Original Article

Knowledge and Perceptions of Dental Students Regarding Vape (E-Cigarette) Usage in Karachi: A Multicenter Cross-Sectional Study

Arsalan Mirza, Aisha Wali, Saleem Ullah Abro, Shakila Nazir, Maryam Riaz, Muhammad Khan

ABSTRACT

Objective: To investigate the knowledge, perceptions, and associated factors influencing Vape (E-cigarette) use among dental students in Karachi, Pakistan.

***Methodology*:** A cross-sectional survey was conducted from April 2023 to July 2023 at two dental colleges in Karachi after obtaining ethical approval. A total of 200 dental students, selected through convenience sampling, participated in the study. A modified version of a pre-validated questionnaire was administered, covering demographics, knowledge, e-cigarette use, and perceptions. Data were analyzed using IBM SPSS software version 22, with the chi-square test used to explore associations, considering a P value of <0.05 as statistically significant.

***Results*:** Of the 200 participants, 53% (n=106) were female, and 57% (n=114) were aged 20-24 years. The study revealed that 36% (n=72) of dental students currently vape, while 79.5%(n=159) were knowledgeable about vaping. Social media played a significant role, influencing 58.5% (n=117) of students to start vaping. Approximately 45% (n=90) purchased vape products online, and 49% (n=98) believed that vaping could help in smoking cessation. However, 78% (n=156) of students acknowledged that vaping posed serious health risks.

***Conclusion*:** A significant proportion of dental students in Karachi are aware of vaping, with a substantial number actively using e-cigarettes. Social media is a key driver of vaping behavior.

KEYWORDS: Electronic Cigarettes, Nicotine, Public Health, Social Media, Students.

INTRODUCTION

Electronic cigarettes, also known as "vaping," have gained popularity in recent years.[1] With the help of a battery, electronic cigarettes heat a liquid containing nicotine, propylene glycol, and flavoring agents, which creates a vapor that the user inhales. A user smokes a liquid containing nicotine, flavoring, and preservatives.[2] These products were introduced by Plurphanswat and Kelvin Choi in the early 2000s, subsequently becoming popular as alternatives to traditional cigarettes.[3] These specific items may have the potential to impact the prevalence of smoking-related health issues, either by increasing or decreasing the burden of disease.[4] Pakistan is becoming a significant center for the vaping industry, with e-cigarette revenue projected to reach $77.2 million by 2024, experiencing an annual growth rate of 1.39%.[5] A study conducted in Karachi revealed that 50.4% of the participants had tried vaping at least once, and 0.9% were current users.[6] A study conducted in Saudi Arabia revealed that about 10% of medical students were using e-

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cigarettes.[7] Another study in Jeddah, Saudi Arabia, reported that 27.7% of participants used e-cigarettes. According to a study conducted at the University of Minnesota, 14.7% of medical students tried e-cigarettes.[8] The prevalence of ever using e-cigarettes among college students in France was 23.0%, similar to Poland, the USA, and Romania. The prevalence of current use of e-cigarettes among college students in France was 5.7% lower than that of the United States.[9] Studies have shown that e-liquids contain chemical additives that may cause harm to the body. Aerosols from these e-liquids can damage DNA, reduce antioxidant defenses, and negatively affect cell health. Acrolein, a component of e-liquids, is toxic to cells, causes DNA damage, and inhibits essential enzymes.

E-liquids contain reactive aldehydes known to cause oxidative stress, leading to cardiovascular, respiratory, pulmonary, and oral diseases. The components of E-liquids, regardless of their nicotine content, can damage oral tissues and cause oxidative stress. E-cigarette liquids contain compounds known to suppress the immune system, such as cinnamaldehyde. Overall, the use of e-cigarettes poses significant health risks.[10]

A person who is addicted to vaping may experience behavioral changes. E-cigarettes have fewer side effects, such as nausea and vomiting, but the aerosol from e-juices and vaping devices can increase the risk of lung cancer.[11]

The aerosols and harmful chemicals from vaping contribute to health risks. Nicotine can affect a person's heart rate, often causing elevated heart rate and blood pressure in users.[12]

The Center for Disease Control in the USA regulates the quality and availability of tobacco products. The use of tetrahydrocannabinol (THC) has been linked to E-cigarette, or vaping associated lung injury (EVALI), a serious condition caused by vaping products.[13] As the global rise in e-cigarette use continues, there is a noticeable lack of data on the awareness and usage of e-cigarettes in developing countries, which are still grappling with the challenges of controlling conventional tobacco products.[14] This underscores a significant knowledge gap that needs to be addressed. Generally, dental students are believed to possess higher levels of knowledge, as they are expected to engage with patients during their training. Therefore, understanding their perspectives on e-cigarettes is crucial.

No research has been conducted in Karachi on the attitudes influencing e-cigarette use among dental students. To the best of our knowledge, this study is the first to examine e-cigarette use among a representative sample of dental students from two dental colleges in Karachi, the country's largest city. Therefore, the objectives of this study are to assess the prevalence of e-cigarette use among dental students and to explore the knowledge, perceptions, and associated factor**s** with its use, such as the influence of family and friends on e-cigarette usage, effects of social media, and the means of acquiring the product.

METHODOLOGY

A cross-sectional survey based on a questionnaire was conducted at two dental colleges-one public (Dow Dental College) and one private (Baqai Dental College) from April 2023 to July 2023. The purpose of the study was explained, and verbal consent was obtained from participants. Official approval was secured from the Ethical Review Board (ERB) of Baqai Medical University, Ref No: BDC/ERB/2023/046. A convenience sampling method was used to recruit the participants. Keeping the confidence interval at 95%, the margin of error 5%, and assuming 50% prevalence for a most liberal estimate, a sample size of 200 was calculated and deemed adequate based on the formula for estimating population percentages[15] and was considered consistent with similar studies in equivalent settings.[16] While calculating, amendments were made for expected logistic limitations and a reasonable finite population of dental students in Karachi. Using a convenience sampling method, 200 dental students were

selected. The study included dental students who were present on the day of data collection and excluded those who were absent. Questionnaires were distributed in printed form for a face-to-face survey to ensure maximum participation. The target participants were dental students from the 1st to the 4th year of BDS. A pre-validated questionnaire, originally developed by Sharanesha R et al., was adopted and modified to suit our context.[17] A pilot study with 20 participants was conducted to assess the reliability of the questionnaire, resulting in a Cronbach's alpha of 80%.

The questionnaire consisted of self-administered, close-ended questions and took 5-10 minutes to complete. It had two sections: the first section collected demographic data, while the second section comprised 14 questions divided into three categories—knowledge, usage and perceptions regarding e-cigarettes.

Data was entered and analyzed for frequency and percentages. The chi-square test was used to assess the relationship between vaping and the age of starting to vape by using IBM SPSS software version 22. p value of < 0.05 was considered statistically significant.

RESULT

The study included two hundred dental students from both private and public dental colleges. Among them, 179 (89.5%) students were from private colleges, and 21 (10.5%) were from public colleges. Among the total two hundred students, 106 (53%) were female. In terms of age range, 114 (57%) of the dental students were between 20 and 24 years old. Table 1 shows the demographic data

Table 1 Demographics of the Dental Students

Age	Frequency	Percentage
14-19	67	33.5%
20-24	114	57%
25-28	19	9.5%
Gender		
Male	94	47%
Female	106	53%
Institute		
Private	179	89.5%
Public	21	10.5%

of the respondents. It was found that 36% of them currently vape while 79.5% of them know about vaping. Among the participants, 47.5% reported that they had never vaped before. Out of those who vape, 50% of them started between the ages of 20-24 years. In addition, 46.5% of them believed that vaping is not permissible in Islam.

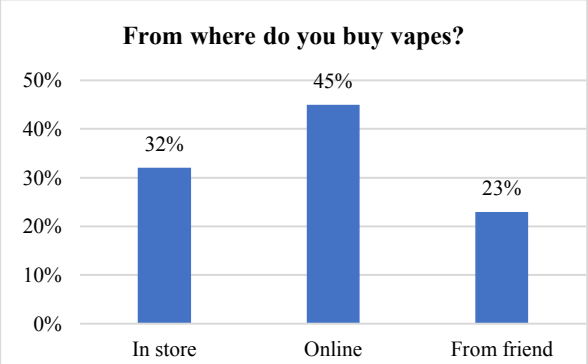
Table 2 Knowledge, use and perception of respondents about vape

Questions	Responses	Frequency (%)
Do you know what a vape is?	Yes No	159(79.5%) 41(20.5%)
Have you ever vaped?	Yes No	105(52.5%) 95(47.5%)
Do you currently vape?	Yes No	72(36%) 128(64%)
At what age you started vaping?	14-19 20-24 25-28	97(48.5%) 100(50%) 3(1.5%)
Does anyone of your family member vape?	Yes No Do not know	63(31.5%) 97(48.5%) 40(20%)
Is vaping permitted in Islam?	Yes No Do not know	54(27%) 93(46.5%) 53(26.5%)
Does vaping invalidate Wudu (ablution)?	Yes No Do not know	86(43%) 38(19%) 76(38%)
Is consumption of vapes permitted in institute?	Yes No Do not know	75(37.5%) 95(47.5%) 30(15%)
Do you think vapes are effective way to stop tobacco smoking?	Yes No Do not know	98(49%) 54(27%) 48(24%)
Do you think vaping will cause health problems?	Yes No Do not know	156(78%) 29(14.5%) 15(7.5%)
Do you think vaping will have lower chance of cancers than tobacco smoking?	Yes No Do not know	93(46.5%) 54(27%) 53(26.5%)
Is vaping approved by FDA?	Yes No Do not know	56(28%) 50(25%) 94(47%)
What influenced you to start vaping?	Television Social media peers	26(13%) 117(58.5%) 57(28.5%)
From where you buy vapes?	From store Online Friends	64(32%) 90(45%) 46(23%)

The survey also revealed that social media played a significant role in influencing participants to start vaping, with 58.5% of them being influenced

through social media. Moreover, 45% of the participants purchased vape products online. Table 2 shows the participants' knowledge, use, and perceptions regarding vaping.

Figure 1 E-cigarette Knowledge and Perception of Dental Students



The current study revealed that there is a high prevalence of vape usage among young adults studying at dental colleges in Karachi.

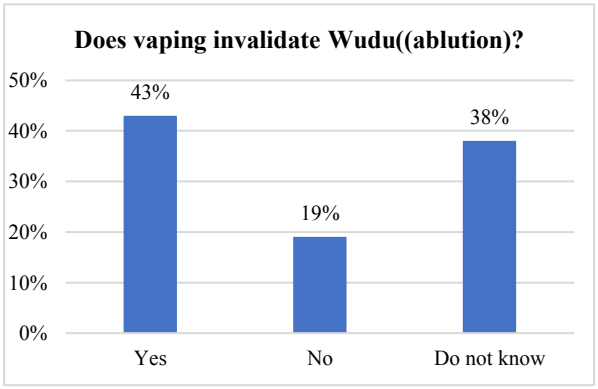
Table 3 Comparison of Knowledge and Perception of Dental Students with e- vaping status

Item	e- vaping status		p-value
	Ever vape	Never vape	
Do you know what a vape is?	104(65.4%)	55(34.6%)	0.000
Do any of your family members vape?	50(79.4%)	13(20.6%)	0.000
Is the consumption of vapes permitted in the institute?	48(64)	27(36%)	0.001
Do you think vapes are an effective way to stop tobacco smoking?	75(76.5%)	23(23.5%)	0.000
Do you think vaping will cause health problems?	78(50%)	78(50%)	0.153
Do you think vaping will have a lower chance of cancer than tobacco smoking?	68(73.1%)	25(26.9%)	0.000
Is vaping approved by the FDA?	44(78.6%)	12(21.4%)	0.000
What influenced you to start vaping? Television Social media Peers	 18(69.2%) 59(50.4%) 28(49.1%)	 8(30.8%) 58(49.6%) 29(50.9%)	0.184

P value ≤ 0.05 taking as significant

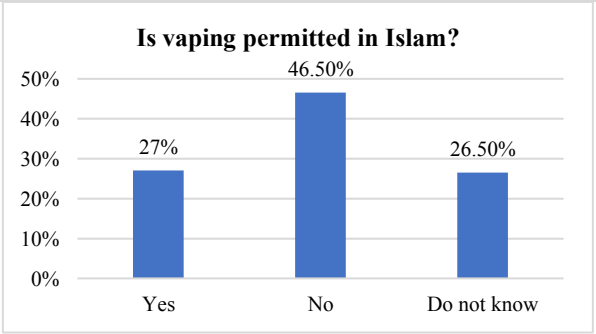
A total of 72 dental students (36%) reported being current vape users, while 105 students (52.5%) stated that they had tried vaping at least once. The majority of current vape users were aged between 20–24 years (n=114, 57%)**,** with most of them enrolled in private colleges (n=179, 89.5%).

Figure 2- Perception and Practices Regarding Vape among Dental Students



Additionally, nearly 80% of dental students reported being aware of vapes. There were noticeable knowledge gaps, as only 56 (28%) of the students knew that vapes are not FDA-approved. A total of 93 (46.5%) of dental students perceived that using vapes lowers the risk of having cancer than smoking. Misconceptions about harm related to vape were strongly associated with its use, as 68 (73.1%) of ever-users among young adults considered that vaping reduces the risk of developing cancer compared to smoking (p<0.000).

Figure 3- Perception and Practices Regarding Vape among Dental Students



Additionally, 75 (76.5%) of ever-users viewed vaping as an effective tool that can help in the cessation of smoking (p<0.000). Likewise, familial along with social influences also played a crucial role in the use of vape among dental students, as 50

(79.4%) of ever-user young adults had a family member who vaped (p<0.000). Peer influence (n = 57, 28.5%) and social influence (n = 117, 58.5%) were also key motivators for vape use. Surprisingly, social media's impact on the consumption of vapes did not reach statistical significance (p=0.184). On the other hand, interestingly, n75 (37.5%) of dental students believed that the use of vapes was permitted in their institution, a perception that showed a strong relationship of higher use of vapes (p=0.001). Religious beliefs, such as the prohibition of vaping in Islam **(**n = 93, 46.5%**),** did not show a significant correlation with reduced vape use **(**p = 0.12**),** highlighting a disconnect between religious norms and actual behavior.

DISCUSSION

The present study was conducted to assess the knowledge and perception of dental students towards vaping. Results from the present study showed that 79.5% of the respondents have vape knowledge. A multicountry large-scale survey revealed that dental students in eleven countries who use e-cigarettes have insufficient knowledge about vaping.[18] Another study reported that 62.1% of the participants have a poor level of knowledge.[19] Natto Z reported that 65% of the participants were found to be knowledgeable about e-cigarettes.[20] Guckert E et al also reported that most students had insufficient knowledge about vaping.[21]

The frequency of vaping among dental students varied in different studies. This study found that 52.5% of dental students had tried vaping, and 30% were current users. Another survey including dental students from various countries found that 43.2% had tried e-cigarettes, with 5.7% being current users.[20] In another study focusing on dental and medical undergraduate students, 99.0% had never used e-cigarettes.[19] AlMuhaissen, S stated in a study that 42.9% of dental students have used e-cigarettes at some point.[22] Significant age-related differences in e-cigarette usage patterns were observed. Among the older age group, e-cigarette use was more prevalent among current and former smokers, while in the younger age group, it was primarily found among former smokers. The present study reported that 50% of the dental students started vaping between 20-24 years. A study done by Madiba et al. reported that 68% of dental students started vaping between 16-20 years.[23]

Young individuals may perceive e-cigarettes as more harmful than traditional cigarettes; however, the easy availability of e-cigarettes from family and friends, coupled with the marketing of appealing flavors, may encourage non-smokers to experiment with them. These observations are alarming because nicotine is highly addictive and can impact the brain's development in young people. Additionally, younger e-cigarette users exhibit a higher prevalence of cannabis use compared to their older counterparts. This emerging trend warrants careful monitoring due to its potential health risks. Considering these age-related differences, existing intervention programs should be optimized or tailored to mitigate the unintended consequences of e-cigarette use across various age groups. Parents have a significant impact on their children's lives. Therefore, students with mothers who smoke e-cigarettes are twice as likely to try e-cigarettes compared to students with non-smoking mothers.[22] The present study reported that 47% of dental students replied that none of their family members vape. Sharanesha et al in a study reported similar results that none of the family members vape.[17] Asim S et al also reported similar results.[6] Another study reported dissimilar results, with a substantial proportion (71.0%) of dental students reported that at least one of their family members vape.[24]

With the rapid increase in vape use among the population, electronic cigarettes have been observed to be used as a tool for smoking cessation. E-cigarettes were found to be more effective for smoking cessation when accompanied by behavioral support compared to nicotine-replacement therapy. Additionally, e-cigarettes were also found to be more effective in alleviating tobacco withdrawal symptoms and received higher

scores. The present study reported that 49% of dental students think that vapes are an effective way to stop tobacco smoking. Sharanesha, et al in a study reported that 81% of dental students agreed that e-cigarettes have a positive role in tobacco cessation.[17] Alzahrani et al., in a survey, reported that 40.4% of dental students responded “no” when asked if e-cigarettes are a helpful aid for smoking cessation.[25] Various studies showed a variable response of 46.9%,[7] 13.9%,[26] and 41.6%.[27]

This variation in results highlights the urgent need for education on vaping patterns and their connection to tobacco smoking cessation, not only for medical students but for students in other disciplines as well.[28] E-cigarette smoking is perceived to be significantly less harmful than conventional cigarette smoking among young adults.[22] In the present study, 78% of dental students reported that vaping will cause serious health problems. Various study results reported that most of the dental students think that e-cigarettes are safer than conventional cigarettes.[22,29] Studies have shown that e-cigarettes contain fewer toxic chemicals than conventional tobacco, but that e-cigarette vapor can also be toxic and carcinogenic, but at lower levels than tobacco smoke.[30] In the present study, 46.5% of dental students perceived that vaping would have a lower chance of cancer than tobacco smoking. The Food and Drug Administration (FDA) has approved thirty-four e-cigarette products and devices that are flavored with tobacco and menthol. These items have been subjected to comprehensive scientific evaluation, encompassing toxicological analyses, and have been determined by the FDA to comply with the legally mandated public health criteria.[22] The present study results showed that most dental students do not know if the FDA approves vaping. A study conducted in Saudi Arabia found that only 28% of dental students were aware that e-cigarettes are approved by the FDA.[20] Alhajj M in a study reported that only 8.2% of dental students knew that the FDA approves vaping.[18] Nowadays, social media platforms play a crucial role in students' daily lives. The present study reported that social media was found to be an influential factor compared to other factors. Similar results were reported by Al-Muhaissen S et al,.[22] It is important to note that extensive exposure to e-cigarette advertising on social media platforms can influence young adults to try e-cigarettes, as evidenced by a study involving college students in Hawaii.[31] This highlights the need for thorough monitoring of advertising posts across all social media

CONCLUSION

The present study concluded that most dental students possess knowledge about vaping. The youngest male age group was more likely to engage in risky behaviors and showed a greater willingness to experiment with vaping trends.

Limitations: The present study has some limitations. The participants selected were only dental students, so comparisons of variables were lacking. The sample was collected from two dental institutes but because of the cross-sectional study design and convenience sampling, data was collected only from the participants that were present on the day of data collection.

Conflict of Interest: None
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Author Contributions:

Arsalan Mirza: conceived the study designed, carried out the data collection and statistical analysis and drafted the manuscripts.

Aisha Wali: Participated in its design and coordination. drafted, read and approved the final manuscript.

Saleem Ullah Abro: Participated in its design and coordination. Statistical analysis, drafted, read and approved the final manuscript.

All authors are equally accountable for research work

Shakila Nazir: Participated in its design and coordination. Statistical analysis, drafted, read and approved the final manuscript.

Maryam Riaz: Participated in its design and coordination. Statistical analysis, drafted, read and approved the final manuscript.

Mohammad Khan: Participated in its design and coordination. Statistical analysis, drafted, read and approved the final manuscript.

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