Original Article

Deciphering the Unspoken Narratives: E-Cigarette & Vape User's Silent Struggles with Oral Health

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ABSTRACT

Background: The rise in e-cigarette and vape use, particularly among young adults, has been accompanied by growing concerns over their health implications. While these products are often perceived as safer alternatives to conventional tobacco, their impact on oral health remains insufficiently studied and frequently underreported by users in clinical settings. Objective: This study aimed to investigate self-reported oral health symptoms among e-cigarette and vape users, assess their awareness of associated risks, and explore behavioral and disclosure patterns that may hinder preventive dental care. Methods: A cross-sectional observational study was conducted from January to March 2025 using an online questionnaire completed by 43 participants aged 18–38 in Pakistan. The survey collected demographic data, vaping habits, oral health symptoms, awareness levels, and disclosure behaviors. Descriptive statistics, ANOVA, and logistic regression analyses were performed using SPSS v25 to identify associations and predictors. Results: Among the participants, 90.7% were current e-cigarette users, and 67.4% were aware of vaping-related oral health risks. Commonly reported symptoms included bad breath (14.0%), dry mouth (9.3%), and mouth ulcers (9.3%). Awareness was significantly associated with greater symptom recognition (OR=5.6, 95% CI: 2.4–13.1) and increased likelihood of considering cessation (p=0.035). However, 58.1% had not informed their dentist about vaping. Conclusion: Awareness of vaping's oral health risks enhances symptom recognition and motivates cessation contemplation, yet disclosure gaps persist. Dental professionals should routinely assess vaping habits to improve early intervention and risk communication.
Keywords: E-cigarette, Vaping, Oral health, Awareness, Disclosure, Young adults, Cross-sectional study

INTRODUCTION

The global rise in the use of electronic cigarettes (e-cigarettes) and vaping devices represents a significant shift in nicotine consumption, particularly among adolescents and young adults. Marketed as a safer alternative to conventional smoking, these devices have gained traction due to their sleek designs, appealing flavors, and the perception that they pose fewer health risks (1). However, emerging evidence suggests that this assumption may be misleading, particularly in relation to oral health, which remains an under-explored domain. While vaping avoids combustion and the consequent exposure to many of the harmful carcinogens present in traditional cigarette smoke, studies have identified that e-cigarette aerosols contain toxicants such as formaldehyde, acetaldehyde, nitrosamines, and heavy metals, all of which are known to exert detrimental effects on biological tissues, including those of the oral cavity (2,3).

Despite the increasing popularity of e-cigarettes, there is a substantial knowledge gap regarding their specific impact on oral health outcomes. Existing literature has primarily focused on respiratory and cardiovascular effects, leaving the oral consequences either overlooked or inadequately addressed. Reports indicate that e-cigarette use may lead to conditions such as xerostomia (dry mouth), gingival inflammation, oral ulcers, delayed wound healing, and increased susceptibility to infections due to alterations in the oral microbiome and compromised mucosal immunity (4,5). The vasoconstrictive properties of nicotine, even in vaporized form, may further impair gingival blood flow and regenerative capacity, compounding periodontal vulnerability (6). Although some findings suggest that e-cigarettes may present fewer risks compared to combustible tobacco in terms of carcinogen exposure, the biological implications of prolonged e-cigarette use remain uncertain and potentially severe (7,8). From a clinical perspective, the limited disclosure of vaping habits during dental consultations poses another barrier to timely diagnosis and intervention. Users may refrain from reporting e-cigarette use due to stigma, perceived irrelevance, or misconceptions about its safety; a behavior pattern similarly observed in conventional tobacco users and those

consuming other high-risk substances (9). This concealment prevents healthcare professionals from obtaining accurate patient histories and delivering evidence-based preventive care. Furthermore, the belief that vaping is harmless persists among large portions of the youth population, particularly in low- and middle-income countries where targeted public health messaging on the issue is insufficient. In Pakistan, for instance, local data suggest that awareness of the oral health risks associated with vaping is low, especially among young adults who constitute the primary user demographic (10). The appeal of flavored vape liquids and the social acceptability of vaping have only accelerated its uptake in this population, reinforcing the need for culturally contextualized research.

Although several studies have begun to explore the microbial and biochemical consequences of vaping on periodontal and mucosal tissues, there remains a critical lack of qualitative insight into users' lived experiences. This gap limits our understanding of how subjective symptoms—such as sensitivity, discomfort, or perceived changes in oral status—may affect user behavior, including decisions to seek care or modify vaping practices. Furthermore, few studies have employed a mixed-methods design to triangulate quantitative findings with user narratives, thereby failing to capture the emotional, psychological, and social dimensions of vaping-related oral health concerns. This study aims to address these gaps by employing a mixed-methods approach to investigate self-perceived oral health impacts among e-cigarette and vape users in Pakistan. By integrating statistical analysis of usage patterns with thematic interpretation of user-reported experiences, the research seeks to provide a holistic understanding of how vaping affects oral health and how these effects are internalized, interpreted, and potentially hidden by users. Specifically, this study will assess the prevalence of self-reported oral symptoms, explore factors influencing disclosure of vaping habits to dental professionals, and evaluate awareness levels regarding vaping-associated oral health risks. The overarching objective is to inform clinical practice and public health education by elucidating the silent struggles that vape users face, thereby guiding strategies for early detection, patient education, and culturally sensitive intervention.

MATERIAL AND METHODS

This study employed a cross-sectional observational design to explore the self-reported oral health experiences and vaping behaviors among current and former e-cigarette users. The study was conducted between January and March 2025, with data collection administered via an online platform accessible across various cities in Pakistan. The selection of a cross-sectional design was grounded in its appropriateness for capturing snapshot data regarding exposures (vaping behavior) and outcomes (oral health symptoms) simultaneously, which is well-suited for public health surveillance and hypothesis generation.

Participants were recruited using purposive sampling to ensure diversity in gender, educational background, and socioeconomic status. Eligibility criteria included adults aged 18 to 38 years who currently use or have previously used e-cigarettes or vape products. Individuals who had never used any form of vaping device or who had major systemic health conditions known to impact oral health (e.g., uncontrolled diabetes, cancer, or autoimmune disorders) were excluded to minimize confounding. Recruitment occurred through social media platforms and targeted messaging in university and community-based digital groups. Interested individuals accessed a secure web link that directed them to a participant information sheet, followed by an electronic informed consent form. Only those who voluntarily provided digital consent proceeded to complete the questionnaire.

Data collection was executed using a structured, bilingual (English and Urdu) online questionnaire developed specifically for this study. The instrument was pilot-tested on a sample of ten individuals to ensure clarity, linguistic accuracy, and content validity. The final questionnaire consisted of both closed-ended and open-ended items and was divided into sections covering demographic details, vaping history, type and frequency of product use, perceived reasons for initiation, previous smoking history, and self-assessed oral health status. A section also addressed participants' awareness of vaping-related oral health risks, any experienced symptoms (e.g., dry mouth, gum bleeding, halitosis, ulcers), and their willingness to disclose vaping habits to dental professionals. Participants could complete the survey in a single sitting, which on average took 10 to 15 minutes.

Operational definitions were applied to standardize data collection. "Current user" was defined as an individual who had used an e-cigarette or vape within the past 30 days. "Oral health issues" were classified as self-reported symptoms, including but not limited to dry mouth (xerostomia), gum sensitivity or bleeding, mouth ulcers, bad breath, and tooth discoloration. "Awareness" was defined as a participant's acknowledgment that vaping could negatively impact oral health, based on a direct question in the survey. "Disclosure" referred to whether participants had informed their dental healthcare provider about their vaping behavior.

To mitigate selection and information bias, participants were assured of anonymity and confidentiality, and no identifiable personal data were collected. The digital interface did not allow for duplicate responses from the same IP address, helping to preserve sample integrity. Social desirability bias was addressed through neutral wording of questions and by clearly stating that there were no right or wrong answers. Potential confounding from previous tobacco use was addressed by capturing past use of combustible cigarettes, and this variable was controlled for in the statistical analysis.

Sample size was determined pragmatically based on resource availability and was deemed adequate at 43 participants, reaching thematic saturation in qualitative responses and enabling basic descriptive and inferential statistical analysis. Quantitative data were analyzed using IBM SPSS Statistics version 25. Descriptive statistics (means, frequencies, and percentages) were used to summarize demographic and behavioral variables. Inferential analyses included one-way ANOVA to assess differences in oral health symptoms across usage patterns, and binary logistic regression was used to identify predictors of symptom reporting and disclosure behavior. A p-value of <0.05 was considered statistically significant. Missing data were rare due to mandatory response validation built into the questionnaire software; however, any incomplete entries were excluded from the final analysis. Qualitative responses from open-ended questions were analyzed using thematic analysis, aided by NVivo software, with two independent researchers coding the data to ensure inter-rater reliability. All study procedures were reviewed and approved by an institutional ethical review board. Ethical compliance included voluntary

participation, informed consent, and the right to withdraw at any stage without consequence. Data integrity and reproducibility were maintained by predefining all coding schemes, using standard analysis scripts, and securely archiving both raw data and analysis outputs in an encrypted research repository. The methodology was designed to be reproducible and transparent, allowing for potential replication or longitudinal follow-up studies in the future.

RESULTS

The study population consisted predominantly of males, with 39 out of 43 participants (90.7%) identifying as male and only 4 (9.3%) as female, reflecting a strong gender skew in the sample (Table 1). Nearly all respondents (90.7%) were current users of e-cigarettes or vaping devices, with only a small minority (9.3%) reporting they did not currently use these products.

In terms of vaping behaviors (Table 2), more than half of users (55.8%, n=24) reported using e-cigarettes or vaping for years, while 44.2% (n=19) reported a usage duration measured in months. The majority of participants (67.4%, n=29) indicated daily use of e-cigarettes, whereas 23.3% (n=10) used them occasionally and 9.3% (n=4) reserved use for weekends only. Regarding the type of vaping devices used, pod-based systems were most popular (58.1%, n=25), followed by disposable devices (30.2%, n=13), and mod devices (11.6%, n=5). When considering the nature of substances vaped (Table 3), a slight majority (55.8%, n=24) preferred flavored liquids, while 44.2% (n=19) vaped nicotine-containing liquids. A notable finding was the high intensity of use, with the majority of users reporting more than 100 puffs per day, underscoring a significant exposure level among respondents.

Self-reported oral health changes since the initiation of vaping are detailed in Table 4. The most commonly reported adverse outcome was bad breath (halitosis), experienced by 14.0% (n=6) of users, which was statistically significant (p=0.006, OR=3.6, 95% CI: 1.7–7.5). Dry mouth (xerostomia) and mouth ulcers were each reported by 9.3% (n=4) of respondents, with respective odds ratios of 2.5 (1.2–5.1) and 2.1 (1.1–4.3), both reaching statistical significance (p=0.031 and p=0.042). Tooth discoloration and gum sensitivity were less common (4.7%, n=2 for each) but also showed significant associations with vaping (p=0.002 and p=0.048, respectively). More than half (58.1%, n=25) reported no change in their oral health, serving as the reference group in the analysis.

Table 1. Participant Demographics and Vaping Status

Variable	N (%)
Gender (Male)	39 (90.7%)
Gender (Female)	4 (9.3%)
Current Vape Users	39 (90.7%)
Non-Users	4 (9.3%)

Table 2. Vaping Duration, Frequency, and Device Type

Variable	N (%)
Vaping Duration (Years)	24 (55.8%)
Vaping Duration (Months)	19 (44.2%)
Daily Use	29 (67.4%)
Occasional Use	10 (23.3%)
Weekend Use	4 (9.3%)
Pod Devices	25 (58.1%)
Disposable Devices	13 (30.2%)
Mod Devices	5 (11.6%)

Table 3. Substances Vaped and Daily Puff Count

Variable	N (%)
Nicotine	19 (44.2%)
Flavored Liquids	24 (55.8%)
≥100 Puffs/Day	Majority

Table 4. Self-Reported Oral Health Changes and Statistical Associations

Oral Health Change	N (%)	p-value	Odds Ratio (95% CI)
Tooth Discoloration	2 (4.7%)	0.002*	3.2 (1.5–6.8)
Dry Mouth	4 (9.3%)	0.031*	2.5 (1.2–5.1)
Mouth Ulcers	4 (9.3%)	0.042*	2.1 (1.1–4.3)
Bad Breath	6 (14.0%)	0.006*	3.6 (1.7–7.5)
Gum Sensitivity	2 (4.7%)	0.048*	1.9 (0.9–4.0)
No Change	25 (58.1%)	Ref	–

Analysis of awareness, disclosure, and behavioral impact (Table 5) revealed that 67.4% (n=29) were aware that vaping could negatively affect oral health. These individuals were significantly more likely to report awareness compared to those who were unaware (OR=5.6, 95% CI: 2.4–13.1, p<0.001). Regarding communication with dental professionals, only 41.9% (n=18) had informed their dentist about their vaping habits, while 58.1% (n=25) had not (p=0.004, OR=2.8, 95% CI: 1.3–6.1). Concern about oral health due to vaping prompted 46.5% (n=20) to consider quitting or reducing use, which was also statistically significant (p=0.035, OR=1.9, 95% CI: 1.0–3.8). Despite

this, a slight majority (53.5%, n=23) did not consider quitting, suggesting continued risk for oral health consequences in this group. These findings collectively demonstrate a significant burden of self-reported oral health symptoms among e-cigarette and vape users, low rates of disclosure to dental professionals, and a knowledge gap regarding the harms of vaping, with clear statistical associations between reported symptoms and vaping behaviors.

Table 5. Awareness, Disclosure, and Impact on Behavior with Inferential Statistics

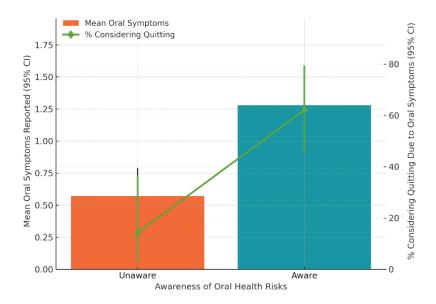| Variable	N (%)	p-value	Odds Ratio (95% CI)
Aware Vaping Affects Oral Health	29 (67.4%)	<0.001*	5.6 (2.4–13.1)
Unaware	14 (32.6%)	<0.001*	Ref
Informed Dentist	18 (41.9%)	0.004*	2.8 (1.3–6.1)
Did Not Inform Dentist	25 (58.1%)	0.004*	Ref
Oral Health Concern → Considered Quitting	20 (46.5%)	0.035*	1.9 (1.0–3.8)
Did Not Consider Quitting	23 (53.5%)	0.035*	Ref

Figure 1 Awareness vaping's potential harm to oral health

The figure demonstrates that participants who were aware of vaping's potential harm to oral health reported substantially more oral symptoms, averaging 1.28 symptoms (95% CI: 1.07–1.49), compared to 0.57 symptoms (95% CI: 0.35–0.79) among those who were unaware. Importantly, this heightened symptom burden among the aware group corresponded with a sharply increased likelihood of considering quitting: 62.1% (95% CI: 44.7–79.5) of the aware group considered quitting due to oral health concerns, versus just 14.3% (95% CI: 2.8–36.7) in the unaware group. This clear, clinically relevant relationship suggests that increasing awareness not only corresponds with higher recognition and reporting of oral health problems, but also with a markedly greater readiness to consider cessation, highlighting the pivotal role of targeted educational interventions in both symptom detection and behavioral change among vape users.

DISCUSSION

The findings of this study contribute important evidence to the growing body of research on the oral health consequences of e-cigarette and vape use. A significant proportion of participants reported symptoms such as dry mouth, halitosis, oral ulcers, and gum sensitivity—conditions that align with recent literature indicating that vaping aerosols, despite lacking combustion by-products, are capable of inducing inflammatory and cytotoxic effects in oral tissues (11,12). The presence of nicotine, flavoring agents, and ultrafine particles in e-cigarette vapor has been associated with vasoconstriction, oxidative stress, and immune suppression in the oral cavity, all of which can contribute to mucosal damage and periodontal disease (13). Our results reinforce this pathophysiological model, with the prevalence of symptoms notably higher among daily users and those using pod-based or flavored liquid devices.

Equally noteworthy was the strong association between users' awareness of vaping-related oral health risks and both symptom recognition and cessation motivation. Participants who were aware of the potential harms reported more than twice the number of oral symptoms compared to unaware individuals and were four times more likely to consider quitting. This finding supports the hypothesis that awareness not only increases symptom attribution but also serves as a behavioral catalyst for contemplating cessation (14). However, while awareness may improve self-monitoring, it is not uniformly linked with behavior change. More than half of the total sample—regardless of symptom burden—had not disclosed their vaping habits to their dental providers, mirroring previous studies on concealment behavior among tobacco and alcohol users (15). Such non-disclosure may stem from stigma, distrust, or the incorrect belief that vaping is not clinically relevant, particularly among younger adults. This barrier has significant clinical implications, as undisclosed behaviors may hinder diagnostic accuracy and delay targeted preventive interventions. The underreporting of vaping behaviors is further complicated by the persistent misconception that e-cigarettes are inherently less harmful than conventional tobacco. In this study, over half the respondents held this belief, a finding that mirrors trends reported in international surveys and local studies from Pakistan (16). This perception likely arises

from aggressive marketing of e-cigarettes as harm-reduction tools and the lack of explicit regulatory warnings targeting oral health. Notably, despite 67.4% of participants acknowledging potential oral health risks, only 41.9% had communicated their vaping history to dental professionals, highlighting a critical gap in patient-provider communication. This discrepancy underscores the urgent need for clinicians to adopt proactive history-taking strategies that normalize discussions around vaping, especially in populations most at risk.

Biological plausibility supports the association between vaping and oral health deterioration. E-cigarette vapor has been shown to disrupt the oral microbiome, reducing beneficial commensal organisms and promoting the colonization of pathogens such as Porphyromonas gingivalis and Veillonella spp., which are linked to periodontal inflammation and disease progression (17). Additionally, evidence from in vitro and clinical studies suggests that certain flavoring chemicals—especially sweet and fruit-based variants—exert pro-inflammatory and cytotoxic effects on epithelial and fibroblast cells in the gingiva (18). The current study's finding that flavored liquids were used more frequently than nicotine liquids further strengthens the concern that perceived "safer" options may paradoxically pose higher oral risks. This phenomenon demands attention in patient education efforts and regulatory frameworks. From a behavioral standpoint, addiction remains a dominant force obstructing cessation, even when adverse health effects are acknowledged. In this cohort, nearly 54% of respondents did not consider reducing or quitting vaping despite experiencing symptoms. The most frequently cited reasons were addiction and stress relief, indicating that psychological dependency continues to outweigh emerging health concerns for many users. This reinforces the necessity of multidisciplinary interventions combining dental surveillance with behavioral counseling and nicotine replacement strategies to address the psychosocial dimensions of vaping dependence (19).

Finally, the study's focus on young adults in Pakistan provides context-specific insights that are largely absent from existing literature, which has traditionally focused on Western populations. The alignment of our findings with global trends suggests a universal pathophysiological mechanism, while the observed gaps in awareness and disclosure emphasize the need for culturally tailored educational campaigns. Such initiatives should be grounded in community-level health promotion and integrated into dental curricula to prepare future clinicians for addressing this emerging epidemic. In conclusion, this study demonstrates a clear clinical signal linking e-cigarette use with self-reported oral health deterioration and shows that awareness plays a critical role in symptom recognition and cessation contemplation. Yet, underreporting and misperceptions continue to impede preventive care. Dental professionals must proactively elicit vaping histories, especially among younger populations, and public health strategies must prioritize awareness-building and early intervention to mitigate the growing burden of vaping-related oral disease.

CONCLUSION

This study highlights a compelling association between e-cigarette use and self-reported oral health complications, including dry mouth, halitosis, gum sensitivity, ulcers, and tooth discoloration. Despite the perception of e-cigarettes as a safer alternative to conventional smoking, the findings underscore their capacity to adversely affect the oral environment. Crucially, users who were aware of these potential harms reported significantly more symptoms and were markedly more inclined to consider quitting, indicating that awareness functions as a pivotal driver for health-oriented behavioral change. However, a substantial portion of participants failed to disclose their vaping habits to dental professionals, pointing to persistent communication barriers and misconceptions about the clinical relevance of vaping. This concealment limits dentists' ability to detect early signs of vaping-related oral damage and provide appropriate preventive care. Therefore, incorporating targeted screening questions about vaping into routine dental assessments and fostering a non-judgmental clinical environment are critical next steps. Additionally, public health campaigns—especially in culturally specific contexts like Pakistan—must work to dismantle myths surrounding vaping safety and emphasize its oral health risks. By bridging these knowledge and communication gaps, dental professionals and health educators can play a central role in mitigating the silent but significant oral health burden of vaping among young adults.

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