



Review Article

Vaping and oral health

Rajiv Ahluwalia^{1,*}, Kunal Sharma¹, Parvinder Kaur Bindra¹, Shabih Fatima¹¹Dept. of Orthodontics and Dentofacial Orthopedics, Santosh Dental College, Ghaziabad, Uttar Pradesh, India

ARTICLE INFO

Article history:

Received 23-01-2020

Accepted 27-02-2020

Available online 31-07-2020

Keywords:

Ecigarette

Vaping

Smoke

Cigarette

Oral health

Effect

ABSTRACT

Electronic cigarettes also known as e-cigarettes, which deliver a vaporised smoke of nicotine and promise less toxicants than conventional cigarette smoke. However, studies suggest e-cigarettes are not completely harmless but are less dangerous than traditional cigarettes. The promise of help in smoking cessation effectiveness is still unproven and requires further evidence and studies. There are ongoing studies on deleterious oral and systemic health effects. Because of the rising popularity of vaping, it is absolutely vital that dental professionals must stay informed to provide patients truthful information as new data emerge.

© 2020 Published by Innovative Publication. This is an open access article under the CC BY-NC license (<https://creativecommons.org/licenses/by-nc/4.0/>)

1. Introduction

The dental professionals are best positioned to address tobacco abuse in clinical practice. Through regular follow-ups and recall appointments and trusting patient partnerships, tobacco use cessation and preventive interventions delivered by dentists and other members of the dental care team can be very effective.¹

Use of tobacco and products like cigarettes can cause serious consequences ranging from tooth staining and heavy plaque to periodontal disease, tooth loss, implant and surgical failures, and oral cancer.² The GATS 2 (Global Adult Tobacco Survey 2) report showed that every tenth adult in India smokes tobacco—11.9% in rural areas and 8.3% in urban areas. The prevalence of smoking among men is 19.0%, while among women the figure is 2.0%.³ Smoking in public places was prohibited nationwide from 2 October 2008. There are approximately 120 million smokers in India. According to the World Health Organization (WHO), India is home to 12% of the world's smokers. More than 1 million people die every year due to tobacco

related illnesses.⁴ Eliminating tobacco use improves clinical outcomes and saves patient lives.

Shifting use patterns of smokers all challenge the practitioner to look beyond cigarettes.⁵ At the forefront of this new shift are electronic cigarettes (e-cigarettes). These devices have been gaining popularity in this decade.⁶ An electronic cigarette or e-cigarette is a portable usually battery operated vaporizer that simulates smoking and the behavioural aspect of it like the hand to mouth action associated with conventional cigarette. The unique thing about electronic cigarettes is that unlike regular cigarettes there is no burning of tobacco. E-cigarettes utilise a heating element that aerosolises a liquid solution.⁷ E-cigarettes are activated by pressing a button, which activates a flow sensor that activates the heating element that atomizes the liquid solution and then taking a puff.^{8,9} Some e-cigarettes may look like conventional cigarettes, but they come in many different variations.^{8,10} The e-liquid is heated to a temperature of roughly 100-250 °C within a chamber to create an aerosolized vapor.¹¹ The user then inhales an aerosol, which is commonly referred to as vapor.¹² The act of using e-cigarettes is called “vaping” and the user is referred to as “vaper”.

* Corresponding author.

E-mail address: drrajvahluwalia@gmail.com (R. Ahluwalia).



Fig. 1: Various forms of E cigarettes



Fig. 2: E-cigarette and different flavoured vaping liquid



Fig. 3: Parts of e-cigarette

2. Safety of E-cigarettes

It is well established that e-cigarette is certainly less dangerous than smoking a traditional cigarette however, it is still unknown how much less harmful an e-cigarette may be to the user. Experts have argued on both sides of the debate where some applaud and endorse the use of e-cigarettes some have a serious concerns regarding the safety of it and think the health benefits are questionable.

Many experts believe that deep lung inhalation of ultra-fine particles present in e-cigarette smoke can cause serious health issues. Flavorands present in e-cigarette smoke such as diacetyl have found to be causative agent in many lung diseases. Other common hazardous compounds found in e-cigarette smoke are heavy metals like nickel, lead, tin etc. and many volatile organic compounds.

The promise of e-cigarettes is that they causes less health issues for individuals unwilling or unable to avoid smoking can use substitution with less dangerous behaviour and as a result, this may improve health. For example, cessation of injection drug abuse is a complex problem, but clean needle and syringe programs help reduce the spread of blood-borne diseases.¹³ But for e-cigarettes to yield meaningful health benefits, their health implications have to be considerably less harmful than cigarette smoking.

3. E-Cigarettes and Oral Health

Studies on the potential oral health effects of e-cigarette use are limited because e-cigarettes have been in use for only a very short duration of time. However, there are plausible mechanisms through which e-cigarettes could harm oral tissues. Majority of periodontal disease cases can be attributed to tobacco use, and damage to the periodontium from smoking is partly result of nicotine exposure. Nicotine inhibits osteoblast proliferation, impedes neutrophil function and stimulates inflammatory cytokine production from human gingival fibroblasts.¹⁴⁻¹⁷ E-cigarettes can deliver nicotine at levels comparable to conventional cigarette addition to other potentially toxic aerosol components.¹⁸

Aerosol temperature could affect oral tissues. The temperature at which e-cigarette aerosols are produced can vary from 130°C to 350°C.¹⁹ Nicotine stomatitis features hyperkeratinization and inflammation of the minor salivary glands of the hard palate. These can be attributed to exposure to high-temperature smoke.

A number of in vitro studies have investigated the response of oral cells and tissues to e-liquid exposure. Exposure of gingival fibroblasts to e-cigarette liquids, both with and without nicotine, demonstrated morphological changes, with nicotine-containing e-liquids found to be particularly cytotoxic.²⁰ In another study, human periodontal ligament fibroblasts exposed to e-cigarette aerosols showed increased markers of oxidative stress and

Table 1: Health hazards caused by e-cigarettes

| May lead to sterility | Respiratory effects such as lung fibrosis | CNS |
|--|---|--|
| Liver disorders, fatty liver changes, focal vacuolization and nodules | Decreased immunity | Color vision impairment |
| Nasal irritation and nasal olfactory epithelial lesions | Cardio-toxic | Weight gain in some individuals |
| Neurological effects such as neurotoxicity | Digestive disturbances | Cancer |
| Nasal olfactory epithelium degeneration | Renal disorders | Hypertension |
| Decreased body weight | Thyroid disorders | Death |
| Increased organ weight | Retarded development for growing individuals even if they are indirectly exposed to smoke | |
| Accidental injury due to explosion caused by faulty e- cigarette devices | Alveolar fracture, tooth fracture and avulsion by explosion caused near mouth | Soft tissue and mucosal burns in accidents |

inflammation, suggesting a pathogenic pathway.²¹

In addition to any oral health implications of e-cigarettes there are multiple documented cases of oral and facial trauma caused by explosions and fires from e-cigarette device malfunctions.^{22–24}

The dental practitioner may come across patients suffering from burns, alveolar fractures, and tooth evulsions, stemming from e-cigarette explosions near the mouth.²³ This potential for injury is unique to e-cigarettes. Despite the promise of lower levels of known toxins, the increasing use of e-cigarettes may be accompanied by new and unexpected risks.

4. Conclusion

Dental clinicians should send a clear message to their patients that no form of tobacco or nicotine is safe. The healthiest option is to eliminate nicotine and tobacco completely. However, patients should be made aware that combustible cigarettes are more harmful than e-cigarettes. Definite high quality research is lacking in the area where we can determine that whether or not e-cigarettes do help in quitting smoking. It must be emphasized that e-cigarettes are not harmless, and their long-term health risks are unknown.

5. Source of Funding

None.

6. Conflict of Interest

None.

References

- Carr AB, Ebbert J. Interventions for tobacco cessation in the dental setting. *Cochrane Database Syst Rev*. 2012;(6):Cd005084.
- Johnson NW, Bain CA. Tobacco and oral disease. EU-working group on tobacco and oral health. *Br Dent J*. 2000;189(4):200–6.
- Global Adult Tobacco Survey; 2016. Available from: <https://www.mohfw.gov.in/sites/default/files/GATS-2%20FactSheet.pdf>.
- Chandrupatla SG, Tavares M, Natto, Zuhair S. Tobacco Use and Effects of Professional Advice on Smoking Cessation among Youth in India. *Asi Paci J Can Prev*. 2017;18(7):1861–7.
- Couch ET, Chaffee BW, Gansky SA, Walsh MM. The changing tobacco landscape: What dental professionals need to know. *J Am Dent Assoc*. 2016;147(7):561–9.
- McMillen RC, Gottlieb MA, Shaefer RMW, Winickoff JP, Klein JD. Trends in Electronic Cigarette Use Among U.S. Adults: Use is Increasing in Both Smokers and Nonsmokers. *Nicotine Tob Res*. 2015;17(10):1195–1202.
- Weaver M, Breland A, Spindle T, Eissenberg T. Electronic Cigarettes. *J Addic Med*. 2014;8(4):234–40.
- Orellana-Barrios MA, Payne D, Mulkey Z, Nugent K. Electronic Cigarettes—A Narrative Review for Clinicians. *Am J Med*. 2015;128(7):674–81.
- Rahman M, Hann N, Wilson A, Worrall-Carter L. Electronic cigarettes: patterns of use, health effects, use in smoking cessation and regulatory issues. *Tob Induc Dis*. 2014;12(1):21.
- Pepper JK, Brewer NT. Electronic nicotine delivery system (electronic cigarette) awareness, use, reactions and beliefs: a systematic review. *Tob Cont*. 2014;23(5):375–84.
- Rowell TR, Tarran R. Will chronic e-cigarette use cause lung disease? *Am J Physiol Lung Cell Mol Physiol*. 2015;309(12):L1398–L1409.
- Cheng T. Chemical evaluation of electronic cigarettes. *Tob Cont*. 2014;23:11–7.
- Palmateer N, Kimber J, Hickman M, Hutchinson S, Rhodes T, Goldberg D. Evidence for the effectiveness of sterile injecting equipment provision in preventing hepatitis C and human immunodeficiency virus transmission among injecting drug users: a review of reviews. *Addict*. 2010;105(5):844–59.
- Tomar SL, Asma S. Smoking-Attributable Periodontitis in the United States: Findings From NHANES III. *J Periodontol*. 2000;71(5):743–51.
- Rothem DE, Rothem L, Soudry M, Dahan A, Eliakim R. Nicotine modulates bone metabolism-associated gene expression in osteoblast cells. *J Bone Miner Metab*. 2009;27(5):555–61.
- Ryder MI. Nicotine Effects on Neutrophil F-Actin Formation and Calcium Release: Implications for Tobacco Use and Pulmonary Diseases. *Exp Lung Res*. 1994;20(4):283–96.
- Wendell KJ, Stein SH. Regulation of Cytokine Production in Human Gingival Fibroblasts Following Treatment With Nicotine and Lipopolysaccharide. *J Periodontol*. 2001;72(8):1038–44.
- Lopez AA, Hiler MM, Soule EK, Ramôa CP, Karaoghlanian NV, Lipato T, et al. Effects of Electronic Cigarette Liquid Nicotine Concentration on Plasma Nicotine and Puff Topography in Tobacco Cigarette Smokers: A Preliminary Report. *Nicotine Tob Res*. 2016;18(5):720–3.
- Talih S, Balhas Z, Salman R, Karaoghlanian N, Shihadeh A. “Direct Dripping”: A High-Temperature, High-Formaldehyde Emission Electronic Cigarette Use Method. *Nicotine Tob Res*. 2016;18(4):453–9.
- Sancilio S, Gallorini M, Cataldi A, Sancillo L, Rana RA, di Giacomo V. Modifications in Human Oral Fibroblast Ultrastructure, Collagen Production, and Lysosomal Compartment in Response to Electronic

- Cigarette Fluids. *J Periodontol.* 2017;88(7):673-80.
21. Sundar IK, Javed F, Romanos GE, Rahman I. E-cigarettes and flavorings induce inflammatory and pro-senescence responses in oral epithelial cells and periodontal fibroblasts. *Oncotarget.* 2016;7(47):77196-204.
 22. Rogér JM, Abayon M, Elad S, Kolokythas A. Oral Trauma and Tooth Avulsion Following Explosion of E-Cigarette. *J Oral Maxillofac Surg.* 2016;74(6):1181-5.
 23. Harrison R, Hicklin D. Electronic cigarette explosions involving the oral cavity. *J Am Dent Assoc.* 2016;147(11):891-6.
 24. Vaught B, Spellman J, Shah A, Stewart A, Mullin D. Facial Trauma Caused by Electronic Cigarette Explosion. *Ear Nose Throat J.* 2017;96(3):139-42.

Author biography

Rajiv Ahluwalia Professor and HOD

Kunal Sharma Second year Post- Graduate Student

Parvinder Kaur Bindra Reader

Shabih Fatima Third Year Post – Graduate Student

| |
|--|
| <p>Cite this article: Ahluwalia R, Sharma K, Bindra PK, Fatima S. Vaping and oral health. <i>Santosh Univ J Health Sci</i> 2020;6(1):1-4.</p> |
|--|