E-cigarette use and respiratory symptoms in Chinese adolescents in Hong Kong

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To the Editor

E-cigarettes are increasingly used, but their health effects remain unclear. The primary ingredients of e-cigarette liquid, propylene glycol and flavoring chemicals (e.g. diacetyl or diketone), are respiratory irritants and harmful to the lungs.[1] Well-documented respiratory toxicants such as particulate matters, volatile organic compounds and metals were found in e-cigarette aerosol although in lower concentrations than conventional cigarettes.[2] Short-term adverse effects of airway resistance and inflammation have been observed in adults but null associations were also reported.[3] Children are particularly vulnerable to respiratory pollutants yet no study has evaluated the respiratory effects of e-cigarettes in children. We assessed the association between e-cigarette use and respiratory symptoms in Chinese adolescents in Hong Kong.

Methods

During 2012/13, we surveyed Secondary 1 (US Grade 7, typically aged 12) to Secondary 6 students from 75 randomly selected schools using an anonymous questionnaire based on the Global Youth Tobacco Survey.[4] An invitation letter was sent to parents, and student participation was voluntary. Ethics approval was granted by a local institutional review board. A total of 45128 students (94.5% of all invited) were available for analysis after data cleaning. Smoking status was defined as never-smoking, experimental smoking (smoked once or a few times), ex-smoking (smoking in the past but not now) and current smoking (smoked on ≥1 day in the past 30 days). E-cigarette use in the past 30 days (yes/no), respiratory symptoms (cough or phlegm) for 3 consecutive months in the past 12 months (yes/no), socio-demographic characteristics (sex, age, perceived family affluence) and secondhand smoke exposure were recorded. We weighted

descriptive data by sex, age and grade distribution of the corresponding general population. Adjusted odds ratios (AORs) of respiratory symptoms due to e-cigarette use were calculated using logistic regression (Stata 13.0; Stata corporation, College Station, TX, USA) for all students and by smoking status adjusting for socio-demographic characteristics, secondhand tobacco smoke exposure, school clustering effects and where appropriate, smoking status.

Results

The mean age was 14.6 ±1.9 years, and 51.1% were boys. Only 1.1% (95% confidence interval (CI) 1.0-1.2) of all students, 0.1% of never-smokers, 2.0% of experimenters, 9.6% of ex-smokers and 9.6% of current smokers had used e-cigarettes in the past 30 days. Respiratory symptoms were reported by 18.8% of all students, 17.7% of never-smokers, 25.8% of ever-smokers, 21.7% of experimenters, 27.2% of ex-smokers and 34.3% of current smokers. Figure 1 shows higher prevalence of respiratory symptoms in e-cigarette users regardless of smoking status. Overall, e-cigarette use was significantly associated with respiratory symptoms (AOR 1.28, 95% CI 1.06-1.56) (Table 1). The corresponding AORs (95% CI) were 2.06 (1.24-3.42) in never-smokers, 1.39 (1.14-1.70) in ever-smokers and 1.40 (1.02-1.91) in ex-smokers. Positive but non-significant associations were observed in experimenters (AOR 1.09, 95% CI 0.66-1.80) and current smokers (AOR 1.15, 95% CI 0.81-1.62).

Comment

We presented the first evidence of an association between e-cigarette use and respiratory symptoms in never and ever smoking adolescents, which were consistent with findings from other laboratory and adult studies on short-term adverse respiratory functions.[3] Similar ORs

between crude and adjusted models suggested the association was unlikely due to confounding effects and e-cigarette use may independently predict respiratory symptoms. Respiratory symptoms are a simple and useful outcome to demonstrate the short-term health effect of e-cigarette use while long-term effects are being studied. Nicotine-containing e-cigarettes are banned in Hong Kong but nicotine free e-cigarettes are not regulated and available from the Internet and retail stores. The strong association of respiratory symptoms with e-cigarettes observed in never smokers (AOR 2.06) is comparable to that found in adolescent occasional smokers (AOR 1.72).[5] This finding, together with the potential of e-cigarettes becoming a gateway for conventional cigarettes,[6] supported the World Health Organization's recommendation on regulating e-cigarette use particularly in children.[7]

(613 words)

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Study concept and design: SY Ho, MP Wang, TH Lam.
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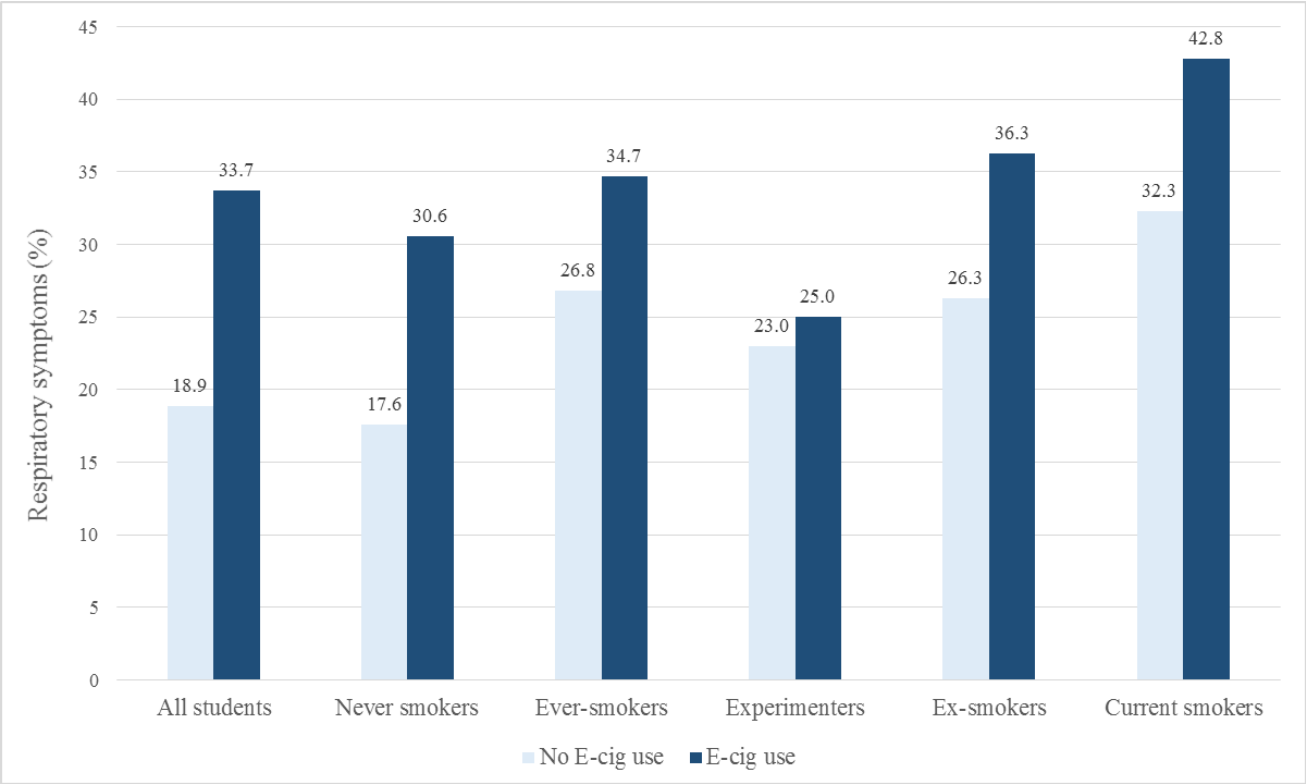
Figure 1. Higher prevalence of respiratory symptoms in e-cigarette users than non-user across different smoking status



χ^2P is <0.001 for all students, <0.01 for never smokers, 0.01 for ever-smokers, 0.69 for experimenters, 0.04 for ex-smokers and 0.40 for current smokers.

Table 1. Associations of e-cigarettes use with respiratory symptoms by smoking status

		Respiratory symptoms (%)		OR (95% CI)	
	N	No e-cig	E-cig	Crude[a]	Adjusted[b]
All	44662	19.4	33.9	2.13 (1.82-2.48)***	1.28 (1.06-1.56)*[c]
Never smokers	36915	17.9	31.3	2.09 (1.27-3.44)**	2.06 (1.24-3.42)**
Ever-smokers	7048	26.8	34.7	1.45 (1.19-1.78)**	1.39 (1.14-1.70)**
Experimenters	3576	23.0	25.0	1.12 (0.67-1.87)	1.09 (0.66-1.80)
Ex-smokers	1812	28.2	36.4	1.46 (1.07-2.00)*	1.40 (1.02-1.91)*
Current smokers	1660	34.3	37.6	1.15 (0.82-1.62)	1.15 (0.81-1.62)

[a]Adjusting for school clustering effects.

[b]Adjusting for sex, age, perceived family affluence, secondhand smoke exposure and school clustering effects.

[c]Additionally adjusted for smoking status.

*P<0.05; **P<0.01, ***P<0.001