Research Article

The Rise of Vaping Culture in Students: Exploring the Trends and Dynamics of E-Cigarette Use: A Cross-Sectional Study

Aiza Ashraf Zia,[1] Ajwa Kaleem,[2] Aimen Hassan,[3] Abdullah Qasim,[4] Abdul Wasay Haseeb,[5] Naila Bajwa.[6]

[1-6]*Department of Community Medicine, King Edward Medical University, Lahore.*

Abstract

Background: Vapes and e-cigarettes are portable devices that heat a nicotine-containing fluid to produce inhalable emissions. Their use has grown significantly and teenagers who vape risk nicotine addiction and impaired brain development.

Objective: To assess the rise of vaping culture and exploring the trends and dynamics of e cigarette use among medical and non-medical students.

Methods: This study was a cross-sectional survey that targeted 222 students from reputable institutions across Punjab using a convenient sampling technique. The data collection tool was pre-tested structured questionnaire that assessed the participant's familiarity with the trends of e-cigarette in their respective colleges. We analyze the data using chi-square test for bivariate associations. P-value of <0.05 was considered statistically significant

Results: Among the 222 respondents, most of the participants were male students who were familiar with the use and risk of vaping. The most common reason of vaping was peer pressure in both medical and non students. Majority of medical students reported no impact of vape on their academic performance whereas increased absenteeism was reported among non medical students. The survey suggests that medical students all over Punjab are generally aware about vaping and its risks however non medical students should be educated more about the severity and impact of e-cigarette use

Conclusion: The study shows distinct disparities in e- cigarette and vape behaviors between medical and non-medical students. Medical students demonstrate more awareness of health risks, lower smoking prevalence, and minimal academic disruption from vaping. In contrast, non-medical students exhibit higher smoking rates and significant academic challenges such as increased absenteeism.

Keywords | Vape, e-cigarette, students, smoking, Punjab.

Corresponding author: Aiza Ashraf, **Email:** aizaashrafzia@gmail.com

Introduction

Vape and e-cigarettes are portable devices that heat a fluid that usually contains flavoring compounds, a humectant, and nicotine to produce emissions for inhalation.[1] Although there are variations in design, most devices have a heating element, a reservoir for the "e-liquid," and a power source (usually a lithium battery). Propylene glycol or vegetable glycerin are commonly used as a solvent in e-liquids, along with flavorings including tobacco, mint, fruit, and bubblegum. A heater is activated when the user inhales, converting some of the liquid into an aerosol that is breathed. This process is triggered by the negative pressure closing a switch. It is theoretically possible to aerosolize and vape any heat stable psychoactive recreational substance. Narcotics including crack cocaine, LSD, methamphetamine, and synthetic cannabinoid receptor agonists are among the recreational substances found in an increasing number of e-liquid reports.[2] By modifying the wattage, temperature, and airflow of the device, vapers who want an even higher nicotine dose with every puff have even more control over the quantity of nicotine they receive.[3] Nicotine may be included in the aerosol, although the formulas are currently unregulated and proprietary.[4]

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Since e-cigarettes were first introduced to the US market, there has been a significant growth in their use, promotion, and awareness. Despite the decline in vaping popularity over the past two years, 3.3% of middle school students and 14.1% of high school students reported use of e-cigarettes.[5] In 2016, a survey conducted among medical students in Pakistan found that 65.6% of them were aware of ECs, and 6.2% of them reported using them, of which 1.2% were daily users.[6] About 2006, the e-cigarette was brought to the US market from China, where it was marketed under the name "electronic atomizing cigarette."[7]

Teenagers who vape can inhale large quantities of nicotine, which can have detrimental impacts on brain development, learning, memory, and attention, as well as increase the chance of addiction.[8]

The objective of our cross-sectional study is to survey the rising dynamics and current trends of e-cigarette usage among medical and non-medical students.

Methodology

The study employed a cross-sectional design and was conducted among students from both medical and non-medical colleges in Punjab, Pakistan. The research encompassed data collection, analysis, and interpretation, and the entire study was completed within three months following the submission of the synopsis. Asample size of 222 students was determined based on a 95% confidence level, a 5% margin of error, and an expected prevalence of 17.7%.[9] The sample size was calculated using the formula:

$$n = \frac{Z^2 - a/2 \,.pq}{a^2}$$

Where n represents the required sample size, Z is the Z-score corresponding to a 95% confidence level, P is the expected proportion of the population, and a is the tolerated margin of error. A non-probability consecutive sampling technique was employed for selecting participants. The inclusion criteria focused on students aged 18-25 years, while those below 18 or above 25 were excluded from the study.

Data were collected using a pretested structured, interviewer-administered questionnaire that was inspired by a questionnaire used to conduct a similar study in Shanghai, China.[24]

Participants were recruited from both medical and non-medical universities across Punjab. The questionnaire consisted of three sections: the first section gathered biodata, including the participant's name, gender, and information regarding their college; the second section focused on participants' knowledge about e-cigarettes, including the frequency of use and awareness of associated health risks; and the third section covered participants' perceptions of vaping and e-cigarettes, reasons for vaping, and the effects of vaping on users. This comprehensive data collection procedure ensured the collection of relevant and diverse information related to e-cigarette usage and perceptions.

The collected data were cleaned, edited, and coded before analysis. After evaluating the original data using questionnaire code numbers, any identified mistakes were corrected. The data were then entered and analyzed using the Statistical Package for the Social Sciences (SPSS) version 24. For quantitative variables such as age, number of cigarettes consumed, and frequency of smoking, the mean and standard deviation were calculated. For qualitative variables such as being a medical student, knowledge and perceptions about e-cigarettes, substances used, reasons for vaping, and effects of vaping, the chi-square test was used for bivariate associations. A p-value of <0.05 was considered statistically significant.

Results

A total of 222 students from medical and non medical universities of Punjab filled our online questionnaire. The frequency of students who participated in the survey was highest among the age group of 18-25 years and least among under 18 years. The pie chart below illustrates the respective percentage distribution.

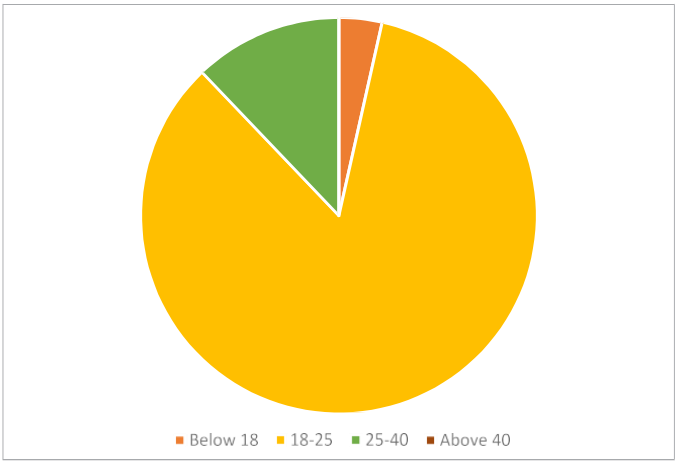

Figure1: *Pie chart showing age distribution among our res-pondents*

Our questionnaire contained questions regarding demographic information and background knowledge of the participants about vaping and perception about risks of vaping.

Out of the 222 students who filled the questionnaire, 69.8% (155) were medical students and 30.1% (67) were not medical students.

Table 1: *Percentages and Frequencies of Trends and Dynamics of E-Cigarette and Vape among Medical students*

Variable		Percentage (frequency)	P value
Gender	Male	61.4% (89)	
	Female	38.6% (56)	
Smoker	Yes	22.1% (32)	0.013
	No	77.9% (113)	
Familiarity with vape	Yes	84.1% (122)	0.216
	No	15.9% (23)	
Awareness about risks	Yes	72.4% (105)	0.036
	No	27.6% (40)	
Greater awareness of health risks in medical students	Yes	90.3% (131)	0.011
	No	9.7% (14)	
Role in quitting smoking	Yes	51% (74)	0.107
	No	49% (71)	
Greater health hazards of Ecigarette than traditional cigarette	Yes	35.2% (51)	0.062
	No	64.8% (94)	
Vaping is a gateway to traditional smoking	Yes	70.3%(102)	0.529
	No	29.7%(43)	
Carcinogens in E-cigarette	Yes	62.8%(91)	0.169
	No	37.2%(54)	
Greater interest of teenagers in-Ecigarette	Yes	89.7%(130)	0.340
	No	10.3%(15)	
Ban on vaping in educational institutions	Yes	75.9% (110	0.138
	No	24.1%(35)	
Source of awareness	Family or friends	55.9% (81)	0.134
	Social media	44.1%(64)	
Usage of vape in institution	Common	65.5%(95)	0.304
	Not common	34.5%(50)	
Perception of E-cigarette	Smoking cessation products	57.3%(83)	0.766
	Environment friendly products	42.8%(62)	
Frequently smoked substance	Flavoured e-liquids	66.9%(97)	0.042
	Nicotine	22.1%(32)	
	Cbd	3.4%(5)	
	Others	7.6% (11)	
Reason of vaping	Peer pressure	63.4%(92)	0.000
	Stress relief	16.6%(24)	
	Flavor	12.4%(18)	
	Addiction	7.6%(11)	
Effect on studies	No impact	80.7%(117)	0.002
	Increased absenteeism	15.2%(22)	
	Decreased focus	4.1%(6)	
Feeling after vaping	Nauseous	55.8%(81)	0.002
	Relaxed	14.5%(21)	
	Energetic	20.7%(30)	
	Dizzy	9.0%(13)	

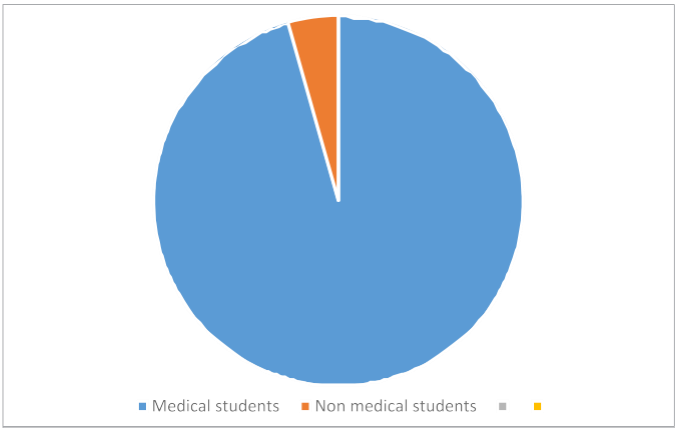

Figure 2: *Pie chart showing the prevalence of medical and non-medical respondents*

Among our respondents, 22.1% (32) medical students were smokers and 84.1% (122) were familiar with vaping whereas 72.4% (105) were aware about the risks of e cigarette use. Usage of vape was reported fairly common 65.5% (95) in medical colleges. The most common source of awareness were friends or family 55.9% (81) and the most common reason being peer pressure 63.4% (92). 80.7% (117) students reported increase absenteeism and a majority [55.8% (81)] students claimed to be nauseous after use of vape and e cigarette.

Among our respondents, 37.7%(29) non-medical students were smokers and 88.3% (68) were familiar with vaping whereas 77.9% (60) were aware about the risks of e cigarette use. Usage of vape was reported fairly common 75.3% (58) in non-medical colleges. The most common source of awareness were friends or family 66.2% (51) and the most common reason being peer pressure 37.7% (29). 54.5% (42) students reported increase absenteeism and 45.5% (35) students claimed to be energetic after use of vape and e cigarette.

In knowledge of vape and e-cigarette, p value was significant for a few variables including smoking, reason of vaping and impact on academic and mood. ($p<0.05$)

Discussion

According to our survey, medical students had a significantly higher perception of the health risks associated with vaping compared to non-medical students; a finding supported by a study conducted by University of Vermont.[10] However, conflicting findings, such as the high prevalence of e-cigarette use among medical students at UQU and their insufficient overall knowledge, challenge our Result.[11] Globally, the use of e-cigarettes (ECs) is increa- sing, raising concerns about their potential to lead adolescents to smoking addiction. A meta-analysis of 11 studies

Table 2: *Percentages and Frequencies of Trends and Dynamics of E-Cigarette and Vape among Non-Medical students*

Variable		Percentage (frequency)	P value
Gender	Male	67.5%(52)	
	Female	32.5%(25)	
Smoker	Yes	37.7%(29)	0.013
	No	62.3%(48)	
Familiarity with vape	Yes	88.3% (68)	0.216
	No	11.7%(9)	
Awareness about risks	Yes	57.1%(44)	0.036
	No	42.9%(33)	
Greater awareness of health risks in medical students	Yes	77.9%(60)	0.011
	No	22.1%(17)	
Role in quitting smoking	Yes	62.3%(48)	0.107
	No	37.7%(29)	
Greater health hazards of E-cigarette than traditional cigarette	Yes	48.1%(37)	0.062
	No	51.9%(40)	
Vaping is a gateway to traditional smoking	Yes	66.2%(51)	0.529
	No	33.8%(26)	
Carcinogens in E-cigarette	Yes	53.2%(41)	0.169
	No	46.8%(36)	
Greater interest of teenagers in Ecigarette	Yes	93.5%(72)	0.340
	No	6.5%(5)	
Ban on vaping in educational institutions	Yes	84.4%(65)	0.138
	No	15.6%(12)	
Source of awareness	Family or friends	66.2%(51)	0.134
	Social media	33.8%(26)	
Usage of vape in institution	Common	75.3%(58)	0.304
	Not common	24.7%(19)	
Perception of E-cigarette	Smoking cessation products	57.1%(44)	0.766
	Environment friendly products	42.9%(33)	
Frequently smoked substance	Flavoured e-liquids	59.8%(46)	0.042
	Nicotine	27.3%(21)	
	Cbd	2.6%(2)	
	Others	10.4%(8)	
Reason of vaping	Peer pressure	37.7%(29)	0.000
	Stress relie	15.6%(12)	
	Flavor	20.8%(16)	
	Addiction	26.0%(20)	
Effect on studies	No impact	27.3%(21)	0.002
	Increased absenteeism	54.5%(42)	
	Decreased focus	9.1%(7)	
Feeling after vaping	Nauseous	33.8%(26)	0.002
	Relaxed	11.7%(9)	
	Energetic	45.5%(35)	
	Dizzy	9.1%(7)	

has shown a significant link between vaping and smoking, with an alarming attrition rate reported (median = 30%).[12] Our survey revealed that flavored e-liquid was the most commonly smoked substance among both groups. The appeal of flavored e-cigarettes, often perceived as "cool" and appealing to youth, has surmounted smoking among teens since 2014.[13] Research also highlights concerning findings regarding e-cigarette emissions, which contain toxic and carcinogenic materials such as acrolein, diethylene glycol, propylene glycol, cadmium, and lead. This information underscores the potential health risks associated with vaping as explained by a study conducted in the US by Catherine Ann Hess.[14] According to the results of our survey, the primary reason among medical students is peer pressure. This finding is supported by research published in the American Journal of Health Promotion.[15] Conversely, addiction is cited as the main reason among non-medical students, as indicated by a study in the Journal of Pharmacy. The research shows that 74% of respondents relate vaping with emotions of happiness, pleasure, joy, or peace.[16] Additionally, among current smokers, the top three reasons for regular vaping use include its perceived effectiveness in reducing smoking (85.6%), its perceived harmlessness to others (Passive Smoking)(77.9%), and its use as a coping mechanism for stress (Peer Pressure).[17] According to our survey, vaping minimally affects the academic performance of medical students, whereas non-medical students may experience increased absenteeism and reduced focus which is a finding supported by a systematic review conducted in March 2024.[18] Understanding the risk and protective factors associated with smoking and vaping among high school students can significantly enhance the effectiveness of adolescent-focused public health interventions.[19] According to our survey, most non-medical students report positive effects such as feeling energetic after vaping. There is extensive global research describing feelings of calmness, relaxation, and youthful vigor after vaping, observed in both males and females.[20]

However, medical students often report negative impacts such as nausea, as highlighted in studies linking vaping to conditions like "nic sick," which can lead to vomiting.[21] Other research also confirms negative feelings associated with vaping, including nausea, headache, sore throat, and dry eyes, as evidenced in the results from the National Survey of Youth.[22] Studies affirm that students familiar with these risks can confidently assist future patients in making informed decisions about smoking and vaping.[23]

Reliance on self-reported data introduces potential biases such as inaccuracies in recall and respondents' inability to provide socially undesirable responses. The cross-sectional design restricts the ability to monitor changes over time and establish causal relationships. Limited sampling and regional focus restrict the study's generalizability beyond the surveyed

population and Factors like cultural differences and evolving vaping trends are not fully addressed which are impacting the broader applicability of the results. Moreover, this study predominantly focused on flavored e-liquids as the primary smoked substance, overlooking the use of other substances such as THC or CBD, levels of nicotine, tobacco-specific nitrosamines (TSNAs), aldehydes, metals, volatile organic compounds, and alkaloids in e-cigarette refill solutions. Conflicting findings within this study, such as the discrepancy between the high prevalence of e-cigarette use and insufficient knowledge about vaping's harmful effects among medical students, underscore the complexities that were not fully explored. Furthermore, this study indicates that managing stress and addiction are primary reasons for vaping. However, global studies suggest that perceived effectiveness in reducing smoking and the perceived harmlessness of vaping to others are also significant factors.

The findings of this study on the awareness of health risks associated with vaping among medical students compared to non-medical students are robustly supported by global studies. Studies from institutions like the University of Vermont and Public Health Malaysia reinforce the higher perception of risks among medical students. Additionally, Article in ScienceDirect affirms that this awareness enables medical students to effectively guide future patients in making informed decisions about smoking and vaping. The observation regarding the prevalence of flavored e-liquid as the most commonly smoked substance aligns with trends documented in various studies, including those published by the American Academy of Pediatrics. Findings regarding the primary reasons for vaping align with established studies: peer pressure among medical students and addiction-related emotions like happiness and joy among non-medical students. Results of emotional responses to vaping among non-medical students, such as feelings of energy, calmness, and relaxation, are consistent with broader global study trends documented in publications like Nicotine & Tobacco Research and Drug and Alcohol Dependence. Conversely, negative effects reported by medical students, such as nausea and other discomforts associated with vaping, are also corroborated by various studies, including those cited in Substance Abuse: Research and Treatment and the National Survey of Youth.

Conclusion

The study shows distinct disparities and differences in e-cigarette and vape behaviors between medical and non-medical students. Medical students demonstrate more awareness of health risks, lower smoking prevalence, and minimal academic disruption from vaping. In contrast, non-medical students exhibit higher smoking rates and significant academic challenges such as increased absenteeism.

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AH:Acquisition of data,critical revision for important intellectual content.

AQ: Analysis & interpretation of data, drafting of article

AWH: conception, Analysis & interpretation of data.

NB: conception and design,data analysis, methodology , validation and the original draft writing.

All authors have approved the final version and are responsible and accountable for the accuracy and integrity of the work.

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