E-cigarettes in India - An invite to oral cancer
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Abstract
E-cigarettes (E-cigs) popularly known as personal vaporizer is the current trend, the youth are attracted to. The target group are kids and teenagers who are driven to its trendy flavors and fruity odor. Adults and non-smokers are addicted too due to its nicotine content and its ease of portability. Robust advertisement with no tag of statutory warnings has scaled the market of E-cigs. The explosive threat of usage by 2018 is expected to double. It appears deceptive to be safe, less toxic alternative to conventional cigarettes. They do not fall under the blanket of tobacco products hence does not catch the eye of regulatory body’s scrutiny. It is assumed that E-cigs products may help smokers to lower the nicotine cravings during their withdrawal phase of tobacco use. E-cigs were in vogue as a tobacco deaddiction device, however, at this point, it is unclear whether they may be effective as smoking cessation aids. It was assumed to perpetuate the nicotine addiction and thus interfere with quitting. The addiction may foster youngsters to take up conventional smoking to attain a higher level of satisfaction. This article highlights the potential risks involved and the impact on teenagers and adolescents due to its usage. Further assessment of the potential carcinogenic effects of E-cigs vapor is urgently required to be explored.

Introduction
E-cigarettes (E-cigs) are pen-like devices operated by a battery used to inhale a combusted aerosol. Propylene glycol, vegetable glycerin, flavorings, and nicotine make up the constituents of the liquid present inside. Since their introduction to the U.S. in 2007, E-Cigs have experienced an exponential surge in popularity, with overall usage climbing from 3.3% to 8.5% between 2010 and 2013 and doubling of usage among adolescents between 2011 and 2012 alone. It is advertised as an adjunct to smoked tobacco products that are designed to simulate the act of tobacco smoking with flavored aerosol that substitutes for tobacco smoke. With a gentle press of a button to ignite, it delivers nicotine but with less toxic chemicals produced by processed and refined tobacco.

E-cigs are popular not only among those looking for rehabilitation to conventional cigarettes but also non-smokers leading to nicotine addiction or tempting them to take up conventional cigarette smoking.

The rapid hike of E-cigs is often attributed to advertisements portraying as a smoking cessation tool or as an ad hoc to traditional smoking. However, these claims have been widely found to be controversial and unfounded in scientific evidence.

A lack of a uniform approach in dealing with this public health problem will not only jeopardize the health of the people but will also enable the sellers of such products to escape the scrutiny of regulatory bodies. Although they are projected as “tobacco cessation” products by various sellers, including tobacco giants themselves, the lack of concrete evidence in support to this claim coupled with the absence of any regulatory approval for their use makes it a serious public health threat.

E-cigs Models
Several E-cigs models are available in the market such as the cig-alike, penstyle, e-Go vaporizer, tank systems, and personal vaporizer. E-cigs or electronic nicotine delivery system is a battery-powered device that simulates tobacco smoking by producing a heated vapor, which resembles smoke. E-cigs generally consist of a battery, a heating element or coil (atomizer), and E-cigs liquid (e-liquid). A schematic depiction is shown in Figure 1. Three generations exist as follows.

First generation
First-generation E-cigs model look like cigarettes and generally use cartomizers. A heating coil is activated and
subsequently vaporizes the E-cigs liquid creating a vapor that can be inhaled.

**Second generation**
Second-generation E-cigs called as personal vaporizer contain a “tank” that the user fills with his choice of E-cigs liquid based on the flavor preferred. The concentration of nicotine can also be adjusted from 0 to 24 mg/ml. These systems typically use larger batteries.

**Third generation**
Third-generation E-Cigs popularly called as variable voltage devices allow the voltage to be adjusted to different modes. An array of replaceable wicks and coils can be used.

**Global Scenario**

**Usage by youth**
Data from the National Youth Tobacco Survey, released by the U.S. Centers for Disease Control and Prevention (CDC) and the Food and Drug Administration, show that youth use of E-cigs exceeds the use of cigarettes, with 16.0% of high schoolers and 5.3% of middle schoolers reporting current use in 2015.[5]

**Usage by adults**
Data from the National Health Interview Survey show that in 2015, 3.5% of adults currently used E-cigs every day or some days (it was 3.7% in 2014).[6]

Earlier data from another survey, released by researchers from the CDC and prevention, found that in 2013, 8.5% of adults had used E-cigs at least once, and E-cigs use among adults in the past 30 days increased from 1% in 2010 to 2.6% in 2013.[2]

**Dangers Posed**
Many E-cigs and their refill liquids also come in sweet and mesmerizing flavors, such as chocolate, gummy bear, chocolate chip cookies, and strawberry, attracting kids and teenagers.[9]

Nicotine by itself is not lethal to initiate cancer. However, it is precisely because of nicotine addiction that people smoke or chew tobacco products and it is this smoking or direct tobacco consumption that poses a cancer risk. Smoking exposes the smoker to thousands of carcinogenic compounds.

A recent study conducted by Yu et al. (2015) evaluated the cytotoxicity and genotoxicity of short and long-term E-cigs vapor exposure on a panel of normal epithelial and head and neck squamous cell carcinoma cell lines treated with nicotine-containing and nicotine-free vapor extract from two popular brands. E-cigs exposed cells showed significantly reduced cell viability and clonogenic survival, along with increased rates of apoptosis and necrosis, regardless of E-cigs vapor nicotine content. The authors concluded that E-cigs vapor, both with and without nicotine, is cytotoxic to epithelial cell lines and is a DNA strand break-inducing agent.[9] Nicotine is an addictive drug, and recent research suggests that nicotine exposure may also tune the brain to substance abuse.[11]

A high level of toxic compounds is present in conventional cigarettes when compared to E-Cigs.[12] However, several studies consider E-cigs to be equally hazardous as traditional cigarettes.[13-15] The synergistic effect of the E-cigs components is unknown.[16] Many carcinogenic compounds are during combustion of e-liquids such as acrolein, carbonyl compounds, formaldehyde, potentially toxic metal nanoparticles, and acetaldehyde.[17]

Other dangers posed by E-cigs, that do not feature in the health warnings, are the possibilities of the product exploding (incidents have been reported globally) and accidental consumption of the liquid inside the E-cigs, which leads to death.[7]
E-cigs contain nicotine, benzene, and other carcinogenic compounds, which could affect the health of users and bystanders. Aerosols from E-cigs contain nicotine that can be inhaled by bystanders exposed passively to the aerosol, benzene, and other compounds.

The use of ordinary USB port charging connections allows users to connect the E-cigs to power adapters that are not provided by the device manufacturers. The fluctuations in the voltage can vary significantly subjecting the battery to explode.\(^\text{[18]}\)

**Significance for Public Health**

Long-term exposure to E-cigs vapor would cause repeated DNA strand breaks and dysfunctional DNA repair. Accumulation of mutations and genomic alterations drive the cell toward cancer development.\(^\text{[10]}\) E-cigs are a gateway for smoking by inducing nicotine addiction and perpetuating smoking by making it more attractive, thereby encouraging persons to become users of tobacco as well as E-cigs.\(^\text{[7]}\)

**Conclusion**

Further research to estimate the prevalence for the use of E-cigs in India is the need of the hour. Identification of potential users and methods to prevent their use must be explored in India. It is recommended that the Indian government imposes appropriate restrictions on the sale, advertisement, and online marketing of E-cigs endorsed with health warnings, to plug the existing regulatory vacuum following the live examples set by Punjab and Maharashtra. This should be done with immediate effect with the intervention of government. This prompted us to initiate such studies to provide conclusive evidence on the carcinogenic effects of E-cigs.

**References**


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