

# Vaping-related injury and illness among Canadian children and adolescents: a one-time survey of paediatric providers

Nicholas Chadi <sup>1</sup>, Charlotte Moore-Hepburn,<sup>2</sup> Suzanne Beno,<sup>3</sup> Sarah A Richmond<sup>4</sup>

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## ABSTRACT

A one-time survey distributed to 2693 Canadian paediatricians enrolled in the Canadian Paediatric Surveillance Programme was conducted between October and December 2019. We identified a wide range of severe vaping-related injuries and illnesses among children ages 0–17 (n=88), which were associated with the routine use or malfunctioning of a vaping device or the ingestion of vaping substances. The most common clinical presentations were acute respiratory symptoms and nicotine toxicity and 15% (n=13) of injuries required intensive care unit admission. Our study highlights the urgent need for substantive policy measures to help protect youth against the risks associated with vaping products.

There was no patient or public involvement in this study.

The survey response rate was 42% (1131/2693) and included respondents from all Canadian provinces and territories. Of the 88 reported cases, there were 13 cases related to the ingestion of vaping substances, and the remainder were related to the routine use or malfunctioning of a vaping device (table 1). Forty-eight cases (55%) were male, and two-thirds (n=58, 66%) occurred in adolescents aged 15–17 years old. The most common presentation was respiratory distress/lung injury (n=39, 44%). Twenty-two cases (25%) were treated on a hospital ward; 13 cases (15%) required intensive care unit admission. Harms associated with ingestion of vaping products included nicotine toxicity, abdominal pain and nausea/vomiting.

Our survey identified a broad range of serious vaping-related injuries and illnesses. Injuries from routine use of a vaping device and resulting in respiratory distress or lung injury were the most common, and several cases required admission to a hospital ward or intensive care unit.

In 2019, 31.7% of Canadian high-school students reported vaping in the past 30 days.<sup>1</sup> Initially presented as a less harmful alternative for adult smokers, vaping products are now more commonly used by youth—many of whom have never used tobacco products.<sup>4</sup> Over 2800 hospitalised cases of vaping-associated lung injury (VALI) were reported between August 2019 and February 2020 in the USA, 15% of whom were adolescents ages 13–17 years.<sup>2</sup> In Canada, only 19 cases (5 cases under age 20) had been publicly reported by March 2020.<sup>5</sup> Our survey, which includes cases of vaping-related injuries that presented before the term VALI was defined, suggests that acute lung injuries only represent a

Recent increases in rates of vaping and exposure to vaping devices<sup>1</sup> have resulted in an increase in vaping-related injuries and illnesses, often in youth.<sup>2</sup> Yet, knowledge about the incidence, characteristics and circumstances of these events among children and adolescents remains limited.

All practising paediatricians and paediatric subspecialists (n=2693) participating in the Canadian Paediatric Surveillance Programme (CPSP), representing approximately 95% of practising paediatric providers in Canada, were invited to complete a one-time online or paper survey<sup>3</sup> between October and December 2019. Participants were asked to provide case-level data for patients under 18 years of age who sought medical attention in the past 12 months for serious illnesses and/or injuries related to one of three mechanisms: (1) routine use of a vaping product, (2) ingestion of vaping substances and (3) malfunction of a vaping device. Descriptive, aggregate data are reported as requested by CPSP policy stating that case numbers and data elements for fewer than five cases cannot be presented (to maintain confidentiality).



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<sup>1</sup>Division of Adolescent Medicine, Department of Paediatrics, Sainte-Justine University Hospital Centre, Montreal, Québec, Canada

<sup>2</sup>Division of Paediatric Medicine, Department of Paediatrics, The Hospital for Sick Children, Toronto, Ontario, Canada

<sup>3</sup>Division of Emergency Medicine, Department of Paediatrics, The Hospital for Sick Children, Toronto, Ontario, Canada

<sup>4</sup>Dalla Lana School of Public Health, University of Toronto, Toronto, Ontario, Canada

## Correspondence to

Dr Nicholas Chadi; nicholas.chadi@umontreal.ca

**Table 1** Characteristics of children and adolescents with vaping-related injuries or illnesses

	Female	Male	Total
Total	40	48	88*
Age range (years)			
1–14	12	18	30
15–17	28	30	58
Injury mechanism			
Routine use of vaping device or device malfunction	32	43	75
Ingestion of vaping product†	8	5	13
Substance‡			
Flavouring	9	13	22
Nicotine	14	19	33
Cannabis	6	15	21
Unknown	17	16	33
No response	5	7	12
Clinical presentation‡			
Respiratory distress/lung injury	22	17	39
Mouth or throat irritation and/or burn	*§	*	6
Abdominal pain/nausea/vomiting	*	*	9
Symptoms of nicotine toxicity (other than nausea/vomiting)	*	*	15
Central nervous system depression/altered mental status	*	*	9
Other¶	*	*	13
No response	6	7	13
Treatment location‡			
Walk-in/outpatient clinic	7	8	15
Emergency department	10	18	28
Hospital ward	10	12	22
Intensive care unit**	*	*	13
Referred to specialist	*	*	5
No response	10	13	23
Patient outcome			
Full recovery	16	19	35
Ongoing health issues	9	7	16
Unknown	5	8	13
No response	10	14	24

\*There were no duplicate cases.

†Fewer than five cases of injuries caused by the ingestion of a vaping product required intensive care unit admission.

‡Respondents could select more than one option.

§Asterisk indicates that one or both sex subgroup cells contain fewer than five participants (exact number may not be disclosed due to confidentiality concerns).

¶Other symptoms included: injury to upper limbs or torso, head or neck burn, eye injury/vision loss, and other (unspecified).

\*\*Of the cases requiring intensive care unit admission, fewer than five had ongoing health issues.

subset of acute vaping-related harms seen in children and adolescents.

Legislative and policy changes limiting youth access to vaping products are at different stages of implementation worldwide. Nonetheless, in most parts of Europe and North America, vaping products remain easily accessible, even for underage youth.<sup>6</sup> The 13 cases requiring intensive care admission captured by our survey emphasise the health burden associated with vaping-related injuries.

Our study has limitations. Survey participants only included paediatric providers; therefore, results do not include cases managed by non-paediatricians. In addition, data collection relied on voluntary reporting which resulted in a low-to-moderate response rate (42%) subject to non-response bias and recall bias given the 12-month reporting period.

Our study provides key insights about acute harms associated with vaping product exposure among children and adolescents. These insights highlight the urgent need for substantive policy measures to help mitigate the risks associated with vaping products.

**Twitter** Nicholas Chadi @nicholaschadi and Sarah A Richmond @Sarah\_A\_Richmond

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**Patient and public involvement** Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

**Patient consent for publication** Not required.

**Ethics approval** This study was exempt from research ethics approval as a public health surveillance project collecting only aggregate and anonymous data.

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#### ORCID iD

Nicholas Chadi <http://orcid.org/0000-0003-1033-2327>

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