

Protecting youth from the vaping epidemic

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Abstract

E-cigarettes (e-cigs) have been initially proposed as an aid to smoke cessation in adults, whereas they turned into a paradoxical preferential gateway to tobacco and nicotine initiation for adolescents naïve to tobacco. More than 25% of US school-age students is an e-cigs user with a steep rise over the past years. A marketing strategy on media and social network targeting youths, in the absence of rules to protect the pediatric users, resulted in an unprecedented trend up in tobacco consumption among adolescents and gave rise to a new generation of nicotine-addicted teenagers. Flavored e-cigs liquids and aerosols contain airway irritants and toxicants, that, in turn, produced an increase in asthma prevalence and its exacerbations among adolescents. In addition, since August 2019 an outbreak of e-cigarette, or vaping, product use-associated lung injury (EVALI) has been described. In view of this, e-cigs must no longer be considered harmless, especially in adolescents never used a tobacco product before. This is a call-for-action to establish effective rules and campaigns targeting youths aimed to limit their access to e-cigs, thereby preserving the potential benefit in quitting tobacco addiction described in adults. Behavioral and educational actions, out of the conventional primary care setting, have been described as a model for a youth-centered campaign. We call for stricter regulations on e-cigs products, with respect to their marketing to the youngest ones, along with public health and primary care interventions that could curb the spread of this “vaping” epidemic.

KEYWORDS

e-cigarettes, pediatric asthma, vaping

1 | INTRODUCTION

E-cigarettes (e-cigs) have been proposed as an aid to smoke cessation in adults, with controversial evidence for their effectiveness, whereas they turned into a paradoxical preferential gateway to tobacco and nicotine initiation for adolescents naïve to tobacco.¹

E-cigs users have outnumbered traditional smokers among adolescents, with an unprecedented trend up in tobacco consumption,

resulting in a new generation of nicotine-addicted teenagers.^{2,3}

Today, e-cigs are the most commonly used tobacco products among young people, surpassing cigarettes in popularity, and half of the adolescent users of the popular JUUL brand, indeed, has never used a tobacco product before. The product design, flavors, marketing, and perception of safety and acceptability have increased the appeal of e-cigs to young people. However, e-cigs airway toxicity, due to irritants and toxicants contained in flavored e-cigs liquids and aerosols,

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is nowadays well known and e-cigs cannot be considered harmless any longer.

The vaping “epidemic” has been characterized by three age-specific features: (a) misperception of the threat among adolescents and caregivers; (b) scarce evidence for their mechanisms of action and consequent acute and chronic effects; and (c) lack of effective strategies to face this novel addiction in youths.

The *misperception of vaping* among adolescents, as the new trendy harmless commercial distraction, originates from an aggressive marketing strategy relied on media and social networks, whose primary audience is embodied by the adolescents. Despite claims that e-cigs are for adults only, evidence showed that manufacturers actively targeted young people and youth are initiating at younger and younger ages. Recent data show that an estimated 27.5% of high school and 10.5% of middle school students in the US are current e-cigs users⁴ and 47% of Italian School-age youths use traditional or electronic nicotine delivery systems (ENDS).³ Furthermore, the majority of vaper adolescents transition to smoking combustible cigarettes.²

Marketing e-cigs as candy bars with fruity is appealing to children and adolescents, thereby the effect of flavors on the airways could represent an additional threat to the users. Furthermore, the majority of flavors and additives of e-liquids are generally recognized as safe for oral consumption, but the effects of their repeated inhalation are unclear.⁵

The use of ENDS by pregnant mothers is also increasing and can expose the developing fetus to nicotine, a known teratogen. Research using animal models has shown that exposure to e-cigs vapor during pregnancy can alter behavior and cognition in offspring. Young children are frequently exposed to second and third-hand nicotine aerosols generated by e-cigs with little understanding of the effects these exposures can have on health.

1.1 | Vaping and pulmonary system

E-Cigs have been associated with an increase of asthma prevalence among adolescents; likewise, adolescents with asthma had a higher prevalence of current e-cigs use (12.4%) compared to their non-asthmatics peers (10.2%).⁵ Furthermore, in patients with moderate

Key message

E-cigarettes have turned into an easy, unexpected, gateway to initiate youths to first tobacco use, due to the misperception of the threat among adolescents and caregivers, and the lack of effective strategies to face their adverse effects including nicotine addiction.

asthma e-cigs were associated with an acute worsening of spirometric values of flow-limitation (FEV1/FVC) and increased values of the exhaled nitric oxide, a marker of airway inflammation. As far as it concerns bronchitic symptoms, such as cough and phlegm, they have been reported in 18,8% of adolescent e-cigs users, both in never-smokers (17,7%) and in ever-smokers (25,8%). Furthermore, risk of bronchitic symptoms was increased by almost twofold among past users, compared with never-users.⁶

Propylene glycol and vegetable glycerin represent the majority of e-liquid volume, whose decomposition during the vaping process produces carbonyl compounds with known toxicity and irritant properties for the airways.⁵ Airways exposure to carbonyl compounds results in a novel pro-inflammatory *milieu*, featured by a decreased expression of anti-inflammatory genes, and an unbalanced protease-antiprotease ratio that poses a significant risk for chronic lung remodeling, similar to the one observed in chronic obstructive pulmonary disease (COPD) and in chronic lung disease with bronchiectasis.⁷

In addition, airway acute toxicity of e-cigs was confirmed at the beginning of 2020 by Centers for Disease Control and Prevention (CDC) in a report of 2558 hospitalized patients with non-fatal cases and 60 patients with fatal cases of e-cigs, or vaping, product use-associated lung injury (EVALI).⁸ Bronchoalveolar lavage (BAL) identified tetrahydrocannabinol (THC) in the majority of these samples and vitamin E acetate in the whole group, suggesting for a role of these two compounds in the pathogenesis of the EVALI.⁸

EVALI was also described in adolescents admitted for respiratory distress after the use of THC-containing e-cigs, or vaping, products.⁹

	Target	Type of intervention
Legislative	Manufacturer	- Advertising risk - Limited sale to >18 y (or 21y) - Use under prescription
Public Health	Users	- Forbidden use in public areas - Forbidden use in closed spaces
Primary Care	- Potential Users - Actual Users	- Education/Brief Counseling - Pharmacotherapy
Non-traditional settings	- School-age youths - Families - Citizens	- Educational Campaigns - Social Media - Interactive/Virtual characters

TABLE 1 Strategies for vaping prevention

1.2 | Strategies for vaping prevention (Table 1)

This is a call-for-action for those responsible for public health policies to balance the regulation for e-cigs as tools to favor smoke cessation, against the collateral damage of creating a new generation of addicted adolescents among those who were not smokers before (Table 1). Some countries have enforced strict regulation on tobacco containing e-cig liquids, by requiring a medical prescription for these latter ones and allowing the free sale only of non-nicotine e-liquids or of combustible tobacco. The question for public health authorities is to seek a compromise between preventing vaping among children and adolescent non-smokers without discouraging current traditional smokers from switching to vaping.

Behavioral interventions—education and brief counseling—have been proven to have a moderate net benefit when administered in a primary care setting for smoking prevention in school-age youths, with insufficient evidence for their efficacy in those who already smoke. We fall short of evidence with regard to the use of primary care interventions in preventing vaping or encouraging its discontinuation. To this end, public health led education campaigns for schools and parents about the health risk of e-cigs use in youth. The use of avatar or virtual characters has been proposed by our group to pave the way to primary care behavioral actions out of a conventional setting.¹⁰ Virtual characters have already been successfully adopted as therapeutic aids to treat substance addiction and represent a promising alternative to traditional medical informed process when used under controlled conditions.

E-cig spread benefited from the use of youth-friendly language delivered by popular media as social networks, therefore shifting the paradigm of public health campaign from a traditional physician-centered approach (conventional setting) to a youth-centered interaction, delivered out of a traditional medical environment, could be a clue to a successful vaping-fight action.

Vaping outbreak calls for an action from pediatricians and all adolescent caregivers to check, inform, and guide youths away from Dr Jekyll's house prior to having him turning into Mr Hyde.

CONFLICT OF INTEREST

The authors have no conflict of interests with regard to the content of this manuscript.

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