online questionnaire was administered to 201 Saudi university students using non-probability convenience sampling. Descriptive statistics, bivariate tests (chi-square and Mann-Whitney U with Benjamini-Hochberg correction), and a multivariable modified Poisson regression with robust standard errors were used to estimate adjusted prevalence ratios (PR) for current use.*

Results: *Current e-cigarette use prevalence was 29.4% (95% CI: 23.5–36.0%), and lifetime use was 51.2%. Peer influence (H1) and perceived harm/addiction risk (H3) were significantly associated with current use in both bivariate and multivariable analysis (adjusted PR for friends' encouragement = 1.30, $p = 0.018$; adjusted PR for perceived long-term risk = 0.73 per one-point increase, $p < 0.0001$). Social-media exposure (H2), perceived policy enforcement (H4), and family influence (H5) were not significant.*

Conclusion: *Peer influence and risk perception, rather than social-media exposure or perceived enforcement, are the strongest correlates of current e-cigarette use in this sample. University prevention programming is likely to be most effective when it targets specific risk-perception gaps — particularly comparative-harm beliefs — and leverages peer-based intervention formats rather than general health-education messaging alone.*

Keywords

Electronic cigarettes, E-cigarettes, Vaping, University students, Saudi Arabia, Prevalence, Peer influence, Risk perception, Theory of Planned Behavior, Health Belief Model, Social Learning Theory.

Introduction

Tobacco use has historically been among the leading preventable causes of morbidity and mortality worldwide, and the past decade has seen the emergence of electronic cigarettes as a distinct nicotine-delivery behavior in their own right — one that has spread rapidly among adolescents and young adults, many of whom have no prior history of conventional tobacco use [1]. The World Health Organization has flagged this trend as a public-health concern warranting close monitoring, given uncertainty about the

long-term health consequences of aerosol inhalation and the well-documented dependence risk of early nicotine exposure [1].

This global pattern is clearly reflected in Saudi Arabia. Recent Saudi epidemiological studies report considerable variation in e-cigarette prevalence across educational settings and regions, generally attributed to differences in demographic composition, social norms, and digital-marketing exposure among youth [2-4]. Several converge on a common observation: university students represent a particularly high-risk population, given dense self-selected peer networks and reduced adult supervision — conditions under which social modeling of substance use is expected to be strongest. Despite this convergence, integrated evidence combining prevalence estimation with the demographic, social, and attitudinal correlates of use within a single, methodologically transparent Saudi university sample has remained comparatively limited, and this is the specific gap the present study addresses.

This study had two aims: (1) to estimate the prevalence of lifetime and current e-cigarette use among a sample of Saudi university students, and (2) to test five hypotheses concerning the demographic, social, and attitudinal correlates of current use: H1, peer influence is positively associated with current use; H2, social-media exposure is positively associated with current use; H3, lower perceived harm and addiction risk is positively associated with current use; H4, weaker perceived policy enforcement (measured via ease-of-access and campus-awareness proxies) is positively associated with current use; and H5, family influence (measured via a general belief item) is associated with current use.

Three complementary behavioral frameworks informed the questionnaire and the interpretation of findings. The Theory of Planned Behavior [5] links behavior to attitudes, subjective norms, and perceived behavioral control, and directly informs the study's motive and peer/family-influence items. The Health Belief Model [6,7] explains health behavior as a function of perceived susceptibility, severity, benefits, and barriers, and underlies the knowledge and risk-perception items central to H3. Social Learning Theory [8] holds that behavior is acquired through observation and imitation of peers, and grounds the peer-influence and social-media items tested through H1 and H2. Together these frameworks structure the discussion of convergence and divergence with prior literature below.

Methods

Design, Population, and Sampling

This was a cross-sectional survey of university students in Saudi Arabia, conducted using non-probability convenience sampling. A bilingual (Arabic/English) online questionnaire was distributed via a shared link on Google Forms; participation was voluntary and anonymous, and no identifying information was collected. The achieved sample comprised 201 respondents, predominantly male (66.7%), concentrated in the 21-and-older age bracket (62.7%), and enrolled mainly at the Bachelor's level (81.1%), with Diploma students forming a secondary group (15.9%).

Instrument

The questionnaire comprised five sections: (1) demographic data; (2) lifetime and current e-cigarette use, and perceived campus prevalence; (3) motives for use (curiosity, peer encouragement, flavor variety, stress relief, ease of access); (4) health awareness and risk perception (knowledge, addiction belief, respiratory-harm belief, long-term-safety belief); and (5) social and legislative factors (family influence, social-media contribution, digital advertising). Attitude items used a five-point Likert scale. Hypotheses 4 and 5 were tested using the closest available proxy items — perceived ease of access and campus-awareness adequacy for H4, and a general family-influence belief item for H5 — rather than direct measures of enforcement strictness or a specific family member's smoking status; this is acknowledged as an instrument limitation.

Data Preparation and Analysis

Likert responses were recoded into a standard ascending 1-to-5 scale, the long-term-safety item was reverse-scored so higher values reflect higher perceived risk, and a three-level use-status variable (Never / Former-Experimental / Current) was derived by cross-referencing the lifetime- and current-use items. Missing data were minimal (2.0% on a single item). Descriptive statistics (frequencies, percentages with 95% Wilson confidence intervals, means, standard deviations) characterized the sample and prevalence. Bivariate hypothesis testing used chi-square tests for categorical predictors and Mann-Whitney U tests for ordinal predictors against current-use status, with Benjamini-Hochberg correction for multiple comparisons within each hypothesis family. A multivariable modified Poisson regression with robust standard errors estimated adjusted prevalence ratios (PR) for current use, in preference to logistic regression, because current-use prevalence (29.4%) is high enough that odds ratios would meaningfully overstate relative risk. Internal consistency of composite scales was assessed with Cronbach's alpha; only the motives-for-use composite met the conventional 0.70 threshold ($\alpha = 0.71$) and was retained as a composite predictor. Statistical significance was set at $\alpha = 0.05$.

Ethical Considerations

Participation was voluntary and anonymous; no personally identifying information was collected. Respondents were informed of the study purpose before participation and were free to exit the form at any time without penalty.

Results

Sample Characteristics

Table 1 summarizes the demographic profile. The sample was predominantly male (66.7%) and concentrated in the 21-and-older bracket (62.7%), with the large majority at the Bachelor's level (81.1%).

Prevalence of E-Cigarette Use

Just over half of respondents (51.2%) reported having tried e-cigarettes at least once, and 29.4% currently use them — meaning roughly four in ten lifetime users have since stopped or use only irregularly (Table 2). Current use was somewhat higher among

males (32.1%) than females (23.9%) and highest among Diploma students (34.4%), but none of these demographic differences reached statistical significance (gender: $\chi^2(1) = 1.08$, $p = 0.298$; age: $\chi^2(3) = 0.69$, $p = 0.876$). Over 83% of students personally knew a peer who uses e-cigarettes, and 52.7% perceived campus prevalence as "high" — both notably higher than the measured current-use rate, suggesting students may overestimate how common the behavior is among peers.

Table 1: Demographic characteristics of respondents (N = 201).

Variable	Category	N (%)	95% CI
Gender	Male	134 (66.7%)	59.9–72.8%
	Female	67 (33.3%)	27.2–40.1%
Age	18–19 years	48 (23.9%)	18.4–30.3%
	20 years	27 (13.4%)	9.4–18.8%
	21 years or more	126 (62.7%)	55.8–69.1%
Education	Diploma	32 (15.9%)	11.5–21.6%
	Bachelor	163 (81.1%)	75.1–85.9%
	Master / PhD	6 (3.0%)	1.4–6.4%

Table 2: Lifetime and current prevalence of e-cigarette use.

Category	N (%)	95% CI
Ever used (lifetime use)	103 (51.2%)	44.4–58.1%
Currently using	59 (29.4%)	23.5–36.0%
Use status: Never-user	98 (48.8%)	41.9–55.6%
Use status: Former/experimental	45 (22.4%)	17.2–28.6%
Use status: Current user	58 (28.9%)	23.0–35.5%
Knows peers who use	167 (83.1%)	77.3–87.6%
Perceives campus prevalence as "high"	106 (52.7%)	45.8–59.5%

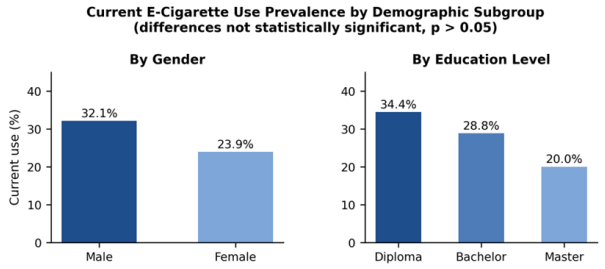

Figure 1: Current e-cigarette use prevalence by gender and education level. None of the subgroup differences shown reached statistical significance (gender: $\chi^2(1) = 1.08$, $p = 0.298$; education/age comparisons: $p > 0.05$).

Motives, Social Influence, and Health Awareness

Ease of access (79% agreement) and flavor variety (73%) were the most widely endorsed motives, followed by curiosity (75%) and peer encouragement (56%); stress relief was more mixed (49% agree). Awareness of nicotine-addiction risk was high and nearly universal (86% agreement), as was belief that e-cigarettes affect the respiratory system (95%); by contrast, only 31% agreed that e-cigarettes are less harmful than conventional cigarettes, and only 14% believed them safe for long-term use — indicating that general addiction awareness coexists with a genuine, more consequential split on comparative-harm and long-term-safety beliefs. Support for including e-cigarette awareness programs at universities was the single highest-agreement item in the survey (85%), and 79% separately agreed that current campus health awareness is insufficient.

Bivariate Tests of the Five Hypotheses

H1 (peer influence) was supported: current users scored markedly higher on "friends encouraged me to try it" (mean 3.92 vs. 3.07, $p < 0.0001$, $r = 0.36$), and knowing a peer user showed a moderate association with current use (Cramer's $V = 0.25$). H2 (social-media exposure) was not supported: current and non-current users held nearly identical views on social-media and advertising influence ($r = 0.06$ for both, $p > 0.5$). H3 (harm/addiction risk) was largely supported: current users were more likely to see e-cigarettes as "less harmful" ($r = 0.31$) and less likely to reject their long-term safety ($r = 0.43$, the largest effect size observed); the addiction-belief item alone showed no group difference. H4 (weak enforcement, via access/awareness proxies) was not supported, plausibly reflecting a ceiling effect given near-universal agreement that access is easy. H5 (family influence, via a general belief proxy) was not supported: current and non-current users reported an identical mean agreement (3.54 vs. 3.54).

Multivariable Analysis

A modified Poisson regression with robust standard errors was fitted with current use as the outcome and six predictors entered simultaneously: gender, age group, knowing peers who use, friends' encouragement, a motives-for-use composite score ($\alpha = 0.71$), and reverse-scored perceived long-term risk (Table 3). Two predictors remained independently significant after adjustment. Perceived long-term risk was protective: each one-point increase was associated with 27% lower prevalence of current use (adjusted PR = 0.73, 95% CI 0.64–0.82, $p < 0.0001$), the strongest and most stable finding in the model. Friends' encouragement remained independently significant (adjusted PR = 1.30, 95% CI 1.05–1.62, $p = 0.018$). Knowing peers who use showed a very large point estimate (PR = 7.88) but an imprecise confidence interval (0.97–63.89, $p = 0.053$), driven by a small-cell issue (only 1 of 34 students who reported no peer users is a current user) rather than evidence against the relationship. Gender, age, and the motives composite were not independently significant. All variance inflation factors were below 2.3.

Table 3: Adjusted prevalence ratios for current e-cigarette use (modified Poisson regression, N = 201).

Predictor	Adj. PR	95% CI	p
Gender: Male (vs. Female)	0.88	0.56–1.37	0.568
Age: 21+ (vs. under 21)	0.94	0.63–1.38	0.740
Knows peers who use e-cigarettes	7.88	0.97–63.89	0.053
Friends encouraged me to try it	1.30	1.05–1.62	0.018
Motives-for-use composite score	1.32	0.88–1.98	0.180
Perceived long-term risk (reverse-scored)	0.73	0.64–0.82	<0.0001

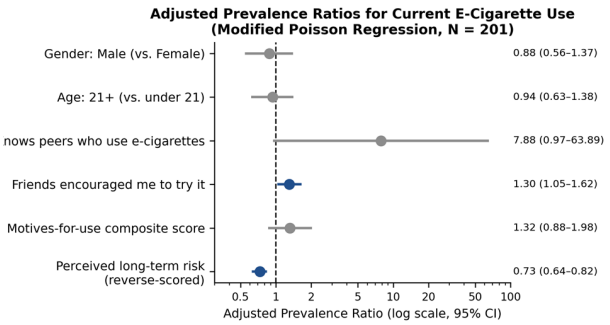

Figure 2: Forest plot of adjusted prevalence ratios (95% CI) from the multivariable model. Dashed line indicates no association (PR = 1); blue markers indicate predictors significant at $p < 0.05$.

Discussion

The finding that 29.4% of respondents currently use e-cigarettes, with a further 22.4% classified as former or experimental users, positions this sample toward the upper-middle range of comparable Saudi university studies, above the Al-Madinah findings of 11.7% [3] and 17.6% [9] and the Shaqra University finding of 20.1% [10], while remaining within the wide range documented by a fifteen-study systematic review [4] (7.2–79.8%, median 36.6%). Given the non-probability, self-selected sampling procedure, this comparatively higher estimate should not be read as evidence that use is objectively more common at the sampled institution; students already engaged with or curious about the topic may have been more likely to complete the survey, a dynamic likely shared by most comparator studies to varying degrees. The gap between lifetime use (51.2%) and current use (29.4%) suggests experimentation does not deterministically progress to sustained use, though the substantial minority who progress to daily use (40.6% of ever-users) warrants continued public-health attention to dependence risk.

H1 (peer influence) emerged as the study's most robust social finding, converging directly with the Saudi literature: peer influence was identified as one of the most consistently reported correlates of use across fifteen pooled studies [4] and features as a core construct in the multi-country Arab-region VAPeS instrument [1]. This result is well explained by Social Learning Theory [8] and by the subjective-norms component of the Theory of Planned Behavior [5], both of which predict that proximity to using peers increases the perceived normality and acceptability of the behavior. H3 (perceived harm/addiction risk) was the single strongest and most theoretically coherent finding, mapping directly onto the Health Belief Model [6,7] and closely paralleling the adjusted association between lower harm perception and e-cigarette use reported in the comparable Al-Madinah sample (adjusted OR = 1.69) [3]. Notably, the addiction-belief item showed no difference between current and non-current users (86% overall agreement), indicating that nicotine-addiction risk is close to common knowledge in this population regardless of personal use status, while comparative-harm and long-term-safety beliefs remain the dimensions on which users and non-users genuinely diverge — a distinction with direct relevance for how awareness messaging should be targeted.

H2 (social-media exposure) was not supported. This null result should not be read as evidence that social media is irrelevant to e-cigarette normalization generally — 71% of the full sample agreed social media has contributed to its spread, consistent with the prominence given to social-media constructs in the regional literature [1] — but rather illustrates that because belief in social media's influence is now close to universal among young people, a single cross-sectional belief item cannot statistically distinguish individual users from non-users, even if such exposure genuinely contributes to population-level normalization. H4 (weak enforcement, via access/awareness proxies) and H5 (family influence, via a general belief proxy) were both not supported, most plausibly due to ceiling effects and construct-proxy mismatches respectively rather than genuine absence of underlying effect; both proxy items measured a general belief rather than the respondent's own direct exposure, a limitation acknowledged at the design stage.

Viewed as a whole, the Health Belief Model received the strongest and most consistent support of the three frameworks, with perceived severity and susceptibility emerging as the single most powerful predictor set in the study. Social Learning Theory received strong support through the peer-influence pathway but not through the social-media pathway, suggesting that direct, proximal social modeling carries more behavioral weight in this population than diffuse media exposure. The Theory of Planned Behavior's subjective-norms component was partially supported through peer influence but not family influence, while its perceived-behavioral-control component could not be adequately tested given the ceiling effect in the access item.

Limitations

This study has several limitations. The non-probability, self-selected sampling procedure limits generalizability to the broader Saudi university population. All data, including use status, were self-reported and subject to social-desirability or recall bias. The cross-sectional design precludes causal or temporal inference, so associations are described as such rather than as causal effects. Hypotheses 4 and 5 relied on proxy items rather than direct measures of enforcement strictness or household smoking status, a genuine instrument limitation acknowledged from the outset. Finally, the single-institution, single-country design is shared by most comparable Saudi studies, which tempers but does not eliminate its significance for cross-study comparison.

Conclusions and Recommendations

Peer influence and risk perception, not social-media exposure or perceived enforcement, are the strongest correlates of current e-cigarette use in this sample. Three evidence-based priorities follow directly from these findings. First, awareness campaigns should target specific risk-perception gaps — particularly comparative-harm and long-term-safety beliefs — rather than

repeating general addiction messaging that already reaches an audience largely convinced of that specific risk. Second, peer-based intervention formats (trained student ambassadors, peer-facilitated sessions, social-norms campaigns run through existing student networks) are likely to outperform top-down lecture-style programming, since the dominant mechanism of influence identified here operates through direct social modeling. Third, because perceived campus prevalence (52.7% rating it "high") exceeds measured current use (29.4%), and because use did not differ significantly by gender, age, or education level, normative-messaging campaigns that correct inflated peer-use perceptions should be piloted campus-wide rather than targeted at a single subgroup. Programming of this kind should also benefit from strong pre-existing buy-in: support for university awareness programs was the single highest-agreement item in the survey (85%).

At the policy level, the near-universal perception that e-cigarettes are easy to obtain (79% agreement) supports reviewing point-of-access controls around campus, and locally-collected prevalence data of the kind reported here should be incorporated into orientation and first-year programming to close the perceived-versus-actual prevalence gap. Future research should replace the general family-influence item with a direct household-smoking-status question, replace the ease-of-access item with a more targeted enforcement-strictness measure, capture social-media exposure frequency rather than general belief, and pursue probability-based or multi-institution sampling with larger sample sizes to resolve the imprecise peer-knowledge estimate observed here.

In summary, this cross-sectional survey of 201 Saudi university students found a current e-cigarette use prevalence of 29.4% and a lifetime-use prevalence of 51.2%. Peer influence and perceived harm/addiction risk were consistently and robustly associated with current use across bivariate and multivariable analysis, while social-media exposure, perceived policy enforcement, and family influence were not — null results attributable to identifiable measurement limitations rather than to a genuine absence of effect. These findings offer an integrated, locally grounded contribution to the growing body of Saudi and Arab-region evidence on e-cigarette use, and a concrete, evidence-based starting point for university-level prevention programming and policy.

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