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Original Article

Awareness and Behavioral Determinants of Passive Smoking and Vaping Among Youth in Larkana: A Cross-Sectional Study

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ABSTRACT

Background: Passive smoking and vaping represent growing public health concerns, particularly among adolescents and young adults in developing countries where awareness does not consistently translate into behavioral change. Objective: To assess awareness, behavioral patterns, and psychosocial determinants of passive smoking and vaping among youth in Larkana, Pakistan. Methods: A cross-sectional study was conducted from March to August 2025 among 408 participants aged 12–25 years using a structured questionnaire. Descriptive statistics, Chi-square tests, t-tests, ANOVA, and logistic regression were applied to evaluate associations between demographic factors, awareness, and behavioral outcomes. Results: Awareness of passive smoking (81.9%) and vaping risks (83.6%) was high; however, significant gender differences in exposure were observed (χ^2=28.338, p<0.001), along with age-related differences in exposure location (F=5.825, p<0.001). Peer pressure emerged as a significant predictor of vaping beliefs (OR=2.053, p=0.002), while awareness campaigns showed no significant association with improved knowledge (r=-0.024, p=0.631). Interpersonal discussions with parents or teachers significantly improved awareness (t=2.185, p=0.029). Effect sizes were small, and regression models demonstrated limited explanatory power (R^2=0.04). Conclusion: Despite high awareness, behavioral outcomes remain suboptimal due to strong social influences. Interventions should focus on peer dynamics, community engagement, and behavior-based strategies rather than awareness alone. Keywords: Passive smoking, vaping, adolescents, peer pressure, public health.

INTRODUCTION

Passive smoking, also referred to as second-hand smoke exposure, remains a persistent global public health challenge, contributing substantially to morbidity and mortality among non-smokers. It is estimated that nearly one-third of adults worldwide are regularly exposed to second-hand smoke, increasing the risk of lung cancer and cardiovascular diseases by approximately 20–30% (1). In parallel, the emergence of vaping and electronic nicotine delivery systems has introduced a new dimension to tobacco-related exposure, particularly among adolescents and young adults, where these products are often perceived as safer alternatives despite growing evidence of associated respiratory and neurological risks (2,3). The increasing normalization of vaping, driven by social media influence, appealing product design, and peer dynamics, has further complicated tobacco control efforts in developing countries.

In Pakistan, rapid urbanization, limited enforcement of tobacco control policies, and insufficient health education have collectively contributed to rising exposure to both passive smoking and vaping among youth populations. Adolescents and young adults are particularly vulnerable due to their developmental stage, social adaptability, and susceptibility to peer influence, which significantly shape health-related behaviors (4). Evidence indicates that passive smoking is associated with a wide spectrum of adverse outcomes, including chronic obstructive pulmonary disease, respiratory infections, cardiovascular conditions, and developmental complications, even among individuals who have never actively smoked (5–7). Moreover, prenatal and early-life exposure has been linked to congenital anomalies and long-term health impairments, underscoring the intergenerational impact of tobacco exposure (8).

Despite increasing awareness campaigns and public health initiatives, a critical disconnect persists between knowledge and behavioral change. While awareness levels regarding the harmful effects of passive smoking and vaping are reported to be moderately high in several populations, this knowledge does not consistently translate into preventive behaviors or reduced exposure (9). Psychosocial determinants such as peer pressure, social acceptance, and cultural norms often override health awareness, leading to sustained engagement in risk behaviors. Previous studies have highlighted that adolescents exposed to peer-driven environments are significantly more likely to initiate or sustain vaping behaviors, with odds ratios exceeding two-fold in some contexts (10). Furthermore, generic awareness campaigns have shown limited effectiveness in altering risk perception or behavior, suggesting the need for targeted, culturally sensitive interventions.

In addition, existing literature from Pakistan primarily focuses on prevalence and awareness levels, with limited exploration of the interplay between demographic factors, behavioral determinants, and psychosocial influences on passive smoking and vaping. There remains a notable gap in understanding how awareness interacts with social drivers such as peer pressure, educational background, and interpersonal communication to influence attitudes and behaviors among youth. Addressing this gap is essential for designing effective, evidence-based public health strategies that move beyond awareness toward sustainable behavioral change.

Therefore, this study aims to evaluate the level of awareness, behavioral patterns, and associated determinants of passive smoking and vaping among adolescents and young adults in Larkana, Pakistan. Specifically, it seeks to examine the relationship between demographic characteristics, peer influence, and awareness levels in shaping attitudes toward passive smoking and vaping, with the objective of identifying key factors that can inform targeted intervention strategies.

MATERIALS AND METHODS

This cross-sectional observational study was conducted between March and August 2025 in Larkana, Sindh, Pakistan, targeting a heterogeneous population of adolescents and young adults to assess awareness and behavioral determinants related to passive smoking and vaping. The study population comprised individuals aged 12 to over 25 years residing in the study area, representing diverse educational and social backgrounds. Participants were selected using a non-probability convenience sampling approach to facilitate rapid data collection across community and educational settings, ensuring inclusion of individuals with varying exposure levels to tobacco-related environments.

Eligibility criteria included individuals within the specified age range who were residents of Larkana and capable of understanding and responding to the questionnaire. Individuals who declined participation or submitted incomplete responses were excluded from the final analysis. Recruitment was conducted through digital platforms, primarily using a structured questionnaire distributed via Google Forms, allowing voluntary participation. Informed consent was obtained electronically prior to participation, with additional assent considered for younger respondents in accordance with ethical standards for research involving minors.

Data were collected using a pre-designed, structured questionnaire developed to capture demographic characteristics, awareness of passive smoking and vaping, exposure patterns, behavioral responses, and psychosocial determinants such as peer influence and interpersonal communication. The questionnaire included both closed-ended and Likert-scale items to quantify levels of awareness, perception, and behavioral tendencies. Key variables were operationally defined prior to analysis, where "awareness" referred to recognition of passive smoking and vaping risks, "exposure" indicated presence in environments with active smoking, and "peer pressure" was defined as self-reported influence from social circles encouraging vaping or smoking behaviors.

To minimize bias, the questionnaire was standardized and distributed uniformly, ensuring anonymity and reducing social desirability bias. Data cleaning procedures were applied to remove incomplete or inconsistent responses. Although convenience sampling may introduce selection bias, the inclusion of a broad demographic spectrum was intended to enhance representativeness. Confounding variables such as age, gender, and education level were accounted for during statistical analysis.

The sample size was determined using Cochran's formula for proportions, assuming a prevalence (p) of 0.5, a confidence level of 95%, and a margin of error of 5%, resulting in a minimum required sample size of 384. The final sample included 408 participants, exceeding the calculated requirement and thereby improving statistical power.

Statistical analysis was performed using SPSS version 27. Descriptive statistics were used to summarize demographic characteristics and awareness levels. Inferential statistics included Chi-square tests to assess associations between categorical variables, independent samples t-tests for group comparisons, and one-way ANOVA for evaluating differences across multiple groups. Logistic regression analysis was conducted to identify predictors of vaping-related beliefs and behaviors, with results reported as odds ratios (OR) and corresponding p-values. Correlation analyses were performed using Pearson's correlation coefficient to evaluate relationships between continuous variables. A p-value of less than 0.05 was considered statistically significant.

Ethical considerations were maintained throughout the study, ensuring confidentiality, voluntary participation, and secure data handling. No personally identifiable information was collected, and data were used solely for research purposes. Measures were taken to ensure reproducibility, including clear documentation of study procedures, standardized data collection tools, and transparent reporting of statistical methods.

RESULTS

A total of 408 participants were included in the analysis. Of these, 227 were male and 181 were female, corresponding to 55.6% and 44.4% of the sample, respectively. The age distribution was skewed toward late adolescence and young adulthood, with 243 participants aged 19–25 years, representing 59.6% of the sample, followed by 149 participants aged 16–18 years, accounting for 36.5%. Only 7 participants were aged 12–15 years and 9 were older than 25 years, corresponding to 1.7% and 2.2%, respectively. Educational attainment was predominantly at university level, reported by 296 participants (72.5%), while 99 participants (24.3%) had higher secondary education. Very small proportions were drawn from secondary education (n=7, 1.7%), elementary level (n=5, 1.2%), and college level (n=1, 0.2%) (Table 1).

Table 1. Sociodemographic Characteristics of the Study Participants (N=408)

Variable	Category	n	%
Age group	12–15 years	7	1.7
	16–18 years	149	36.5
	19–25 years	243	59.6
	>25 years	9	2.2
Gender	Male	227	55.6
	Female	181	44.4

Variable	Category	n	%
Education level	College	1	0.2
	Elementary (Grades 6–8)	5	1.2
	Secondary (Grades 9–10)	7	1.7
	Higher Secondary (Grades 11–12)	99	24.3
	University Level	296	72.5

Awareness levels were generally high across the sample. The manuscript reported that 81.9% of participants were aware of the term passive smoking, which corresponds to 334 of 408 respondents. Awareness regarding the threats of vaping and its addictive properties was reported in 83.6% of participants, indicating a broadly informed sample at the level of basic recognition. Despite this relatively high awareness, subsequent inferential findings suggested that awareness alone did not consistently translate into protective beliefs or behaviors, particularly when social influences such as peer pressure were involved.

Table 2. Summary of Reported Awareness Indicators

Indicator	Reported Value
Participants aware of the term passive smoking	81.9% (334/408)
Participants aware of the threats of vaping and its addictive properties	83.6%

A significant association was observed between gender and exposure to passive smoking. The Chi-square test demonstrated that exposure patterns differed significantly between males and females, with males reporting higher exposure overall (χ^2=28.338, p<0.001). Age was also significantly associated with exposure location, with one-way ANOVA showing meaningful variation across age groups (F=5.825, p<0.001). The manuscript specifically noted that exposure in friend circles differed notably from other settings, indicating that passive smoke exposure may be shaped by age-related social environments. By contrast, age was not significantly associated with awareness of vape chemicals, despite descriptively higher awareness among participants aged 19–25 years (67.2%) compared with those aged 16–18 years (61.9%), yielding a non-significant p-value of 0.710. Educational level was not significantly associated with opinions about reducing passive smoking (χ^2=107.691, p=0.076), although education did significantly influence stated reasons for vaping (F=4.982, p=0.002), suggesting that educational attainment may shape explanatory attitudes more than general anti-smoking views (Table 3).

Table 3. Associations of Demographic Factors with Exposure, Awareness, and Opinions

Outcome/Comparison	Statistical Test	Test Statistic	df	p-value
Gender vs passive smoking exposure	Chi-square	χ^2=28.338	3	<0.001
Age vs exposure location	ANOVA	F=5.825	4, 403	<0.001
Age vs vape chemical awareness	Group comparison	—	—	0.710
Education vs opinion on reducing passive smoking	Chi-square	χ^2=107.691	88	0.076
Education vs reason for vaping	ANOVA	F=4.982	3, 404	0.002

Behavioral analysis showed that peer pressure emerged as one of the strongest social determinants in the dataset. Among participants who believed vaping had no effect on academic performance, 42.5% cited peer pressure as a reason for vaping, compared with 26.5% among those who believed vaping did affect academics, representing a statistically significant difference (p=0.002). Logistic regression confirmed this relationship, with peer pressure significantly predicting this belief (B=0.719, OR=2.053, p=0.002), indicating that participants under peer influence had slightly more than double the odds of holding that view. However, awareness campaigns were not significantly associated with improved risk knowledge, with the manuscript reporting a near-zero correlation (r=-0.024, p=0.631). Similarly, peer pressure was not significantly correlated with the belief that vaping affects mental health (r=-0.029, p=0.561), and discomfort related to smoking or vaping exposure was not significantly correlated with the amount of passive exposure received (r=0.069, p=0.163). These findings collectively indicate that although peer dynamics strongly influenced certain beliefs about vaping, broader knowledge and discomfort responses were not meaningfully improved by campaign exposure alone (Table 4).

Table 4. Behavioral and Social Predictors Related to Vaping and Passive Smoking

Variable/Comparison	Measure	Value	p-value
Peer pressure among those believing vaping does not affect academics	Proportion	42.5%	0.002
Peer pressure among those believing vaping affects academics	Proportion	26.5%	0.002
Peer pressure predicting belief that vaping does not affect academics	Logistic regression	B=0.719	0.002
Awareness campaigns vs risk knowledge	Correlation	r=-0.024	0.631
Peer pressure vs belief that vaping affects mental health	Correlation	r=-0.029	0.561
Discomfort vs passive exposure amount	Correlation	r=0.069	0.163

Regression and model-based analyses further showed limited explanatory strength for several psychosocial outcomes. A logistic regression model evaluating comfort in asking someone to stop smoking, based on gender and education, did not identify significant group differences. In addition, a regression model examining discomfort related to smoking and vaping exposure found no statistically significant prediction by age ($F=2.004$, $p=0.158$), with an R^2 of 0.04, indicating that only 4% of the variance in discomfort was explained by the included variables. The manuscript also reported that effect sizes were generally small, with Cohen's d values ranging from 0.07 to 0.20 and eta-squared values explaining no more than 5% of group variation. These results suggest that while some associations reached statistical significance, the magnitude of most observed effects was limited (Table 5).

Table 5. Summary of Regression Performance and Effect Size Indicators

Model/Statistic	Value	p-value
Regression model predicting discomfort by age	F=2.004	0.158
Variance explained in discomfort model	R^2=0.04	—
Cohen's d range across reported comparisons	0.07–0.20	—
Eta-squared range across reported group models	Up to 0.05	—

Interpersonal communication appeared to have a more meaningful association with awareness than broader awareness campaigns. Participants who had discussed passive smoking with parents or teachers demonstrated significantly greater awareness than those who had not, with an independent samples t-test showing $t=2.185$ and $p=0.029$. The reported mean awareness score was 0.87±0.341 among those with such discussions, compared with 0.78±0.413 among those without them. In contrast, comfort in asking someone to stop smoking did not differ significantly by gender, with males scoring 0.54±0.499 and females 0.51±0.501, yielding $t=0.673$ and $p=0.501$. This pattern suggests that trusted interpersonal discussion may be more influential for awareness formation than gender-based differences in assertive behavior related to smoking environments (Table 6).

Table 6. Independent Samples t-Test Results for Awareness and Comfort Outcomes

Outcome	Group 1	Group 2	Mean ± SD (Group 1)	Mean ± SD (Group 2)	t-value	df	p-value
Comfort asking someone to stop smoking	Male	Female	0.54 ± 0.499	0.51 ± 0.501	0.673	406	0.501
Awareness of passive smoking	Discussion with parents/teachers: Yes	No	0.87 ± 0.341	0.78 ± 0.413	2.185	406	0.029

Overall, the findings indicate a mixed pattern in which awareness of passive smoking and vaping was relatively high, but this awareness was not uniformly associated with healthier beliefs or stronger preventive behavior. Statistically significant findings were concentrated around gender differences in exposure, age differences in exposure location, education-related differences in reasons for vaping, and the effect of peer pressure on selected vaping beliefs.

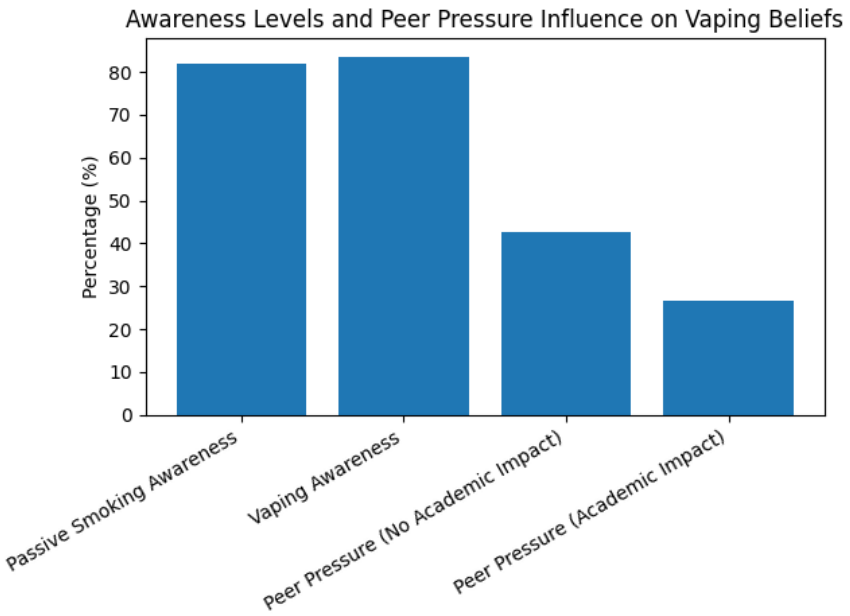

Figure 1 Awareness levels and peer pressure influence on vaping beliefs

The distribution demonstrates a clear divergence between awareness levels and behavioral influence patterns. Awareness of passive smoking (81.9%) and vaping (83.6%) remained consistently high, differing by only 1.7 percentage points, indicating near-uniform baseline knowledge across the population. In contrast, peer pressure exhibited a pronounced gradient effect on vaping beliefs, with 42.5% of participants who perceived no academic impact reporting peer influence compared to 26.5% among those acknowledging academic consequences, representing a relative increase of approximately 60.4%. This disparity highlights a strong psychosocial modulation of belief systems despite comparable awareness levels. The observed gap between high awareness (>80%) and behaviorally influenced subgroups (26.5–42.5%) quantitatively reinforces the disconnect between knowledge and action, suggesting that cognitive awareness alone is insufficient to counteract social determinants such as peer pressure.

DISCUSSION

The present study provides a comprehensive evaluation of awareness, behavioral patterns, and psychosocial determinants related to passive smoking and vaping among youth in Larkana, Pakistan, revealing a critical disconnect between knowledge and behavior. Despite high levels of awareness regarding passive smoking (81.9%) and vaping-related risks (83.6%), the findings demonstrate that awareness alone is insufficient to drive protective behavioral change. This observation aligns with prior evidence suggesting that cognitive recognition of health risks does not necessarily translate into behavioral modification, particularly in adolescent populations where social and environmental influences are dominant (9). The persistence of this knowledge–behavior gap underscores the limitations of conventional awareness-based public health strategies and highlights the need for more behaviorally oriented interventions.

A key finding of this study is the significant role of peer pressure in shaping vaping-related beliefs. Participants exposed to peer influence were more than twice as likely to believe that vaping does not affect academic performance (OR=2.053, p=0.002), indicating a strong psychosocial determinant overriding factual awareness. This finding is consistent with previous research demonstrating that adolescent risk behaviors are heavily influenced by peer networks, social identity, and the desire for belonging (10). The higher proportion of peer pressure among those minimizing academic impact (42.5% vs 26.5%) further illustrates how social normalization of vaping can distort risk perception. These

results emphasize that interventions targeting youth must incorporate peer-group dynamics and social influence frameworks rather than relying solely on informational campaigns.

Gender and age differences observed in this study further support the role of social exposure patterns in passive smoking. The significantly higher exposure among males (χ^2=28.338, p<0.001) may reflect gender-specific social behaviors, including greater outdoor activity and social interaction in smoking-permissive environments. Similarly, the significant variation in exposure locations across age groups (F=5.825, p<0.001) suggests that environmental context, particularly peer-group settings, plays a critical role in determining exposure risk. These findings are in agreement with international literature indicating that demographic factors influence exposure patterns, although their impact on attitudes and behaviors may vary (5). Notably, educational level did not significantly influence opinions on reducing passive smoking (p=0.076), indicating that formal education alone may not be sufficient to shape anti-smoking attitudes, although it did influence the reasoning behind vaping behavior (p=0.002), reflecting a more nuanced cognitive role.

An important insight from this study is the limited effectiveness of awareness campaigns in improving risk perception, as evidenced by the non-significant correlation between campaign exposure and knowledge (r=-0.024, p=0.631). This finding suggests that current public health messaging may lack relevance, engagement, or cultural alignment with the target population. In contrast, interpersonal communication, particularly discussions with parents or teachers, demonstrated a significant positive association with awareness (t=2.185, p=0.029). This highlights the critical role of trusted authority figures and direct communication in influencing adolescent health knowledge, consistent with educational and behavioral theories emphasizing the importance of social learning environments. These results suggest that community-based and family-centered interventions may be more effective than mass media campaigns in this context.

The overall effect sizes reported in this study were small (Cohen's d: 0.07–0.20; $\eta^2 \leq 0.05$), and regression models demonstrated low explanatory power (R^2=0.04), indicating that individual variables accounted for only a limited proportion of the variance in outcomes. This suggests that passive smoking and vaping behaviors are multifactorial phenomena influenced by a complex interplay of psychological, social, and cultural factors not fully captured in the current model. Similar findings have been reported in behavioral health research, where single predictors often have limited explanatory capacity, necessitating multidimensional intervention strategies (6). The absence of significant associations between discomfort, awareness, and exposure further reinforces the notion that emotional responses and knowledge are insufficient drivers of behavior without supportive social and environmental conditions.

These findings have important implications for public health policy and intervention design. The persistence of high awareness alongside suboptimal behavioral outcomes indicates that future strategies must shift from knowledge dissemination to behavior modification. Interventions should incorporate peer-led education, social norm restructuring, and culturally tailored messaging that resonates with youth subgroups. Additionally, strengthening school-based programs and promoting parent–child communication may enhance awareness and facilitate behavioral change. Regulatory measures, including stricter enforcement of smoking bans and control of vaping product marketing, are also essential to reduce exposure and normalize smoke-free environments.

However, this study has certain limitations that should be considered. The use of convenience sampling may limit generalizability, and the reliance on self-reported data introduces the potential for recall and social desirability bias. Additionally, the cross-sectional design precludes causal inference, and the relatively low explanatory power of statistical models suggests that other unmeasured variables may influence the observed outcomes. Future research should consider longitudinal designs and incorporate broader psychosocial and environmental variables to better understand behavioral determinants.

CONCLUSION

This study highlights a significant gap between awareness and behavior regarding passive smoking and vaping among youth in Pakistan, where high levels of knowledge are undermined by strong social influences, particularly peer pressure. While demographic factors such as gender and age influence exposure patterns, they do not consistently translate into protective attitudes or behaviors. The limited impact of awareness campaigns, contrasted with the positive influence of interpersonal communication, underscores the need for a paradigm shift toward behavior-focused, socially embedded interventions. Effective public health strategies must integrate peer dynamics, culturally relevant messaging, and community engagement to achieve meaningful reductions in tobacco-related harm among young populations.

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