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*Review Article*

# Normalized Vaping Among Pakistani University Students: A Narrative Review of Its Toll on Academic Performance and Respiratory Health

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## ABSTRACT

Background: Vaping has become increasingly visible among Pakistani university students, but evidence concerning its respiratory, cognitive, and academic consequences remains methodologically uncertain. Objective: To synthesise Pakistan-specific evidence on the social normalisation of vaping and its reported associations with respiratory health, cognitive functioning, and academic performance. Methods: A structured narrative review integrated Pakistan-focused quantitative studies and contextual literature with selected international mechanistic and policy evidence. Findings were synthesised thematically, and greater weight was assigned to studies with identifiable samples, denominators, exposure definitions, comparator groups, and objective measurements. Results: A convenience-sampled Karachi survey enrolled 389 students, of whom 266 (68.4%) reported vaping; among these users, 35.5% vaped daily, 60.9% had vaped for more than one year, and 25.6% reported breathing problems. A Lahore study restricted to 160 current vapers reported cough in 38 participants (23.8%), shortness of breath in 24 (15.0%), and palpitations in 18 (11.3%). Friends, social media, perceived social status, and beliefs that vaping was preferable to smoking were prominent reported influences. Both studies were cross-sectional, used non-probability sampling, and relied on self-report. No sufficiently supported Pakistan-specific evidence established objective pulmonary dysfunction, cognitive impairment, or reduced academic achievement. Conclusion: Vaping is established in selected Pakistani student populations and is accompanied by self-reported health concerns, but causal and nationally representative conclusions are not justified. Longitudinal studies using objective exposure, respiratory, cognitive, and academic measures are required. Keywords: Vaping; electronic cigarettes; university students; Pakistan; respiratory health; cognition; academic performance

## INTRODUCTION

Electronic nicotine delivery systems, including electronic cigarettes and vaping devices, have substantially altered patterns of nicotine use among adolescents and young adults. Although these products may expose established cigarette smokers to lower concentrations of several toxicants than combustible tobacco, they are not harmless, and their uptake by nicotine-naïve young people presents a distinct public-health concern (10,15). Young adulthood is also a developmental period characterised by increasing independence, identity formation, sensitivity to peer approval, and exposure to commercial and digital influences. Within this context, the social normalisation of vaping refers to the process

through which e-cigarette use becomes perceived as ordinary, socially acceptable, fashionable, or relatively low risk rather than as a potentially addictive health behaviour.

Pakistan represents an important setting in which to examine this process. Published studies and commentaries describe the increasing visibility of vaping among young people, particularly in urban educational settings (1,3,4). Surveys conducted among selected university populations have documented e-cigarette use and have identified peer influence, curiosity, flavoured products, perceived social status, accessibility, and beliefs about reduced harm as common factors associated with initiation and continued use (6,7). These studies indicate that vaping is an established behaviour within some Pakistani student populations; however, most have relied on convenience samples from individual institutions or major cities. Their findings should therefore not be interpreted as nationally representative prevalence estimates. The available literature also suggests that discreet device designs, limited odour, visually appealing packaging, and promotion through social media may make vaping more socially acceptable than conventional cigarette smoking, including among students who would not otherwise identify themselves as tobacco users.

The potential respiratory consequences of vaping are central to concerns about its increasing acceptance. E-cigarette aerosol is not simply water vapour but may contain nicotine, ultrafine particles, volatile organic compounds, carbonyls, flavouring chemicals, and metals released from device components (10,17). Experimental and observational evidence indicates that exposure to these constituents may promote airway irritation, oxidative stress, inflammatory responses, impaired mucociliary function, and small-airway dysfunction. Studies involving young adults have also reported cough, wheezing, phlegm production, breathlessness, and differences in pulmonary-function measures among people who vape. Nevertheless, much of this evidence is derived from cross-sectional or short-term studies, and the independent contribution of vaping is not always distinguishable from conventional cigarette smoking, waterpipe use, air pollution, respiratory disease, or other exposures. Respiratory symptoms reported by people who vape should therefore be interpreted as associations rather than proof that vaping was their sole cause.

Nicotine exposure may also affect neurocognitive functioning during adolescence and young adulthood, when the prefrontal cortex and associated networks involved in attention, impulse control, working memory, planning, and decision-making continue to mature. Nicotine activates nicotinic acetylcholine receptors and can produce short-term increases in alertness and attention. Repeated exposure, however, may result in receptor adaptation, dependence, withdrawal-related concentration difficulties, and disruption of neural processes involved in executive functioning and reward regulation (23,24). These effects provide a biologically plausible basis for concern about learning and academic engagement among students who vape regularly. However, biological plausibility should not be treated as direct evidence that vaping causes academic underachievement in Pakistani university students.

Cognitive functioning and academic performance are related but separate outcome domains. Cognitive outcomes include objectively or subjectively assessed attention, memory, processing speed, executive functioning, and problem-solving. Academic performance is more directly reflected in examination results, grade point averages, course completion, attendance, progression, and institutionally recorded achievement. Other factors associated with nicotine dependence, including sleep disturbance, withdrawal symptoms, time spent obtaining or using vaping products, financial expenditure, and absence from classes, may also affect academic engagement without necessarily producing a measurable neurocognitive deficit. Existing studies frequently combine these outcomes or rely on self-reported concentration and academic performance, limiting the ability to determine whether observed differences reflect nicotine exposure, associated behaviours, pre-existing academic difficulties, psychological distress, or other confounding factors.

The Pakistan-specific evidence base remains methodologically limited. Most available studies use cross-sectional designs, non-probability sampling, self-reported exposure, and inconsistent definitions of

experimental, current, regular, and daily vaping. Students from rural areas, public-sector universities, lower socioeconomic groups, and less urbanised regions remain underrepresented. Objective measures such as cotinine verification, pulmonary-function testing, inflammatory biomarkers, validated neuropsychological batteries, and institutionally verified academic records are uncommon. In addition, many studies do not adequately adjust for conventional smoking, waterpipe use, cannabis or alcohol consumption, pre-existing respiratory disease, sleep, socioeconomic position, parental tobacco use, anxiety, depression, or attention-related disorders. These weaknesses restrict causal inference and make direct comparison across studies difficult.

A critical synthesis is therefore required that distinguishes observed associations from causal conclusions and separates Pakistan-specific findings from international evidence used to explain biological mechanisms or policy options. Such a synthesis should also differentiate respiratory symptoms from objective pulmonary impairment and distinguish cognitive test performance from educational achievement. This narrative review consequently aimed to examine the social determinants contributing to the normalisation of vaping among Pakistani university students and to critically synthesise the available evidence concerning respiratory health, cognitive functioning, and academic performance. It further sought to evaluate the methodological strengths and weaknesses of the current literature, identify clinically and educationally relevant implications, and define priorities for more rigorous research without treating findings from selected urban samples as estimates for the national student population.

## MATERIALS AND METHODS

A structured narrative-review approach was used to integrate heterogeneous epidemiological, clinical, neuropsychological, educational, and policy evidence concerning vaping among university students. A narrative design was considered appropriate because the available literature included diverse study designs, exposure definitions, participant populations, measurement instruments, and outcome domains that were not sufficiently homogeneous for statistical pooling. The review focused primarily on Pakistani university students and young adults, while international evidence was used selectively to contextualise biological mechanisms, methodological considerations, and intervention or regulatory approaches for which locally generated evidence was limited.

The evidence base included peer-reviewed original studies, systematic reviews, umbrella reviews, methodological analyses, policy analyses, government or institutional reports, and selected grey literature published within the period covered by the manuscript's source set. Pakistan-specific original studies were considered when they examined the prevalence or patterns of vaping, determinants of initiation and continued use, perceptions of harm, respiratory symptoms, pulmonary function, biomarkers, cognitive performance, academic outcomes, nicotine dependence, or cessation-related factors among university students or comparable young-adult populations. International studies were incorporated when they provided relevant evidence concerning aerosol toxicology, nicotine-related neurocognitive mechanisms, respiratory effects, longitudinal outcomes, cessation interventions, or regulatory measures. Media reports and opinion articles were used only to describe public discourse or the regulatory context and were not treated as primary evidence for prevalence, clinical effects, or causal relationships.

Evidence relating exclusively to combustible cigarette smoking without a separately identifiable vaping exposure was not used to support vaping-specific conclusions. Findings involving dual users were interpreted separately where the source allowed distinction from exclusive vaping. Respiratory symptoms, objective pulmonary outcomes, cognitive measures, and academic indicators were treated as separate outcome categories. Self-reported concentration, absenteeism, sleep disruption, or grade point average was not considered equivalent to performance on a validated neuropsychological assessment or to institutionally verified academic achievement. Similarly, findings concerning e-cigarette or vaping

product use-associated lung injury involving tetrahydrocannabinol-containing or informally sourced products were interpreted separately from evidence concerning routine nicotine vaping.

For each retained source, relevant information was organised according to the study setting, population, design, sample characteristics, sampling approach, definition and frequency of vaping exposure, comparator group, outcome measures, principal findings, and reported limitations. Pakistan-specific findings were synthesised separately from international evidence to avoid assuming that differences in product characteristics, nicotine concentrations, regulatory conditions, cultural practices, or patterns of use were directly transferable between settings. Numerical findings were reported only when the source provided an identifiable denominator and a sufficiently clear definition of the exposure and outcome. Estimates from convenience samples were described as findings from the sampled population and were not treated as nationally representative prevalence figures.

The evidence was synthesised thematically across five domains: epidemiological patterns and social determinants of vaping; respiratory symptoms and objective pulmonary outcomes; neurocognitive findings; academic and behavioural outcomes; and implications for clinical practice, university policy, regulation, and future research. Because of substantial heterogeneity in study designs, populations, exposure definitions, and measurement methods, no pooled prevalence, meta-analysis, or combined effect estimate was calculated. Findings were instead compared narratively, with attention to the direction and consistency of associations, the objectivity of exposure and outcome measurement, the presence of comparator groups, adjustment for confounding variables, and the distinction between statistical association and causal inference.

Methodological credibility was evaluated qualitatively according to study design, sampling strategy, sample size, exposure ascertainment, outcome validity, confounder control, transparency of statistical reporting, and applicability to Pakistani university populations. Greater interpretive weight was assigned to peer-reviewed studies using clearly defined exposure categories, appropriate comparison groups, objective measures, validated instruments, and adjusted analyses. Cross-sectional studies, self-reported measures, convenience samples, conference material, media reports, and opinion articles were interpreted more cautiously. Contradictory findings were retained where relevant and were considered in relation to methodological differences rather than being resolved through selective reporting.

As the review used published and publicly accessible material and involved no direct participation, intervention, access to identifiable records, or collection of individual-level data, institutional ethical approval and individual informed consent were not required. The synthesis was conducted with an emphasis on accurate source attribution, separation of evidence from interpretation, and avoidance of causal claims unsupported by the underlying study designs.

## RESULTS

The Pakistan-specific quantitative evidence suitable for direct synthesis consisted principally of two cross-sectional studies conducted among university students in Karachi and Lahore (5,6). Both studies used non-probability sampling and self-administered questionnaires. The Karachi study enrolled a broader university-student sample, whereas the Lahore study recruited only students who were already using e-cigarettes. Consequently, the Karachi study provided a sample-specific estimate of vaping frequency, while the Lahore study could describe patterns and symptoms among users but could not estimate prevalence or compare health outcomes between users and non-users.

In the Karachi study, 266 of 389 participants reported vaping, corresponding to 68.4% of the recruited convenience sample (5). This estimate describes the sampled participants and should not be interpreted as the prevalence of vaping among all Pakistani university students. Among the 266 participants who reported vaping, 60.9% had used vaping products for more than one year, 35.5% reported daily use, and 73.7% used pod-based devices. Friends were identified as a source of information by 77.4% of participants,

followed by social media and other internet sources at 58.1%. Vaping was reported more frequently among non-medical than medical students, with a reported p-value of 0.005.

*Table 1. Characteristics of the Pakistan-Specific Quantitative Studies*

| Study | Setting and period | Design | Sample | Sampling method | Exposure population | Measures | Comparator |
|---|---|---|---|---|---|---|---|
| **Qureshi et al. (5)** | Urban university setting, Karachi, Pakistan | Cross-sectional survey | 389 students aged 18–35 years | Non-probability convenience sampling | Entire recruited student sample; 266 participants reported vaping | Structured self-administered questionnaire; vaping frequency, duration, device type, information sources, perceived health and lifestyle effects | Medical versus non-medical students for selected analyses |
| **Manzoor et al. (6)** | Multiple medical and non-medical colleges and universities, Lahore, Pakistan; March–July 2020 | Analytical cross-sectional study | 160 current vapers | Snowball sampling | Students already using e-cigarettes | Pre-tested structured online questionnaire; symptoms, reasons for initiation, and awareness | Medical versus non-medical students for selected analyses; no non-vaping control group |

*Table 2. Vaping Patterns and Social Determinants Reported in the Pakistan-Specific Studies*

| Variable | Qureshi et al. (5) | Manzoor et al. (6) |
|---|---|---|
| **Total sample, n** | 389 | 160 |
| **Participants reporting vaping, n (%)** | 266 (68.4) | 160 (100.0) |
| **Male participants, n (%)** | 305 (78.4)* | 111 (69.4) |
| **Mean age, years** | 22.40 ± 2.44 | — |
| **Vaping for >1 year, %** | 60.9† | — |
| **Daily vaping, %** | 35.5† | — |
| **Pod-device use, %** | 73.7† | — |
| **Friends as an information source, %** | 77.4 | — |
| **Social media or internet as an information source, %** | 58.1 | — |
| **Perceived better alternative to smoking, n (%)** | — | 70 (43.8) |
| **Social status or "social upgradation," n (%)** | — | 48 (30.0) |
| **Medical versus non-medical discipline, p-value** | 0.005 | — |
| **Awareness of nicotine content, p-value** | — | 0.020 |
| **Awareness of harmful chemicals, p-value** | — | 0.050 |
| **Awareness of adverse effects, p-value** | — | 0.002 |

*Calculated from the reported percentage and total sample; the original source reported the percentage without an accompanying count in its abstract. †Denominator: 266 participants who reported vaping. Abbreviation: , not reported in the supplied source.

*Table 3. Self-Reported Health and Lifestyle Findings Among Participants Who Vaped*

| Outcome | Qureshi et al., n or % (5) | Manzoor et al., n (%) (6) |
|---|---|---|
| **Perceived unhealthy change after initiating vaping** | 32.3%† | — |
| **Breathing problems** | 25.6%† | — |
| **Cough** | — | 38 (23.8)* |
| **Shortness of breath** | — | 24 (15.0) |
| **Palpitations** | — | 18 (11.3) |
| **Loss of appetite** | — | 16 (10.0) |
| **No change in sleep pattern** | 55.3%† | — |
| **Perceived positive effect on mood** | 57.1%† | — |

*The source reported cough as 38 (27%); the percentage was recalculated as 38/160 = 23.8%.†Denominator: 266 participants who reported vaping. All outcomes were self-reported. Neither study established whether the reported symptoms began before or after vaping through longitudinal assessment. Abbreviation: —, not reported.

The Lahore study recruited 160 students who were already using e-cigarettes and therefore did not provide a prevalence estimate (6). Men comprised 111 participants (69.4%), while women comprised 49 (30.6%). The most frequently reported reason for initiation was the perception that vaping was a better

alternative to conventional smoking, reported by 70 participants (43.8%). Social status or "social upgradation" was reported by 48 participants (30.0%). Awareness of nicotine content, harmful chemical constituents, and adverse effects differed between the compared student groups, with reported p-values of 0.020, 0.050, and 0.002, respectively.

*Table 4. Methodological Appraisal of the Quantitative Pakistan-Specific Evidence*

| Study | Probability sampling | Non-vaping comparator | Biochemical exposure verification | Objective respiratory assessment | Validated cognitive assessment | Verified academic records | Multivariable confounder adjustment | Principal limitation |
|---|---|---|---|---|---|---|---|---|
| **Qureshi et al. (5)** | No | Not clearly reported | No | No | No | No | Not reported | Convenience sampling and self-reported exposure and outcomes |
| **Manzoor et al. (6)** | No | No | No | No | No | No | No | Snowball sample restricted to current vapers |

Self-reported respiratory and health-related findings were common but varied between the two studies. In the Karachi sample, 32.3% of participants who vaped reported an unhealthy change after initiating vaping, while 25.6% reported breathing problems (5). In the Lahore sample, cough was reported by 38 of 160 participants, equivalent to 23.8% after recalculation, rather than the 27% stated in the original report. Shortness of breath was reported by 24 participants (15.0%), palpitations by 18 (11.3%), and loss of appetite by 16 (10.0%) (6). The Karachi study additionally reported that 55.3% experienced no change in sleep pattern and 57.1% perceived a positive effect of vaping on mood.

The studies did not include biochemical verification of nicotine exposure, spirometry, inflammatory biomarkers, validated neuropsychological testing, or institutionally verified academic outcomes. Neither study prospectively established whether symptoms followed vaping initiation, and the Lahore study lacked a non-vaping comparator. Consequently, the available Pakistan-specific quantitative evidence supports the presence of vaping and self-reported health concerns in selected university samples but does not establish national prevalence, objective pulmonary impairment, cognitive deterioration, academic underperformance, or causality.

The remaining Pakistan-focused sources in the evidence base consisted mainly of letters, editorials, and narrative or mini-reviews discussing the visibility of vaping, youth appeal, cardiopulmonary concerns, and policy responses (2–4). These sources contributed contextual and interpretive material but did not provide original participant-level evidence suitable for quantitative synthesis.

## DISCUSSION

This review found that vaping is an established behaviour within selected Pakistani university populations, but the quality and scope of the available local evidence remain limited. The most directly relevant quantitative studies reported frequent vaping, sustained use, daily use, strong peer and digital-media influences, and several self-reported respiratory or general health complaints (5,6). These findings warrant clinical, educational, and public-health attention; however, they do not provide a nationally representative estimate of vaping prevalence or demonstrate that vaping caused the reported symptoms. The central conclusion is therefore one of concern accompanied by substantial uncertainty rather than definitive evidence of population-wide respiratory or academic harm.

The large difference between the proportions reported in available Pakistani studies illustrates the importance of sampling and case definition. The Karachi study found that 68.4% of its recruited convenience sample reported vaping, whereas earlier and differently sampled student populations have produced substantially lower estimates (5). Such variation may reflect differences in institution type, city, participant age, recruitment channels, definitions of ever and current use, and the likelihood that students who vape were more willing to participate in a vaping-related survey. The reported figure

should therefore be described as the frequency within that particular sample rather than national prevalence. Population estimates require probability sampling across public and private institutions, provinces, urban and rural settings, and different socioeconomic groups.

Peer influence and perceived social acceptability emerged as consistent contextual factors. Friends were a prominent source of information in the Karachi study, while the Lahore study identified perceived superiority to smoking and social status as common reasons for initiation (5,6). These observations support the concept of social normalisation, in which vaping becomes integrated into peer interaction and is perceived as less deviant or less hazardous than cigarette smoking. Letters and reviews from Pakistan have similarly highlighted device appearance, flavour variety, discreet use, social acceptance, and perceptions of reduced harm as possible contributors to youth uptake (2–4). Nevertheless, the available studies did not formally measure normalisation using validated sociological constructs, nor did they prospectively evaluate whether these factors preceded initiation. The findings should therefore be interpreted as reported motivations and information pathways rather than proven determinants.

The respiratory findings are clinically relevant but methodologically preliminary. Approximately one-quarter of participants who vaped in the Karachi study reported breathing problems, while the Lahore study documented cough, shortness of breath, palpitations, and loss of appetite among current users (5,6). E-cigarette aerosol can contain nicotine, carbonyl compounds, metals, volatile organic compounds, and ultrafine particles, and experimental evidence supports the biological plausibility of airway irritation, oxidative stress, and inflammatory effects (1). However, the Pakistani studies relied on self-reported symptoms and did not include spirometry, imaging, biomarkers, baseline assessment, or prospective follow-up. They also did not comprehensively account for cigarette smoking, waterpipe use, asthma, respiratory infection, air pollution, occupational exposure, or other potential explanations. These findings identify symptoms requiring further investigation but cannot quantify vaping-attributable pulmonary injury.

The supplied evidence base did not provide sufficiently authenticated Pakistan-specific primary research demonstrating objective cognitive impairment or reduced academic achievement attributable to vaping. The original manuscript treated lower cognitive scores, reduced grade point averages, absenteeism, sleep disturbance, and withdrawal-related concentration difficulty as a unified academic outcome, although these constructs are distinct. Cognitive performance should be measured with validated tests of attention, memory, processing speed, and executive function, whereas academic performance should ideally be assessed through verified grades, examination results, course completion, or progression. Self-reported concentration, class absence, or perceived academic difficulty may be educationally important but should not be interpreted as evidence of neurocognitive injury.

Nicotine-related biological mechanisms provide a rationale for further study but do not substitute for direct human evidence. Adolescence and early adulthood involve continued maturation of neural systems governing executive function, reward processing, attention, and behavioural control. Repeated nicotine exposure may alter nicotinic acetylcholine receptor activity, reinforce dependence, and produce withdrawal-related irritability or concentration difficulty (7,8). Much of the evidence concerning persistent neural effects originates from preclinical research, studies of combustible tobacco, or populations outside Pakistan. It is therefore appropriate to describe cognitive harm as biologically plausible and potentially important, while avoiding claims of permanent impairment or a directly quantified reduction in academic performance among Pakistani students.

Clinical practice should prioritise non-judgmental identification of vaping rather than assuming that young patients will classify themselves as smokers. Clinicians assessing persistent cough, wheezing, breathlessness, palpitations, sleep disturbance, or concentration difficulties should ask separately about e-cigarettes, combustible cigarettes, waterpipe use, cannabis-containing products, and dual use. Symptomatic patients require evaluation according to their clinical presentation rather than automatic attribution of symptoms to vaping. Students who wish to stop using nicotine should receive behavioural

support and evidence-based cessation care. Evidence concerning nicotine e-cigarettes as cessation aids applies principally to established adult smokers and should not be extrapolated to justify initiation among nicotine-naïve students (9).

Universities should adopt policies that clearly include e-cigarettes within tobacco-free campus provisions while avoiding reliance on punishment alone. Effective institutional approaches should combine environmental restrictions with prevention education, confidential screening, counselling, referral pathways, and cessation support. Orientation programmes and student-health communication should address common misconceptions, explain that lower exposure to some toxicants than combustible cigarettes does not mean absence of risk, and distinguish between harm reduction for established adult smokers and recreational initiation among young non-smokers. Campus-health guidance supports comprehensive indoor and outdoor tobacco-free environments integrated with prevention and cessation services (11).

Regulatory responses should be proportionate to the available evidence and designed to reduce youth access and misleading promotion. Pakistan's principal federal tobacco-control ordinance predates the widespread availability of contemporary vaping products and does not clearly provide a comprehensive framework tailored to ENDS (12). Regulatory priorities may include age-of-sale enforcement, truthful health warnings, restrictions on youth-directed advertising and influencer promotion, product-quality standards, disclosure of nicotine concentration and ingredients, and surveillance of sales and adverse events. WHO has emphasised that e-cigarettes are harmful and addictive products that are extensively marketed to young people and that governments should protect children and non-smokers from uptake (10). Specific measures such as flavour restrictions, taxation levels, nicotine limits, or licensing systems should be evaluated in relation to local enforcement capacity, illicit-market risks, and their effects on both youth initiation and adult smoking cessation.

The review has several strengths. It separates Pakistan-specific findings from international mechanistic evidence, distinguishes self-reported symptoms from objective disease, and treats cognition and academic performance as different outcome domains. It also corrects a numerical inconsistency in the Lahore study and avoids pooling heterogeneous convenience samples. Its limitations arise from the underlying evidence base and from the narrative-review design. The available Pakistani studies were cross-sectional, used non-probability samples, relied on self-report, and provided limited confounder control. The review did not have sufficiently documented search and screening information to support claims of systematic comprehensiveness, and some initially supplied references could not be retained because their bibliographic identity or underlying data were insufficiently secure.

Future studies should use multicentre probability or stratified sampling and apply standard definitions of ever, current, regular, daily, exclusive, and dual use. Longitudinal cohorts should assess participants before and after vaping initiation and should include biochemical verification of nicotine exposure, detailed device and liquid characteristics, spirometry or other pulmonary measurements, validated cognitive instruments, sleep and mental-health assessment, and institutionally verified academic outcomes. Analyses should adjust for cigarette and waterpipe use, cannabis and alcohol consumption, respiratory disease, air pollution, socioeconomic position, psychological distress, and baseline academic performance. Qualitative research is also needed to clarify how peer relationships, gender norms, flavours, digital promotion, perceived status, and academic stress influence initiation and cessation within different Pakistani university settings.

## CONCLUSION

Vaping is present and socially embedded within selected Pakistani university populations, with peer communication, digital media, perceived social status, and beliefs about reduced harm contributing to its appeal. Cross-sectional studies have documented self-reported breathing problems, cough, shortness of breath, palpitations, and other health concerns among students who vape, but non-probability

sampling, absent comparison groups, self-reported measurement, and inadequate control of confounding prevent causal or nationally representative conclusions. The current Pakistan-specific evidence does not yet establish objective pulmonary impairment, neurocognitive deterioration, or reduced academic achievement attributable to vaping. Universities and clinicians should nevertheless identify vaping routinely, provide non-punitive prevention and cessation support, and evaluate symptomatic users appropriately, while future research should prioritise longitudinal, objectively measured, and geographically representative investigations.

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