Use of E-cigarettes (Vaping) among dental students and their Self-perceived oral health symptoms: A Questionnaire-based study

Jashwinder Singh Chauhan[1], Isha Garg, Kanak Kapoor[2], Jyoti Samchung[3], Gauri Kalra[4], Pratibha Taneja[5],

Abstract

INTRODUCTION

Recently, use of electronic nicotine releasing devices called as E- Cigarettes or Vaping Devices or Vape Pens has been trending globally [1,2]. Its use has increased, especially among adolescents and young adults [3]. The first identification of Vape terminology dates back to the 1960s when inventor H. Gilbert introduced the first alternative to the conventional cigarette. The mechanism of the vape consists a battery that generates an electric current, which activates a filament atomizer. This ignited filament causes e-liquid to evaporate in the cartridge, generating an aerosol. The vapours produced by vaping are not only made up of water as each inhalation introduces nanoparticles, volatile organic compounds, nicotine with flavourings in our bodies [4]. It has been seen to be more in routine as it has been promoted as an alternative to conventional nicotine cigarettes. Its sales have increased dramatically especially among the younger age consumers who consider vaping to be safer and more enjoyable than that of the traditional cigarettes [5]. However, Current presentation of these devices and the available commercial alerts are not clear enough to make consumers aware that vaping produces harmful effects. Since, its use is on a rise in western countries, WHO has issued an advisory to label and warn the impact of detrimental effects on health. Various substances such as formaldehyde, acetaldehyde and acrolein present in Vape are considered to be cancer inducers. Therefore, Vaping persists as an element detrimental to health [7]. Short term adverse effects such as Lipoid Pneumonia, poisoning or injuries caused due to being explosive have been documented in literature, however, long term effects are lacking [8].

Furthermore, there is ample evidence of establishing an association between vaping smoke and increased risk of developing oral complications such as caries, gingivitis and periodontal diseases [9]. With known ill effects, the manufacture, import/ export, sale and distribution of E- cigarettes is banned in many countries including India [10].

Since, dental clinicians play a pivotal role in tobacco cessation programmes and providing mass education about the ill-effects of tobacco use and use of Vaping devices [11]. Therefore, instilling awareness about E-cigarettes among students pursuing dentistry may prove effective since them being the future dentists [12]. However, their knowledge about Vaping and associated health complications is scarce, thus, this study is intended to assess the knowledge, attitude and practice about E-cigarettes and assessment of their own oral health related to the frequent use of Vaping devices among Indian students pursuing dental profession.

AIM & OBJECTIVE

To assess the knowledge, attitude, practice about E-cigarettes among dental students and their Self perceived oral health status due to use of E-cigarettes

MATERIAL & METHODS

Study Design, Setting, Study Population & Study Procedure

A cross-sectional questionnaire based study was conducted targeting undergraduate students pursuing dentistry aged 18 years and above in Delhi NCR region. The study was conducted during the academic year of 2023-2024. The study was approved by the Institutional Ethical Committee and was designed following the recent guidelines set by Declaration of Helsinki (2013)

The research study included generation of a questionnaire which was designed using google forms and the link was sent to all the dental students enrolled in various dental colleges of Delhi NCR region. Link to the survey form was shared among the students through emails and WhatsApp following snowballing sampling technique.

Before beginning the survey, the purpose and objectives of the study were explained to all the participants and informed consent was obtained from them excluding the minors. The participation in the current survey was voluntary and the students had the right to withdraw from the study anytime. They were also instructed to attempt this survey only once. No personal information or IDs were asked from the participants to maintain confidentiality and anonymity during the study.

Questionnaire

A total of 25 questions were formulated derived from the previously published studies [13, 14, 15]. The questionnaire was divided into sections, the first section included four open-ended questions regarding the demographic data- age, gender, level of study and marital status. The other section included twenty close ended questions assessing the knowledge, attitude and practices of dental students regarding vaping or use of E-cigarettes. The last section included one question evaluating if they reported any self-perceived symptoms such as sore throat, dry mouth, and inflammatory changes on tongue, gingiva and mouth. Primary outcome of the survey was to evaluate the knowledge, attitude and practices of using vape. Secondary outcome included status of self-perceived oral symptoms among E-cigarette users.

RESULT

A total of 304 dental students participated in the study. About two-third of the participants were females (73%, n=222), almost all being unmarried (96.1%, n=292). More than half of the participants were in less than 20 years-old (59.2%, 181) age group. Majority of the subjects (78.3%, n=289) were in their clinical years. When the Knowledge quotient of the study was assessed, it was found that about 67.1% (n=204) of the students agreed to know about E-cigarette and only 22 (7.2%) had tried E-cigarettes previously. Almost all the participants (n = 284, 93.4%) reported they never smoked, while 20 (6.6%) students reported they were current smokers; of whom 8 (2.6%) students smoke tobacco cigarette only, 2 (0.7%) student use E-cigarettes only, and 10 (3.3%) students were dual users. No significant associations were found between smoking status and marital status, age, or level of study. However, significant association was obtained between smoking status and if the participants had tried cigarettes before ($p < 0.05$).

The majority (72.3%, n = 220) of the students reported that E-cigarettes are harmful to health (p value significant between knowledge of harmful effects of E-cigarettes and their smoking status), 68 (22.4%) reported that E-cigarettes are less harmful than tobacco cigarettes, 87

(28.4%), 154 (50.7%) reported that E-cigarettes are addictive, 44 (14.5%) reported that The FDA does not approve e- cigarettes, and 52(17.1%) reported that E-cigarettes do not reduce passive smoking. The sources of information about E-cigarette were social media (169, 55.5%), online advertising (66, 21.8%), dental school (75, 24.5%), television/radio (42, 13.6%), public signs (36, 11.8%), newspaper or magazines (39, 12.7%) and others (97, 31.8%).
148 (48.4%) believed that E-cigarettes are a helpful aid for smoking cessation. The majority (n = 244, 80.3%) believed that dental practitioners should be educated about E-cigarettes, and 90 (59.2%, 180) agreed that E-cigarettes should be banned. Significant association was found between the smoking status of the study subjects and their perception about the need of education regarding E-cigarettes among dental clinicians. In addition, 224(73.7%) students believed that education about E-cigarettes should start during the school years.
Regarding the smokers (n=16, 5.3%), half of them are using vape for less than 1 year and 6 (2%) of them vape more than 20 times a day and 10 (3.3%) vape immediately after waking up. Significant correlation have been found between the duration participants had been using E-cigarettes, frequency of use and the need to vape immediately after waking up from the bed. (Table 1)
Table 1- Knowledge, Attitude and Practice of Dental students about E-cigarettes and their current smoking status.

Variables	Total	Never Smoke	Tobacco Only	E- cigarette only	Dual User	P value
Heard about E-cigarettes						0.793
Yes	204	188	6	2	8	
No	100	96	0	2	2	
Tried before						
Yes	22	12	02	02	06	0.000*
No	282	272	06	0	4	
FDA approval status of E cigarettes						0.338
Yes	36	32	2	0	2	
No	44	40	4	0	0	
Don't Know	224	212	2	2	8	
Is E-cigarette harmful to health						
Yes	220	188	04	2	06	0.000*
No	10	06	04	0	0	
Don't Know	94	90	0	0	04	
E-cigarette reduces passive smoking around						0.245
Yes						
No						
Don't Know	74	66	4	0	4	
	52	46	2	2	2	

	178	172	2	0	4	
E-cigarettes are less harmful than tobacco cigarettes Yes No	 258 46	 240 44	 8 0	 0 2	 10 0	0.065
Are E- cigarettes better option than smoking tobacco products. Yes No	 246 58	 228 56	 8 0	 0 2	 10 0	0.094
E-cigarettes are addictive Yes No	 294 10	 274 10	 08 0	 02 0	 10 0	0.948
E-cigarettes pose a lower risk for cancer than traditional cigarettes Yes No	 248 56	 232 52	 4 4	 2 0	 10 0	0.260
comfortable discuss the harmful effects cigarettes with patients Agree Disagree Neutral	 200 32 72	 184 30 70	 06 0 02	 2 0 0	 8 2 0	0.829
Ability to discuss the harmful effects e-cigarettes use with my patients Agree Disagree Neutral	 200 22 82	 190 18 76	 2 2 4	 2 0 0	 06 02 02	0.483
Are E-cigarettes helpful aid in smoking cessation Agree Disagree Neutral	 88 68 148	 76 66 142	 6 0 2	 0 2 0	 6 0 4	0.090

Is it essential for a dentist to be educated about e-cigarettes Agree Disagree Neutral	 244 18 42	 230 14 40	 2 4 2	 2 0 0	 10 0 0	0.010*
Should e-cigarettes be banned Agree Disagree Neutral	 180 10 114	 166 10 108	 4 0 4	 2 0 0	 8 0 2	0.350
Best time to be educated about the harmful effects of e-cigarettes At school At University No Need	 224 50 30	 212 46 26	 04 02 02	 0 02 0	 08 0 02	0.241
How long have you been using e-cigarettes/tobacco cigarettes? I don't use it , <1 year 1-2 months ago > 2 years ago - 0	 288 08 06 02	 278 02 04 0	 08 0 0 0	 0 0 02 0	 02 06 0 02	0.000*
How many times per day do you use e-cigarettes/tobacco cigarettes? I don't use it not daily < 20 times a day >= 20 times a day	 282 10 6 6	 274 4 4 2	 06 0 0 02	 0 02 0 0	 02 04 02 02	0.000*
How soon after waking-up do you start using your e-						0.000*

cigarettes/tobacco cigarettes? I don't use it it varies After (1-2) hours Immediately after waking up	286 4 4 10	276 2 2 4	06 0 02 0	0 02 0 0	04 0 0 06	

P value >0.005

Regarding the knowledge of people about the harmful effects of E-cigarettes, 56 (18.4%) of them believe that it causes dry mouth and/or throat, 24 (7.9%) believe it causes mouth and/or tongue inflammation, 20 (5.9%) of them thinks it causes gingivitis. Out of vape users and dual users, about 10 participants agreed of having dry mouth or throat and about 6 suffering with gingivitis and inflammation of tongue and mouth. A significant relationship was found between smoking status and their self-perceived oral symptoms after smoking. (Table 2)

Table 2 – Self perceived oral symptoms among dental students according to their current smoking status

	Total	Never Smoke	Tobacco Only	E-cigarette only	Dual User	P value
Dry Mouth/ Throat Yes No	56 248	46 238	0 8	2 0	8 2	0.000*
Mouth/Tongue Inflammation Yes No	24 280	14 270	4 4	0 2	6 4	0.000*
Gingivitis Yes No	20 284	10 276	4 4	0 0	6 4	0.000*

P value >0.005

DISCUSSION

E-cigarettes have been found to trend as a newer tobacco product in global markets and is gaining popularity among the youth since a decade. It evidently entered the U.S. markets in 2007 and its sales had reached to 2.5 billion dollars in 2014 [16]. Since then, it has been advertised widely as a non- combustible tobacco and nicotine product. By 2014, E-cigarettes were the second most advertised product in magazines after tobacco cigarettes [17]. It's hyped advertising as an aid to quit smoking or its use being associated with lesser health effects have made it popular among adolescents and younger generation. Its advertising has been associated with initiation of smoking habit among adolescents, which led to reinforcing of regulations to limit its use among minors [18]. CDC and FDA has also reported a comprehensive data on increased use of E-cigarettes among 3.02 million American high school students in their report in 2020 [19].

Considering the Indian Scenario, complete ban on manufacturing, advertising and usage of E-cigarettes came into effect in September 2019. Before 2019, it was neither officially banned nor it was addressed as a public health hazard and it was freely marketed in the country [20]. Though there aren't any long term studies on the health effects of E-cigarettes, the American Lung Association has warned the general public over release of potentially hazardous substances from E-cigarettes. National Academies of science has reported young people using E-cigarettes to suffer from coughing, wheeze, and asthma. Also there are reports of presence of substances such as Propylene glycol and vegetable glycerine which might have toxic effects on human cells. Substances such as acetaldehyde, acrolein and other chemicals have been associated with lung as well as cardiovascular disorders [21].

Besides general effects, E-cigarettes have been found to cause oral ill effects. Evidence has reported the role of smoking with increasing risk of periodontitis, which can lead to tooth loss at a higher rate in comparison with non-smokers. However, dental clinicians become the first point of contact with smokers suffering oral effects related to smoking. Thus, it becomes imperative to assess the knowledge, attitude and practices of dental students regarding E-cigarettes. In a study examining dental students' understanding and perceptions of e-cigarettes, Almost two-third of study population had heard about E-cigarettes or vaping, about 7.2% of participants owned an e-cigarette, while the vast majority (93.4%) reported that they had never smoked. Among the 6.6% who were current smokers, 2.6% smoked only traditional tobacco cigarettes, 0.7% used only e-cigarettes, and 3.3% were dual users. The study found that most participants lacked a clear understanding of the health effects of e-cigarettes, indicating a need for more education on the topic. Similar results were concluded in a study conducted including Public health dentists in Bengaluru where 87% of participants had heard about E-cigarettes. In the current study, majority was ignorant about the FDA approval status of E-cigarettes where as in the above cited study about 50% of participants were aware of it regulatory and approval status by the health agencies [22]. In the current study, 50% of population agreed upon E-cigarettes being addictive. Similar results were obtained in a study conducted on highly educated young adults and it was concluded that the use of e-cigarettes resulted in higher nicotine dependence levels due to e-cigarettes in comparison to tobacco cigarette smokers [23]. In another study involving U.S. adolescent healthcare providers (HCPs), many were hesitant to recommend switching to e-cigarettes, viewing addiction to e-cigarettes as a greater issue than traditional cigarettes [24].

Most of the study subjects agreed upon the need to educate dental clinicians about the ill-effects of smoking E-cigarettes and a significant relationship was found with their belief and current smoking status. On the contrary, a study assessed the knowledge and perception of dental students in Riyadh, Saudi Arabia, showed that about 80% dental students were completely ignorant about the ill-effects of smoking E-cigarettes and didn't feel to be educated regarding the same [25]. In the present study, only 1% of smokers felt confident being able to discuss the ill oral effects of E-cigarettes with either their patients or parents. However, in another large scale multi-national study, about 50-60% of study population felt confident [15]. Out of the smoking population, 50% of the study subjects reported symptoms of dry mouth, gingivitis and inflammation present on tongue. Similar results were reported in the study conducted by Alhajj MN et al (2022) [11].

Limitations

The cross-sectional survey study had some limitations. Firstly, this study was an online survey which included only a cross-section of young population with access to internet. Also, snowballing technique for participant recruitment which could have led to a bias of recruiting students with similar backgrounds and setting.

Study Implications

The survey results could serve as an eye opener to depict the current scenario of use of E-cigarettes among dental students. Using the findings of the current survey, dental schools might identify gaps in students' knowledge about e-cigarettes, which could inform curriculum updates to include specific modules on vaping-related oral health issues. Understanding students' attitudes and practices around e-cigarettes can help schools design more practical and relatable training programs, preparing students to counsel patients effectively. Additionally, this assessment could serve as a baseline for future studies, enabling researchers to track changes in knowledge, attitudes, and practices as new data on vaping's health impacts emerges. Targeted interventions aimed at reducing e-cigarette use among dental and other healthcare students could be designed aiming at improved oral health care outcomes.

CONCLUSION

Dentists are uniquely positioned to advise patients on the dangers of smoking and to encourage them to quit. Given their regular contact with patients, dentists can play a crucial role in supporting smoking cessation efforts as part of dental care. However, some studies have identified barriers to providing this service, including time constraints, lack of training, and concerns about negatively affecting the patient-dentist relationship.

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