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Original article

The Associations Between E-Cigarettes and Binge Drinking, Marijuana Use, and Energy Drinks Mixed With Alcohol

Sandra Milicic, Ph.D. *, and Scott T. Leatherdale, Ph.D.

School of Public Health and Health Systems, University of Waterloo, Waterloo, Ontario, Canada

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 A B S T R A C T

Purpose: Use of e-cigarettes by youth is proliferating worldwide, but little is known about the behavioral profile of youth e-cigarette users and the association of e-cigarette use with other health-risky behaviors. This study examines the associations between e-cigarette use and tobacco, marijuana, and alcohol use among a large sample of Canadian youth.

Methods: Using Canadian data from 39,837 grade 9 to 12 students who participated in year 3 (2014–2015) of the COMPASS study, logistic regression models were used to examine how current use of e-cigarettes were associated with tobacco, marijuana, binge drinking, and energy drinks mixed with alcohol. Pearson's chi-square tests were used to examine subgroup differences by sex.

Results: Overall, 9.75% of respondents were current e-cigarette users. Current cigarette smokers (odds ratio [OR] = 3.009), current marijuana users (OR = 5.549), and noncurrent marijuana users (OR = 3.653) were more likely to report using e-cigarettes than noncigarette smokers and non-marijuana users. Gender differences among males and females showed higher risk of e-cigarette use among female current marijuana users (OR = 7.029) relative to males (OR = 4.931) and female current smokers (OR = 3.284) compared to males (OR = 2.862). Compared to nonbinge drinkers, weekly (OR = 3.253), monthly (OR = 3.113), and occasional (OR = 2.333) binge drinkers were more likely to use e-cigarettes. Similarly, students who consume energy drinks mixed with alcohol (OR = 1.650) were more likely to use e-cigarettes compared to students who do not consume them.

Conclusions: We identify that youth who binge drink or use marijuana have a greater increased risk for using e-cigarettes compared to cigarette smokers. These data suggest that efforts to prevent e-cigarette use should not only be discussed in the domain of tobacco control.

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 IMPLICATIONS AND
 CONTRIBUTION

E-cigarette use is not exclusive to youth cigarette smokers as it also appears to be strongly associated with alcohol and marijuana use. Moving forward, e-cigarette use prevention efforts should not lie solely within tobacco control efforts but substance use prevention efforts more broadly.

E-cigarette use is proliferating among the youth populations worldwide. For instance, in the U.S., there has been a twofold increase in the experimentation of use of e-cigarettes from 2011 to 2012 among middle-school students—from .6 to 1.1—and

high-school students—from 1.5 to 2.8 [1], while past month use of 10th and 12th graders was as high as 14% and 16%, respectively [2]. In contrast, use increased in Poland from 5.5% in 2010–2011 to 29.9% in 2013–2014 [3]. The prevalence of e-cigarette use among Canadian youth is becoming more common as approximately 20% of youth nationally report having ever tried an e-cigarette [4,5]. Data from a large sample of youth in Ontario and Alberta from 2013 to 2014 found that 7.2% of grade 9 to 12 students surveyed were considered current e-cigarette users [6].

Conflicts of Interest: The authors have no conflicts of interest to disclose.

* Address correspondence to: Sandra Milicic, Ph.D., School of Public Health and Health Systems, University of Waterloo, 200 University Avenue, Waterloo, ON N2L 3G1, Canada.

E-mail address: smilicic@waterloo.ca (S. Milicic).

Little is known about the long-term health effects that consumption of e-cigarette vapor might pose [7]. Furthermore, although some suggest that e-cigarettes are a healthier alternative to conventional cigarette smoking and may help individuals to stop smoking [8–10], there is concern that e-cigarettes have the potential of becoming a gateway substance to the use of cigarettes and renormalizing tobacco smoking [1,9,11,12]. As such, public health is taking a precautionary approach to regulating its sale and use.

Research evidence consistently shows that risk-taking behaviors tend to cluster in youth [13–16]. Since the emergence of e-cigarettes, evidence has linked their use among youth populations with traditional cigarettes. Research consistently shows that youth cigarette smokers have a higher prevalence of use of e-cigarettes relative to nonsmokers [6,17,18], with some research even identifying a link between e-cigarette use and other tobacco product use including cigars, hookah, and smokeless tobacco [6,8,11,19–25]. However, the potential link between e-cigarettes and other risk behaviors common among youth (e.g., alcohol use and marijuana use) would benefit from additional investigation considering not all e-cigarette users consume tobacco.

For instance, research examining the link between e-cigarette use and marijuana use has found consistent evidence that individuals who used marijuana also had an increased prevalence of using e-cigarettes [14–16,18], even among noncigarette smokers [24]. However, the link with alcohol use is mixed. Some studies find that e-cigarette users were more likely than non-users to have used alcohol [20,22,24], even among nonsmokers of conventional cigarettes [25]. Other studies have reported that youth who binge drink are more likely than youth who do not binge drink to have used e-cigarettes [8,22,26,27], even among nonsmokers of cigarettes [8]. There is some evidence to suggest that compared to current cigarette smokers, e-cigarette users were not at a higher risk of using alcohol [23] or there was no relation to alcohol use [21]. Given how common the consumption of energy drinks mixed with alcohol is among youth populations [28] and that there is some evidence suggesting that consumption of energy drink is associated with other risky health behaviors such as marijuana use, smoking, and alcohol drinking [28,29], it may also be important to explore if there is an association with e-cigarette use among youth as well.

The purpose of this paper is to explore whether the current use of e-cigarettes is associated with traditional cigarette smoking, the use of marijuana, binge drinking, and the consumption of energy drinks mixed with alcohol in a large sample of Canadian youth aged 14 to 18 years participating in the COMPASS study (www.compass.uwaterloo.ca). Considering evidence of gender differences in substance use onset and risk taking [30,31,32], we also explored interactions by sex when examining the associations between e-cigarettes and substance use in our models.

Methods

Design

This study uses data from the COMPASS study which is an established school-based system designed to effectively guide and improve youth prevention research and practice. The COMPASS study is an ongoing cohort study (2012–2021) collecting hierarchical and linked longitudinal behavioral and

program/policy data from a sample of 50,000+ grade 9 to 12 students and the 89 secondary schools they attended in Ontario ($n = 79$) and Alberta ($n = 10$) [32]. While the first wave of data for COMPASS was collected during the 2012/2013 school year, measures of e-cigarette use were not added until the year 2 data collections (2013/2014). For the purpose of this paper, we present data from 87 secondary schools participating in year 3 of COMPASS (2014/2015). A full description of the study methods is available in print [32] or online (www.compass.uwaterloo.ca).

Participants and procedures

Schools and school boards in Ontario and Alberta were purposefully sampled, and eligible schools were approached after a board-granted approval. Board-level and school-level inclusion criteria required being an English-speaking secondary school that permits the use of active-information passive-consent parental permission protocols. At participating COMPASS schools, the parent(s) or guardian(s) of eligible students were mailed an information letter about the COMPASS study and were asked to contact the COMPASS recruitment coordinator using either the toll-free phone number or email address provided in the information letter should they not want their child to participate. All eligible students whose parent(s) or guardian(s) did not contact the COMPASS team to withdraw their child were deemed eligible to participate. Students could decline to participate at any time. In year 3, data were collected from 42,355 grade 9 to 12 students (78.7% participation rate) in 87 schools. Youth who were at field trips, absent, or had classroom spares (mostly an issue for grade 12 students) on the day and time of the survey resulted in missing data (20.5%) and parental refusal accounted for the remaining missing data (.8%).

The student-level questionnaire for COMPASS (Cq) collects individual student data pertaining to multiple behavioral domains (e.g., marijuana use, eating behavior, tobacco use, physical activity, etc.), correlates of the behaviors, and demographic characteristics. In each school, the Cq was used to collect within-school samples during class time. The Cq items were based on national standards or current national public health guidelines, as described elsewhere [32].

Measures

Consistent with Czoli et al. [6], we modeled the main outcome of interest, use of e-cigarettes in the past 30 days, using the following question: In the last 30 days, did you use any of the following? (mark all that apply). Students could choose one or more of the following response options: pipe tobacco, cigarillos or little cigars, cigars, roll-your-own cigarettes, loose tobacco mixed with marijuana, e-cigarettes, smokeless tobacco, nicotine patches, nicotine gum, nicotine lozenges, nicotine inhalers, hookah to smoke tobacco, hookah to smoke herbal sheesha/shisha, blunt wraps, and have not used any of these things in the last 30 days. Respondents who reported using e-cigarettes in the past 30 days were considered current e-cigarette users.

We include age (14 or younger, 15, 16, 17, 18 or older), sex (female, male), ethnicity (white, black, Asian, Aboriginal, Latin American/Hispanic, other/mixed), and amount of weekly spending money in dollars (0, 1–20, 21–100, more than 100) as correlates in the models as well. Sex and ethnicity are time-invariant sociodemographic characteristics which are important consideration as correlates. If we exclude any of the

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