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Electronic Vapor Product Usage and its Relationship to Suicidality in Vermont Youth

John Paul Grogan
University of Vermont

Bonnica Zuckerman
University of Vermont

Frezette Ackah
University of Vermont

Melissa Ackley
University of Vermont

Margaret Cameron
University of Vermont

See next page for additional authors

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Author

John Paul Grogan, Bonnica Zuckerman, Frezette Ackah, Melissa Ackley, Margaret Cameron, and Kelsey Gleason

Abstract

Objective: To examine the association between the use of electronic vapor products (e-cigarettes) and suicidal ideation.

Methods: This study explored the association between e-cigarettes usage and suicidal ideation among 16,733 Vermont high school respondents of the 2017 Youth Risk Behavior Survey (YRBS). Bivariate logistic regression was used to predict the odds of suicidal ideation with current electronic vapor product (EVP) use as the main predictor while controlling for current cigarette, alcohol, and marijuana use, age, gender, sexual orientation, and a history of bullying or sexual violence.

Results: The odds of suicidal ideation are 5.86% lower for students using EVPs than those who do not when controlling for gender, age, sexual orientation, past bullying or forced sexual experience, and current alcohol, marijuana, and cigarette use.

Conclusion: EVP use and suicidal ideation were related in this study sample. Further research is needed to replicate and understand this relationship.

Introduction

In 2017, electronic vapor products (EVPs) were the most common type of nicotine product used by adolescents.¹ An estimated 2.1 million middle school and high school students reported using EVPs in 2017; that number jumped to 3.6 million in 2018.² Tobacco is the leading cause of preventable cancer.³ The World Health Organization (WHO) estimates around 1.27 billion tobacco users world-wide and states that tobacco consumption accounts for 5.4 million deaths per year.⁴ EVPs have now accounted for an “outbreak of lung injury.”⁵ As of October 22, 2019, 1,604 cases have been reported to the Centers for Disease Control and Prevention (CDC) and 34 deaths have been confirmed.⁵

The prevalence of suicidality is increasing across the United States. It is reported that over the last 17 years, the rate of suicide has increased by 31%.⁶ This trend is also true in Vermont. According to the Vermont Youth Risk Behavior Survey (YRBS), during the past year, 10% of students made a suicide plan and 5% attempted suicide, and these numbers have increased significantly over the past ten years.⁷ Understanding the link between EVP use and suicidal ideation could improve adolescent mental health by identifying populations with an increased risk of psychiatric disorders. The knowledge gained from this study could be used for future public health awareness and preventative strategies.

Previous studies have shown an association between nicotine exposure in adolescence and an increased risk of developing psychiatric disorders and cognitive impairments later in life.⁸ Research has also shown that suicidal ideation and suicide attempts have been linked to various factors, such as alcohol use, a history of sexual assault, and depression.⁹ This study examined the association between adolescent EVP use and suicidal ideation. Variables that could impact the association between EVP use and suicidal ideation were controlled for, such as age, gender, sexual orientation, a history of sexual violence and/or bullying, and current substance use (alcohol, cigarettes, and marijuana).

Methods

Data Source

The data used in this study was from the 2017 Vermont Youth Risk Behavior Survey (YRBS). YRBS data collection procedures are well established, and 77% of Vermont high school students completed surveys.⁷ 16,733 of the 20,653 respondents in grades 9-12 had data for all of the study variables and were included in the study analysis.

Variable Selection and Treatment

Variables were selected based on reported associations with either EVP use or suicidal ideation, which included age, gender, sexual orientation, a history of sexual violence and/or bullying, and other substance use.⁹ The variables were defined using the following criteria:

1. *Age* was broken into categories including, ≤ 13 , 14-15, 16-17 and ≥ 18 .
2. *Gender* was categorized as male or female.
3. *Sexual orientation* was determined using the survey question “which of the following best describes you?” which had response options of heterosexual (straight), gay or lesbian, bisexual, or unsure. This study used two categories of “heterosexual” or “other:”
4. *History of sexual violence and/or bullying* was examined by combining two survey questions asking about bullying and forced sexual intercourse. A participant was considered to have a history of sexual violence and/or bullying if he answered yes to either question.
5. *Substance usage* was measured using questions that asked about past 30-day use of cigarettes, alcohol, and marijuana. Response options began with “0 days” and increased up to “all 30 days.” Any response other than “0 days” for any of the three substances was considered current substance use.
6. *Suicidal ideation* was measured using the survey question asking whether or not the respondent made a suicide plan in the last 12 months. Responding “yes” to this question corresponded to suicidal ideation while “no” indicated the participant did not have suicidal ideations.

Statistical Analyses

Frequencies were used to describe the variables. The variables were cross tabulated with current EVP usage to assess concurrent responses. The relationship between EVP use (main predictor)

and suicidal ideation (outcome) was studied using Binary Logistic Regression, while controlling for age, gender, sexual orientation, a history of sexual violence or bullying, and current cigarette, alcohol, and marijuana usage. The statistical analyses were carried out using SPSS 26 (IBM, 2019).

IRB Ethics Statement.

The data was collected by the Vermont Health Department and Agency of Education with the consent of the subjects involved in the study and ensuring their privacy. Use of the Vermont YRBS data is in compliance with current research ethics standards

Results

Demographics

This study was based on a sample of 16,733 Vermont high school students surveyed in 2017. A summary of the demographic variables can be found in the supplemental materials. The majority of the students were ages 14-15 (39.21%) or 16-17 (48.40%). The proportions of male and female participants were approximately equal. A majority (85.7%) of students identified as heterosexual, while 14.3% were classified as “other,” which included gay, lesbian, bisexual, or unsure participants.

Covariates

Of the 16,733 students in the survey, 11.0% were current users of EVPs, 29.1% currently drank alcohol, 8.6% currently smoked cigarettes, and 19.4% used marijuana. The concurrent usage of these substances with EVPs can be found in supplemental materials. Simultaneous usage of EVPs with cigarettes occurred 67.5% of the time, alcohol use 32% of the time, and marijuana use 42.4% of the time.

Relationship between EVP Usage and Suicidal Ideation

The association between EVP use and suicidal ideation was significantly negative without the inclusion of covariates (OR=0.363(95%CI: 0.320-0.411), $p < 0.001$, Table 1). The association between EVP usage and suicidal ideation was significant when controlling for age, gender, sexual orientation, a history of sexual violence or bullying, and current substance use (OR = 0.586(95% CI: 0.501-0.685 $p < 0.001$, Table 1).

Table 1. SPSS Logistic Regression Output for EVP Use (Predictor) and Suicidal Ideation (Outcome) With and Without Covariates

Variable	B	OR(95% CI)	p-value
<i>Without covariates</i>			
Current EVP Use	-1.013	0.363(0.320-0.411)	$p < 0.001^*$
Constant	2.316	10.133	$p < 0.001^*$
<i>Considering covariates</i>			
Age	0.097	1.102(1.054-1.152)	$p < 0.001^*$
Gender	0.521	1.683(1.501-1.887)	$p < 0.001^*$
Sexual Orientation	-1.313	0.269(0.239-30.02)	$p < 0.001^*$
Sexual Violence and/or Bullying	-1.278	0.279(0.249-0.312)	$p < 0.001^*$
Current Substance Use Y/N	-0.638	0.528(0.467-0.597)	$p < 0.001^*$
Current EVP Use Y/N	-0.535	0.586(0.501-0.685)	$p < 0.001^*$
Constant	1.883	6.576	$p < 0.001^*$

Values marked with * are considered significant

Discussion

The odds of suicidal ideation were 5.86% lower among Vermont adolescents who use EVPs compared to those who do not, while controlling for age, gender, sexual orientation, a history of sexual violence or bullying, and current substance use. This indicates that EVPs could serve as a protective factor against suicidal ideation. Other studies have reported similar results. For example, a study of 2,488 found that adolescents who only use EVPs report less anxiety and depression symptoms.¹⁰

Previous research has also concluded that EVP usage is associated with an increase in health-risk behaviors and other substance use among high school students.¹¹ The variability in findings suggests that more research examining the association between EVP use and mental health symptoms is necessary. This study can also encourage future researchers to study whether

or not EVP usage truly does serve as a protective factor against suicidal ideation. This suggests that in this sample, EVP use may be acting as a protective factor for suicidal ideation, although the direction of the association cannot be determined with this study design. Understanding this relationship is important for developing effective strategies that can prevent suicidal ideation.

There are various limitations of the study. The YRBS data that was collected was self-reported and therefore, subject to reporter bias. The survey did not include a question to measure socioeconomic status, which could have been a confounding variable. Lastly, the data was only representative of Vermont adolescents, so the findings may not be applicable to teenagers across the country.

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Supplemental Materials

Table 2. Summary of Variable Frequencies across High School subjects (percentages per group) in the study and per Electronic Vapor Products user category (User/Non-User, percentages per category within group).

	N(% from group)	Electronic Vapor Products user	
		No(%)	Yes(%)
Age			
≤13	46(0.27%)	28(60.87%)	18(39.13%)
14-15	6561(39.21%)	6092(92.85%)	475(7.24%)
16-17	8099(48.40%)	7072(87.39%)	1017(12.56%)
≥ 18	2027(12.11%)	1683(83.03%)	344(16.97%)
Gender			
Female	8314(49.7%)	7589(91.3%)	725(8.7%)
Male	8419(50.3%)	7296(86.7%)	1123(13.3%)
Sexual Orientation			
Heterosexual	14334(85.7%)	12785(89.2%)	1549(10.8%)
Other	2399(14.3%)	2100(87.5%)	299(12.5%)
History of sexual violence			
No	15862(94.8%)	14296(90.1%)	1566(9.9%)
Yes	871(5.2%)	589(67.6%)	282(32.4%)
History of bullying			
No	14308(85.5%)	12887(90.1%)	1421(9.9%)
Yes	2425(14.5%)	1998(82.4%)	427(17.6%)
History of sexual violence and/or bullying			
No	13824(82.6%)	12529(84.2%)	1295(9.9%)
Yes	2909(17.4%)	2356(15.8%)	282(32.4%)
Current Alcohol Use			
No	11865(70.9%)	11576(97.6%)	289(2.4%)
Yes	4868(29.1%)	3309(68%)	1559(32%)
Past 30-day user of standard Cigarettes			
No	15303(91.5%)	14420(94.2%)	883(5.8%)
Yes	1430(8.6%)	465(32.5%)	965(67.5%)
Current Marijuana Use			
No	13489(80.6%)	13017(96.5%)	472(3.5%)
Yes	3244(19.4%)	1868(57.6%)	1376(42.4%)
Current Substance Use			
No	11018(65.8%)	10909(73.3%)	109(5.9%)
Yes	5715(34.2%)	3976(26.7%)	1739(94.1%)
N (Subjects in Study)	16733	14881(88.93%)	1854(11.08%)