

## TOBACCO SMOKERS AND ELECTRONIC CIGARETTES USERS AMONG POLISH UNIVERSITIES STUDENTS

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### ABSTRACT

**Background.** Electronic cigarettes (e-cigarettes) are small battery-powered electronic devices, heating the liquid to produce vapour – in most cases the latter contains nicotine and several flavourings. E-cigarettes are highly advertised across the media, mainly as healthy substitute to conventional cigarettes, aid in quitting smoking addiction or way of circumventing ban on smoking in public places.

**Objective.** The aim of study was obtaining epidemiological data on cigarette smoking and electronic cigarette usage among Polish universities students.

**Material and methods.** Students of different Polish state universities were asked to fill a self-prepared survey on cigarette-smoking and electronic cigarette usage. 1068 fulfilled questionnaires were gathered. The population was divided into two subgroups – medical universities' students (n=545) and non-medical universities students (n=523).

**Results.** 23.78% of respondents declared current smoking while 57.0% admitted ever smoking. The mean duration of smoking among current smokers was  $4.17 \pm 2.53$  years. 56.30% of current smokers tried quitting at least once. 31.46% of students declared ever using e-cigarettes (37.28% (n=195) among non-medical universities' students and 25.87% (n=141) among medical universities' students and 8.33% current usage. Among the latter 52.81% admitted simultaneous smoking. 26.97% of current e-cigarettes' users declared having experienced side effects of e-cigarettes. 42.70% (n=456) of respondents viewed e-cigarettes as safer than conventional cigarettes, this group comprises of 40.54% (n=212) non-medical and 44.77% (n=244) medical universities' students. 85.39% (n=912) of students viewed e-cigarettes as generally unhealthy, there were 83.56% (n=437) non-medical and 87.16% (n=475) medical universities' students among this group.

**Conclusions.** The frequency of e-cigarettes usage resembles current status in many Western countries. Collected data shows high frequency of e-cigarettes usage and conventional cigarettes smoking among students (also medical universities' students). The situation requires intensive preventive measures to limit and reduce the popularity of tobacco products along with modern equivalents like electronic cigarettes.

**Key words:** *electronic cigarettes, e-cigarettes, smoking, smoking cessation, nicotine dependence, university students*

### STRESZCZENIE

**Wprowadzenie.** Elektroniczne papierosy (e-papierosy) są niewielkimi urządzeniami elektronicznymi, zasilanymi bateriami. Po ogrzaniu płynu zawartego w papierosie utworzona zostaje para, zawierająca określona ilość nikotyny i substancji zapachowych. E-papierosy są szeroko reklamowane na całym świecie, najczęściej jako zdrowsza alternatywa dla tradycyjnych papierosów, pomoc w rzucaniu nałogu tytoniowego lub sposób na ominięcie zakazu palenia w miejscach publicznych.

**Cel.** Celem badania było uzyskanie danych epidemiologicznych dotyczących palenia papierosów oraz używania e-papierosów przez studentów polskich publicznych uczelni wyższych.

**Material i metody.** Studenci wielu polskich publicznych uczelni wyższych zostali poproszeni o wypełnienie autorskiego formularza ankietowego na temat palenia papierosów oraz użytkowania e-papierosów. Do analizy użyto 1068 prawidłowo wypełnionych formularzy ankiety. Grupa respondentów została podzielona na dwie podgrupy – studentów uniwersytetów medycznych (n=545) oraz niemedycznych (n=523).

**Wyniki.** Wśród ankietowanych 23.78% zadeklarowało aktywne palenie w momencie wypełniania ankiety, 57.0% przyznało się do palenia papierosów kiedykolwiek w przeszłości. Średnia długość nałogu obecnych palaczy wynosi  $4.17 \pm 2.53$  lat.

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56.30% obecnych palaczy próbowało przynajmniej raz rzucić nałóg. 31.46% ankietowanych deklaroowało użycie e-papierosów przynajmniej jeden raz. Wśród nich 37.28% (n=195) stanowili studenci uczelni niemedycznych i 25.87% (n=141) studenci uczelni medycznych. 8.33% badanych używa ich obecnie, spośród nich 52.81% zadeklarowało jednoczesowe palenie tradycyjnych papierosów. 26.97% obecnych użytkowników e-papierosów deklaroowało odczuwanie przynajmniej raz skutków ubocznych korzystania z tych urządzeń. 42.70% (n=456) badanych uważa e-papierosy za bezpieczniejsze dla zdrowia od tradycyjnych papierosów, na tą grupę przypada 40.54% (n=212) studentów uczelni niemedycznych oraz 44.77% (n=244) medycznych. 85.39% ankietowanych (n=912) uważa e-papierosy za niekorzystne dla zdrowia, z czego 83.56% (n=437) to studenci uczelni niemedycznych i 87.16% (n=475) medycznych.

**Wnioski.** Odsetek populacji polskich studentów używających e-papierosy jest zbliżony do wyników uzyskanych przez badaczy w wielu krajach zachodnich. Dane te wskazują na częste używanie e-papierosów i papierosów tradycyjnych wśród studentów, w tym także studentów uczelni medycznych. Wymagają one podjęcia intensywnych działań prewencyjnych, ukierunkowanych na ograniczenie popularności wyrobów tytoniowych oraz ich nowoczesnych odpowiedników.

**Słowa kluczowe:** *elektroniczne papierosy, e-papierosy, palenie, rzucanie palenia, uzależnienie od nikotyny, studenci*

## INTRODUCTION

In 1912 German physician and researcher *Isaac Adler* published his monograph on lung cancer, stating that its incidence is constantly growing and connecting this with tobacco and alcohol abuse as possible causes [1]. Since then numerous articles on health risks related to cigarette smoking as well as its epidemiology have been published and therefore it is well established how harmful cigarettes are. Since more than 10 years we face a new problem connected to the nicotine addiction – electronic cigarettes (e-cigarettes). These are small battery-powered electronic devices, composed of atomizer, liquid-filled tank, mouthpiece and casing. Heating element (primary part of atomizer) is responsible for creating vapour from the liquid that is to be inhaled or hold in mouth by the user. E-cigarettes are highly advertised across the media, mainly as healthy substitute to conventional cigarettes, aid in quitting smoking addiction or way of circumventing ban on smoking in public places [3, 13, 19]. The expenditures on adverts are even rising – from 6.4m USD in 2011 to 18.3m USD in 2012 in the USA [15] and from 1.7m GBP in 2010 to 13.1m GBP in 2012 in the UK [3]. With growing popularity, according to Action on Smoking and Health currently about 2.6 million people in United Kingdom use e-cigarettes even special term for e-cigarettes' usage was created: vaping [5]. The popularity of e-cigarettes raises questions about their safety as well as shows a need for both experimental and epidemiological studies. In a 2014 survey study consisting of 821 young (16-17 yrs) Irish 23.8% admitted to ever use e-cigarettes [6]. In 2012 a survey was conducted in Great Britain on 3538 current and 579 ex-smokers and revealed that about one fifth is currently using and about one third has ever used e-cigarettes. The three most popular reasons for e-cigarettes' usage were health concerns, cutting down and quitting smoking [10]. In another survey based

study *Brose et al.* revealed that daily use of e-cigarettes correlated with frequency of quitting attempts but not with successful cessations [9].

In our study we investigated conventional and electronic cigarettes usage among Polish universities' students to explore the epidemiology of e-cigarettes' usage and cigarette smoking as well as associated factors. Currently only very limited data on the usage of e-cigarettes is available.

## MATERIAL AND METHODS

A self-prepared online questionnaire composed of 32 questions about usage and knowledge about e-cigarettes was presented to students of various Polish universities. Data was collected from March to June 2015. Respondents were asked to fulfil the forms *via* Facebook groups associated with their studies. The study was anonymous and voluntary. Respondents received no financial gratification for their effort. 1068 people correctly completed the survey. The group was further divided into medical universities students (n=545) and non-medical universities students (n=523), the latter group consists of all Polish state universities (except medical) and polytechnics. Average age of respondent was  $21.72 \pm 2.10$  yrs. (minimum: 18 yrs., maximum: 39 yrs., median: 21 yrs.), women comprise 75.00% (n=801) while men 25.00% (n=267).

Respondents were asked about their current status in terms of tobacco smoking and e-cigarettes usage as well as the former and the latter in the past. The group of ever smokers had additional questions about quitting: reasons, frequency, aids and smoking history: duration, number of cigarettes smoked a day. At the end of the survey the respondents answered questions on their attitude towards smoking and e-cigarettes usage in public places.

### Statistical analysis

Collected statistical data was analysed with Statistica 10 Software (StatSoft, USA). The level of significance was set at  $p < 0.05$  and calculated using *Pearson's Chi<sup>2</sup>* test (for current smokers, people who ever tried smoking, smoking occasions, quitting aids, quitting reasons, e-cigarettes' usage), *U Mann-Whitney's* test (for smoking duration, quitting frequency, e-cigarettes' safety, e-cigarettes' usage in public).

## RESULTS

### Demography

31.18% (n=333) of respondents came from villages, 25.84% (n=276) from cities with more than 250,000 inhabitants, the rest from towns and smaller cities. Respondents came from 51 Polish state universities and polytechnics. About 50% of respondents comprises of students of six Polish high schools - Medical University of Lublin, Warsaw Medical University, Medical University of Białystok, Nicolaus Copernicus University (Toruń), Maria Curie-Skłodowska University (Lublin) and John Paul II Catholic University of Lublin.

### Cigarette-smoking

57.30% (n=612) admitted having ever smoked cigarettes, this number comprises of 62.90% of non-medical universities' students (n=329) and 51.93% of medical universities' students (n=283). The statistically important difference of e-cigarettes usage between students of medical and non-medical universities was observed with  $p = 0.00029$ . 23.78% (n=254) of respondents declared smoking currently – this comprises of 30.02% of non-medical universities' students (n=157) and 17.80%

(n=97) medical universities' students ( $p = 0.00000$ ). Mean duration of smoking habit among the whole group was  $4.17 \pm 2.53$  years, among non-medical universities' students:  $4.27 \pm 2.49$  years, among medical universities' students:  $4.00 \pm 2.59$  years ( $p = 0.31$ ). The most common occasions for cigarettes' smoking among tested students are: party (n=210), stressful moments (n=169), hang-out with friends (n=166), breaks between classes (n=152), on morning (n=79), before going to bed (n=71), during conversation (n=60). The difference between medical and non-medical universities' students was not statistically relevant ( $p > 0.05$ ).

### Quitting smoking

56.30% (n=143) of current smokers tried quitting at least once, 31.10% (n=79) have not tried, but is planning to, 11.42% (n=29) have not tried nor is planning to, 3 people had omitted this question. Comparison of quitting frequency between medical and non-medical universities' students is listed in Table 1. The most common aid for quitting smoking was progressive reduction of cigarettes' number smoked daily (n=108). Others were at most half as popular: switching to e-cigarettes (n=51), physical activity (n=43), pharmaceutical aid (n=31), relatives and friends support (n=26), meditation (n=6). No statistically significant difference between two tested groups was observed ( $p > 0.05$ ). Quitting reasons chosen by current smokers in their past attempts are listed in Table 2.

### E-cigarettes' usage

31.46% (n=336) of respondents admitted having ever used e-cigarettes, 37.28% (n=195) among non-medical universities' students and 25.87% (n=141) among medical universities' students ( $p = 0.00006$ ). 8.33%

Table 1. Frequency of quitting attempts - differences among groups

	Total	Non-medical universities' students	Medical universities' students	p value ( <i>U Mann-Whitney's</i> test)
Only once	44	28 (18.06%)	16 (16.67%)	0.9602
More than once	99	60 (38.71%)	39 (40.63%)	
Not even once but is planning to	79	49 (31.61%)	30 (31.25%)	
Not even once and is not planning to	29	18 (11.61%)	11 (11.46%)	

In brackets: percentage of medical/non-medical universities' students (smokers) who chose this answer.

Table 2. Reasons for quitting chosen by current smokers

	Total	Non-medical universities' students	Medical universities' students	p value ( <i>Pearson's Chi<sup>2</sup></i> test)
<b>Health issues</b>	<b>116</b>	<b>63 (40.13%)</b>	<b>53 (54.64%)</b>	<b>0.0240</b>
Aesthetic reasons	73	44 (28.03%)	29 (29.90%)	0.7488
Somebody's influence	28	17 (10.83%)	11 (11.34%)	0.8992
Social advert in media	2	0 (0.00%)	2 (2.06%)	0.0709
Financial reasons	108	66 (42.04%)	42 (43.30%)	0.8435
Other	45	28 (17.83%)	17 (17.53%)	0.9501

In brackets: percentage of medical/non-medical universities' students (smokers) who chose this answer. Bold: correlation statistically significant.

Table 3. Occasions for e-cigarettes' usage listed by total number of current users who chose them.

Occasion	Total	Non-medical universities' students	Medical universities' students	p value ( <i>Pearson's Chi<sup>2</sup> test</i> )
Party	53	39 (60.00%)	14 (58.33%)	0.8869
Stressful moments	50	35 (53.85%)	15 (62.50%)	0.4653
Hang-out with friends	54	43 (66.15%)	11 (45.83%)	0.0816
Breaks between classes	46	36 (55.38%)	10 (41.67%)	0.2504
On morning	42	32 (49.23%)	10 (41.67%)	0.5258
Before going to bed	52	41 (63.08%)	11 (45.83%)	0.1430
During conversation	45	34 (52.31%)	11 (45.83%)	0.5877

In brackets: percentage of medical/non-medical universities' students (e-cigarettes' users) who chose this answer.

(n=89) declared current usage of e-cigarettes: 12.43% (n=65) among non-medical universities' students and 4.40% (n=24) among medical universities students ( $p < 0.00001$ ). 93.26% (n=83) of current e-cigarettes' users admitted having ever smoked conventional cigarettes, 6.74% (n=6) of these users have not smoked conventional cigarettes before ( $p < 0.00001$ ). 52.81% (n=47) of current e-cigarettes' users simultaneously smoke conventional cigarettes, this number make up 18.50% of smokers. Occasions for e-cigarettes' usage are listed in Table 3.

#### *E-cigarettes' safety and public usage*

26.97% (n=24) of current e-cigarettes' users had experienced side effects of e-cigarettes, most frequently mentioned (listed according to frequency): headache, mucous membranes dryness, nausea, cough, dyspnoea, sore throat, vertigo. 42.70% (n=456) considered e-cigarettes as safer than conventional cigarettes, this group comprises of 40.54% (n=212) of non-medical and 44.77% (n=244) of medical universities' students ( $p = 0.4012$ ). 85.39% (n=912) of respondents believed e-cigarettes are generally unhealthy, there were 83.56% (n=437) non-medical and 87.16% (n=475) medical universities' students among this group ( $p = 0.0848$ ). 47.28% (n=505) stand for ban on e-cigarettes' usage in public places (44.93% (n=235) non-medical and 49.54% (n=270) medical universities' students, ( $p = 0.0173$ )). Respondent's opinion on e-cigarettes' usage in public places is listed in Table 4.

## DISCUSSION

Despite numerous research on tobacco smoking and nicotine addiction new questions still emerge. New form of delivery has been implemented: e-cigarette and as it is relatively new matter a lot of gaps in knowledge needs to be filled, alongside with epidemiological studies on e-cigarettes' usage in different populations. The danger related to tobacco smoking is well known since decades, unfortunately e-cigarettes' influence on human health has not been so comprehensively studied. Although they are considered safer, it is not fully legitimated by scientific research. It should be therefore positively seen that most of respondents do not fully trust e-cigarettes and believes that although they may be safer than conventional cigarettes they still establish danger to human health. The safety of electronic cigarettes would be hard to establish firmly as there are dozens of different liquid with different additives. *Bahl et al.* [7] has tested 41 liquids for their cytotoxicity on cell lines and concluded that it depends mostly on used flavourings and can range from none to well-marked. *Romagna et al.* [18] compared cytotoxicity of e-cigarettes and conventional cigarettes vapour on cell lines, the results showed significantly lesser cytotoxicity of electronic cigarettes' vapour, although it was still present, the latter results were later acknowledged by *Farsalinos et al.* [11].

Percentage of e-cigarettes' users among students of Polish universities is currently low, we can however assume that it will grow over time, mainly due to increasing marketing and advertising of e-cigarettes'. *White et al.* [23] compared rate of e-cigarettes ever-use among New Zealand adolescents in 2010 and 2014 and

Table 4. Opinion on e-cigarette's usage in public places

Opinion	Total	Non-medical universities' students	Medical universities' students	p value ( <i>U Mann-Whitney's test</i> )
Definitely positive	22	15 (2.87%)	7 (1.28%)	
Rather positive	47	23 (4.40%)	24 (4.40%)	
Neutral	560	292 (55.83%)	268 (49.17%)	0.0341
Rather negative	321	146 (27.92%)	175 (32.11%)	
Definitely negative	118	47 (8.99%)	71 (13.03%)	

In brackets: percentage of medical/non-medical universities' students (e-cigarettes' users) who chose this answer.

found it tripled. *Babineau et al.* [6] studied e-cigarettes' usage among youth in Ireland (aged 16-17 years) with similar results in terms of percentage of people who ever tried e-cigarettes but more than twice lower percentage of current users. *Saddleson et al.* [20] in a sample of American college students revealed almost twice higher percentage of current e-cigarettes' users and slightly higher ever-use rate.

As the safety and long term risk related to e-cigarettes is not verified similar security measures should be applied to marketing, sales and usage of them as to conventional cigarettes. *Blaser et al.* [8] asked 40 Swiss experts about their opinion on e-cigarettes' legislation. The consensus was found: the e-cigarettes' should be available on market, but should be sold only to adults, advertising should be strictly limited and usage prohibited everywhere where smoking is illegal. Almost 25% of active smokers in young and educated population must be seen as highly inappropriate. Although different studies from Europe and USA [4, 14] shows similar results still there are studies showing much lower rates of smoking [2, 16]. Polish epidemiological studies reveals even worse situation as *Piotrowska et al.* [17] reported almost 50% of girls aged 16-18 years to be active smokers (32% daily). Comparable smoking rate was noted among students of one of Polish life sciences universities with 27% of women and 40% of men smoking [21]. On the other hand only 10% of students of another Polish life sciences university reported active smoking at the time the survey took place [12], comparable results were obtained by *Sygit* [22] with almost 16% of boys and 11% of girls aged 15-19 years from rural areas admitted to active smoking. Before mentioned difference can be attributed to slightly younger population included in those two studies (both had respondents between 10 and 20 years old). The problem of tobacco smoking should not be left and needs to be addressed as soon as possible. As our study revealed there are two main reasons for quitting – financial and health issues – therefore educational program about health risk associated with smoking should be implemented as well as further increase in price of cigarettes with illegal tobacco market fighting are needed.

## CONCLUSIONS

Cigarettes and e-cigarettes are popular among students of different Polish universities and therefore a long term effort should be planned to improve the situation and prevent increase in e-cigarettes' popularity, especially among adolescents. The study proved that the knowledge of health risk related to smoking is not enough to prevent people from smoking and therefore legal regulations should be implemented, especially

regarding usage of e-cigarettes in public places as well as among youth.

## Conflict of interest

*The authors declare that there is no conflict of interests regarding the publication of this paper.*

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