Article

Youth Access to Electronic Cigarettes in an Unrestricted Market: a Cross-Sectional Study from Poland

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Abstract: Background: Electronic cigarette (e-cigarette) use among youth in Poland has become very popular. The aim of this study was to identify potential points of access to these products among students aged 16-17 before implementation of sales restrictions to minors in Poland in November 2016.

Methods: A school-based, cross-sectional survey was administered in 2015-2016 in 21 secondary/technical schools across two regions of Poland. Analyses focused on 341 students aged 16-17 who reported past 30-day use of e-cigarettes. Pearson chi-square analyses were utilized to examine associations between access-related items, e-cigarette use, and demographics.

Results: Among youth e-cigarette users, the most common access to their first e-cigarette was from a friend (38%), followed by purchasing from vape shops (26%). Similar patterns emerged when students were asked about the access to their currently used e-cigarette. Most youth reported no difficulty purchasing cartridges/e-liquid containing nicotine (90%); the majority of users (52%) reported buying such products in vape shops. **Conclusions:** Prior to implementing age-related sales restrictions, youth access to e-cigarettes and paraphernalia did not pose any significant barriers. Poland's introduction of a new age limit on e-cigarette sales may help limit the number of youth who purchase e-cigarettes from vape shops.

Keywords: e-cigarette access; e-cigarette use; youth

1. Introduction

Several epidemiological, clinical and laboratory studies show that although electronic cigarette (e-cigarettes) are promising harm reduction tools, they also may pose risks to non-smokers who start to use them. According to the U.S. Surgeon General, nicotine should not be used by youth, as youth are disproportionately vulnerable to adverse effects related to nicotine exposure (such as addiction, greater likelihood of using other addictive substances, and greater problems with mood, attention and cognition).[1] Irrespective of nicotine, other ingredients in e-cigarette liquids and aerosols may also pose health risks to users. For example formaldehyde and acetaldehyde are recognized carcinogens that have been found in aerosols produced in e-cigarettes.[2] Additionally, flavorings found in e-liquids are appealing to youth users [3] and can present potential respiratory health risks, as the effects of repeated inhalation of food-grade flavorings is currently unknown. For instance, benzaldehyde (commonly found in in cherry-flavored e-cigarette products) is a respiratory irritant,[4] while diacetyl (present in many fruit-flavored e-cigarettes) can cause a condition known as "popcorn lung disease".[5]

Despite these potential health risks, e-cigarette use has become popular among youth.[6] Epidemiological studies show differences in the prevalence of e-cigarette use in this group across countries. Past 30-day e-cigarette use among youth in the U.K. was 2.0%[7], 3.1% in USA[8] and 3.2% in Ireland[9]. By contrast, there are countries where e-cigarettes are used more frequently. Recent prevalence estimates from South Korea suggest that 4.7% of youth report using e-cigarettes in the past 30 days;[10] rates of youth e-cigarette use are much higher in New Zealand (19.9%)[11]. Our studies on e-cigarette use among youth in Poland have shown significant increases in ever use of e-cigarettes from 6.0% in 2011[12] to 29.9% in 2014[13].

Researchers have shown that factors associated with e-cigarette uptake among students are similar to those for cigarette smoking. For example evidence suggests that "curiosity" and "experimentation" serve as factors influencing e-cigarette trial.[14,15] Concerns have been raised that e-cigarette experimentation leads to regular e-cigarette use, and may serve as a gateway product for cigarette smoking among youth who may not have otherwise been introduced to nicotine containing products[16].

Unrestricted access to tobacco products serves as a key factor in initiating nicotine use,[17] yet little is known about how young e-cigarettes users access and purchase e-cigarette products. It is important to identify and enforce effective strategies that may limit youth access to e-cigarettes, as any prevention measures limiting youth access to e-cigarettes need to be balanced with controlled access by adult smokers. In Poland, access to tobacco products, including conventional cigarettes, is limited to those above age 18. Prior to 2016, no parallel age limits were implemented for e-cigarette purchases. The article outlines how youth in Poland accessed e-cigarettes in an unregulated market without age-related restrictions on e-cigarette purchases.

2. Materials and Methods

2.1 Participants

Data were from a cross sectional survey performed by the authors in 2015-2016. Detailed methodology was described previously.[13,18] Briefly, data were collected using an anonymous, self-directed, paper and pencil questionnaire administered by school teachers to students in 21 secondary and technical schools throughout two regions of Poland (10 in slaskie and 11 in pomorskie voivodeship) using a three-staged stratified cluster sampling design. In total, 2,222 students responded to the survey, including 1,059 students from schools located in urban areas, and 1,139 students from schools located in rural areas.

We restricted the scope of our analysis to participants aged 16-17 who answered all key demographic questions to evaluate how those under legal age of purchasing tobacco products accessed e-cigarettes, and if they reported any restrictions or problems with purchasing devices. Our analyses focused on youth who reported any use of e-cigarettes in the past 30 days. The analytical sample included students who only used e-cigarettes (exclusive e-cigarette users) and students who reported past 30-day use of e-cigarettes and smoking tobacco cigarettes (dual users). After exclusions, 341 students remained in the final analytic sample.

2.2 Measures

Tobacco and e-cigarette use status was determined by self-reported use of e-cigarettes (exclusive e-cigarette users) or concurrent users of tobacco cigarettes and e-cigarettes (dual users) within the past 30 days. Main outcome measures included responses to the following questions: "Did you have difficulty obtaining an e-cigarette?" (yes, no), "Where did you get your first e-cigarette?" (Internet, shopping mall, vape shop, received it as a gift, bought on black market, from a friend, other), "Where did you get the e-cigarette you currently use?" (Internet, shopping mall, vape shop, use device that I received as a gift, bought on black market, I borrow an e-cigarette but do not own one), "Have you had trouble getting cartridges/liquid with nicotine?" (yes, no) and "Where do you usually buy your cartridges/e-liquid? (Internet, shopping mall, vape shop, other)"

2.3 Statistical Analysis

Descriptive statistics were generated for each variable of interest, and Pearson chi-square analyses were utilized to examine associations between access-related items, e-cigarette use, and demographics. P-values <0.05 were considered statistically significant. All analyses were conducted in IBM SPSS Version 21.0.

3. Results

Table 1 displays demographic information for the sample. Among all e-cigarette users, 33% were exclusive past 30-day e-cigarette users, while 67% were dual users of e-cigarettes and tobacco cigarettes. Largely, there were no statistically significant differences between exclusive e-cigarette users and dual users, with the exception of differences by gender (χ^2=10.725, p<0.001) as more male students reported exclusive use of e-cigarettes. By contrast, numerous differences emerged in product use patterns and characteristics of products chosen by exclusive and dual users (Table 1).

Table 1: Participant demographics, e-cigarette use patterns, and e-cigarette product characteristics

		Current e-cigarette use				
		Overall (n=341)	Exclusive E-cigarette Users (n=112)	Dual Users of E-cigarettes and Tobacco Cigarettes (n=229)	χ^2 (excl. vs. dual)	p-value
Age	16	126 (37%)	44 (39%)	82 (36%)	0.391	0.532
	17	215 (63%)	68 (61%)	147 (64%)		
Sex	Female	165 (48%)	40 (36%)	125 (55%)	10.725	<0.001
	Male	176 (52%)	72 (64%)	104 (45%)		
Place of Residence	Urban	166 (49%)	51 (46%)	115 (50%)	0.660	0.417
	Rural	175 (51%)	61 (55%)	114 (50%)		
Type of School Attended	Secondary School	129 (38%)	49 (44%)	80 (35%)	2.485	0.115
	Technical/Vocational School	212 (62%)	63 (56%)	149 (65%)		
Ever smoked one cigarette	Yes	311 (91%)	82 (73%)	229 (100%)	67.256	<0.001
	No	30 (9%)	30 (27%)	0 (0%)		
Frequency of E-cigarette Use	Everyday	110 (33%)	27 (25%)	83 (37%)	5.466	0.065
	At least weekly	81 (24%)	27 (25%)	54 (24%)		
	Less than weekly	146 (43%)	56 (51%)	90 (40%)		
Puffs per day on EC	<5 times/day	186 (58%)	67 (64%)	119 (54%)	7.305	0.026
	5-10 times	40 (12%)	16 (15%)	24 (11%)		
	10+ times	97 (30%)	21 (20%)	76 (35%)		
Use nicotine in EC?	Yes	276 (87%)	82 (79%)	194 (90%)	7.792	0.005
	No	43 (14%)	22 (21%)	21 (10%)		
Use flavor in EC?	Yes	305 (97%)	105 (98%)	200 (97%)	0.580	0.446
	No	9 (3%)	2 (2%)	7 (3%)		

Figure 1 shows the most commonly reported sources of e-cigarette acquisition. The most frequently reported sources of first e-cigarette and currently used e-cigarette were from friends (38% and 49%, respectively). Vape shops also emerged as a significant point of access to e-cigarettes among youth; 26% respondents reported purchasing their first e-cigarette at a vape shop, and 17% reported obtaining the device they currently used from a vape shop. Youth in rural areas more frequently reported obtaining their first e-cigarette from the internet compared to youth in urban areas, and less frequently reported purchasing on the black market relative to urban youth (χ^2=12.721, p=0.048). Rural youth were significantly less likely to report purchasing their currently used e-cigarette from a kiosk in contrast to urban youth (χ^2=13.904, p=0.031).

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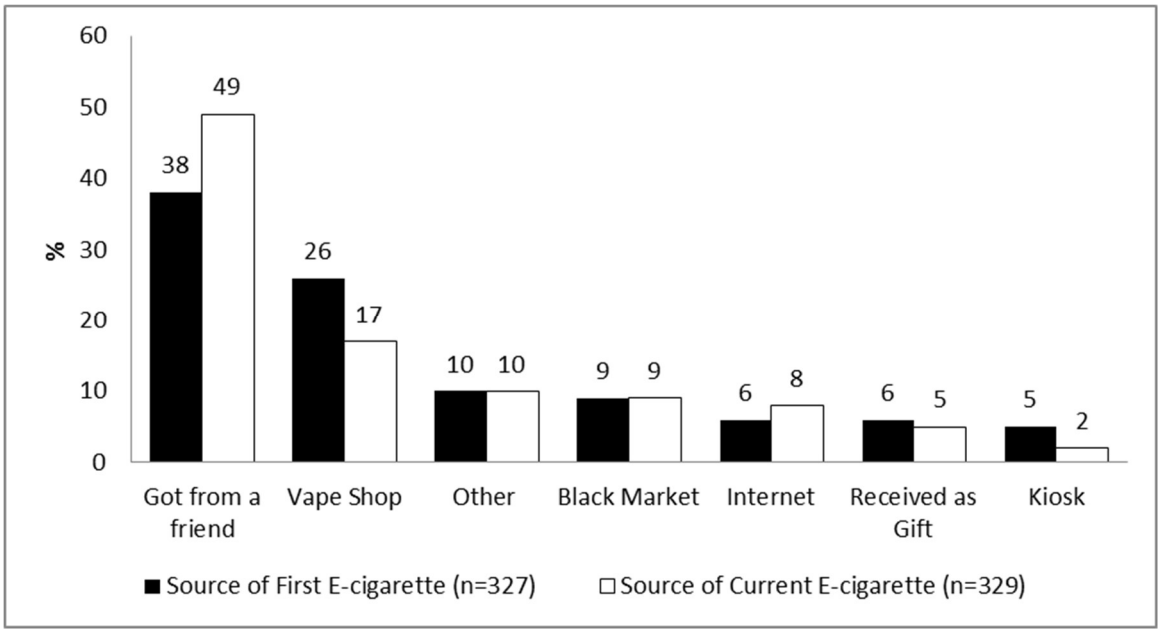
Figure 1: Sources of acquisition for first e-cigarette and current e-cigarette used



Among all past 30-day e-cigarette users, 52% reported obtaining cartridges/e-liquid from a vape shop, compared to 29% reporting getting cartridges/e-liquid from "other" sources, 14% from kiosks, and 6% from online shops. Differences in source of cartridges/e-liquid acquisition were not statistically significant (χ^2=2.686, p=0.443). One in 10 students reported having trouble obtaining an e-cigarette, and 9% reported having trouble obtaining cartridges or e-liquid that contained nicotine. The only significant differences in reported difficulty in obtaining an e-cigarette were by age, with 14% of 16 year old respondents reporting having difficulty, compared to 7% of those aged 17 (χ^2=4.673, p=0.31).

4. Discussion

According to our knowledge, this is the first study to assess points of access and retail outlets where youth obtained e-cigarettes in an unrestricted market. Our data showed that youth mainly received e-cigarettes from friends, while the second most common retail outlet was purchasing devices in vape shops. Similarly, youth frequently reported buying cartridges/e-liquids in vape shops and in kiosks. The Internet was not a popular way to buy e-cigarette devices or e-liquids. Findings from previous studies suggest web retailers easily supply underage users[19] due to the absence of effective age-verification measures. [20] Our study challenges the assumption that the most common access to e-cigarettes among youth is via Internet. However, in the countries with more restrictions on retail sale of tobacco products, youth may be more likely to attempt purchasing e-cigarettes from online stores.

In our sample, teens got their devices mostly from friends, which is consistent with other data from the U.S. showing the association between friends' use of e-cigarettes with e-cigarette use.[21] In line with this finding, it seems that Polish youth share their devices often. Peer groups influence experimentation with substance use, many of whom supply other youth with e-cigarette devices. Identifying problematic interrelationships among youth that may lead to increased likelihood of substance experimentation and trial is warranted with respect to growing e-cigarette use experimentation and use.[22]

At the time this study was conducted, there were no age-related sales restrictions in Poland to limit the ability for teens to purchase e-cigarettes or nicotine-containing e-liquids from different

sources. This needs to be taken into consideration when interpreting results of our study. As is the case with many other nations, Poland regulates tobacco sales, use and marketing.[23] While representatives of the e-cigarette industry declared self-regulation measures being sufficient to forbid youth access to e-cigarettes, our study suggests that the voluntary actions taken by retailers may have only marginal effects at best. The new amendment to the tobacco control law (The Act of November 9, 1995 on Protection of Public Health Against the Effects of Tobacco Use) is in accordance with the European Union Tobacco Product Directive implementation, which requires a ban on sales of these products to people under age 18. Even today, based on our knowledge, retailers and internet vendors in Poland are not subject to surveillance, which limits the ability to ensure compliance with the law. To minimize access to e-cigarettes by youth, Internet sale of these products needs to be closely monitored, and online shops should implement strict age verification processes. Retail outlets should be required to verify the age during the purchase of e-cigarettes.[24]

This study was subject to limitations. First, there was no objective validation of e-cigarette and combustible cigarette use, such as exhaled CO or measurements of cotinine. Also, our results cannot be generalized to all Polish teens, as we only researched two regions in Poland. Finally, our data did not permit us to compare access to tobacco cigarettes and e-cigarettes, especially given the small group of other tobacco product users.

5. Conclusions

Our data suggest that, prior to implementing age-related sales restrictions, youth access to e-cigarettes and paraphernalia was not restricted by any effective preventive measures. The implementation and future evaluation of Poland's new policy will provide additional information to support the effectiveness of age-related policy interventions as applicable to e-cigarette use among youth. Future surveillance efforts are needed to assess changes in self-reported access to e-cigarettes. Novel approaches are needed to minimize access to e-cigarettes from peers and friends.

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