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## Awareness of dangers of using e-cigarettes among society

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### Abstract

E-cigarettes were introduced as a new way of quitting smoking and became a popular alternative to regular cigarettes. For a long time, e-cigarettes were considered harmless, however year after a year, new facts about their adverse effects are being discovered. This year in the USA, using e-cigarettes caused a lot of deaths among their users because of the newly discovered disease called EVALI. According to this, we decided to make a research on awareness of dangers associated with using e-cigarettes. We prepared a survey with 283 responses and analyzed literature related to the topic.

Responses showed that 71,4% used to smoke cigarettes. Moreover, 81,6% uses or has used e-cigarettes in the past, however, only 4,9% consider them harmless. The most common reasons

for using e-cigarettes are: variety of liquid flavors (58,4%), desire to try something new (52,8%) and stress relief (32,9%). Quitting smoking was motivation only for 24,2% of responders. The fact that 72,3% do not plan to quit vaping is an alarming sign. Analysis of literature confirmed results of our survey, showing that there is a group of people using e-cigarettes although they have never smoked. Mostly they are under 20 years old.

Results of our study imply the necessity of taking up actions aimed to increase society awareness of dangers associated with using e-cigarettes and to do more research on vaping side effects.

**Key words:** e-cigarettes; vaping; vape; society; teenagers; dangers

## 1. Introduction

In spite of widely available knowledge of dangers related to smoking, Poland is still a country where nicotine concerns 29% of the population (Giovino et al. 2012). According to gender, men are the majority of smokers, however among people aged 18-24 there are more smoking women. Moreover, results of anti-nicotine therapy in Poland are still not satisfactory, as abstinence percentage is below 30% (Górecka et al., 2012).

Recently another problem has been standing out against nicotine addiction. Raising interest in using e-cigarettes concerns a big group of people, mostly teenagers and young adults. Contrary to regular cigarettes, electronic ones heat up a special liquid until it changes into vape inhaled by the user. Liquids can contain different ingredients, such as nicotine (up to 24mg/ml), CBD or THC.

Researches on electronic cigarettes have been carried since the early 90's when tobacco concern, Phillip Morris first tried to invent a healthier alternative for smoking. Devices used nowadays have been invented in 2003 by Chinese pharmacist Hok Lik. In Poland, they were first introduced in 2006 and became more and more popular during the next few years.

In 2008 WHO banned advertising electronic cigarettes (Kaleta, 2010), however the choice of devices in the market is still very wide and new models are being introduced every month. One of the determinants of e-cigarettes popularity is an array of liquids' flavors. They are available not only in tobacco flavors, but can also imitate sweets, fruits or alcohol taste. It can cause raising popularity of smoking among teenagers and under-aged. As using e-cigarettes became more popular, another dangerous behavior appeared. Performing tricks with e-cigarette vape became a well-known trend, especially among younger users. It could be highly dangerous because of the fact that people that did not have contact with e-cigarettes are starting to use them this way. Another threat is that performing tricks demands a lot of practise which is related to using devices producing a high amount of vape which may cause more nicotine usage or quicker addiction (Pepper, 2017).

Another aspect of e-cigarettes popularity is the fact that there were advertised as a way to quit smoking. In the United Kingdom smokers were offered a free starter kit in order to change traditional cigarettes to e-cigarettes (McKeganey, 2018). It turned out to be a great success and e-cigarettes became extremely popular among British people. Similar situation took place in the United States, where company called Juul became one of the most popular e-cigarettes distributors. Those devices were popular not only among adults, but also teenagers what resulted in high number of addicts among the youngest.

In Poland as well as in other countries e-cigarettes were new hope for people wanting to quit smoking. Although that, studies show that a lot of e-cigarette users smoke traditional cigarettes at the same time. Moreover, 19% of people younger than 20 years vapes even if they have never smoked (Górski, 2017). Results of survey conducted on people wanting to quit smoking showed a spectacular outcome of 80% of respondents declaring abstinence after starting using e-cigarette (Szmagaj and Jóźwiak, 2009). Observations however established a significantly lower percentage of abstinence (12,5%) and a significant amount of return to smoking, which is probably caused by sustaining nicotine addiction (Królikowski and Domagała-Kulawik, 2014). According to WHO report e-cigarettes cannot be considered as nicotine replacement therapy as it is not possible to control the doses of nicotine taken by the user, which is crucial for addiction treatment (Kaleta, 2010).

Right after introducing e-cigarettes to the worldwide market, they were advertised as less harmful or completely harmless alternative for smoking. They were supposed not to contain less carcinogens due to heating substances containing nicotine instead of burning. Liquids mostly contain glycerin and propylene glycol in various proportions, providing specific properties of vape. They also contain flavorants, sometimes nicotine and becoming more and more popular cannabinoids such as THC and CBD. However, substances classified by the *International Agency for Research on Cancer (IARC)* in the first group of risks, such as formaldehyde or acrolein irritating the respiratory tract were found in some of the liquids. Moreover, the main ingredients (glycerin and propylene glycol) may cause eyes and mucous membranes inflammation, behavioral disorders and neurological symptoms. Dangers related to e-cigarettes are also caused by the size of the particles in the vape. They are deposited in respiratory tract, especially lungs. Liquid's ingredients can cause inflammation in the lungs, be a source of oxidation stress and disturb balance of oxidants and antioxidants (Górski, 2017).

Last year problem of dangers associated with e-cigarettes became one of the most popular topics because of respiratory tract disorders appearing among e-cigarettes users in the USA. The most common symptoms were digestive problems, such as diarrhea or vomiting, followed by pneumonia-like respiratory problems. The disease called EVALI (*E-cigarette or Vape Associated Lung Injury*) afflicted over 2500 people in the United States during just six months. Some registered cases were lethal and most patients required hospitalization in Intensive Care Units (Kalinsky et al., 2019). According to the *Centers for Disease Controlling and Prevention (CDC)* significant majority of EVALI cases appeared to people using liquids containing cannabinoids (especially THC). Probably symptoms were caused by vitamin E acetate used to thicken cannabinoid containing liquids.

## 2. Purpose

According to the fact, that number of e-cigarettes users has significantly raised during last years as well in Poland and worldwide and the fact that Poland is one of the countries with a higher percentage of young smokers (Górski, 2017) we decided to study society awareness of dangers associated with e-cigarettes usage. Increasing awareness of hazard related to this relatively new product may reduce the number of serious health consequences.

### 3. Material and methods

In order to research society awareness of dangers associated with using e-cigarettes we prepared a three-part survey. First part was accessible for everyone and included questions used to gather some basic information about interviewee and determine if they are using e-cigarettes. Second part was designed for people using e-cigarettes and included questions related to their vaping habits. Third part was again accessible for everyone and included questions about awareness of dangers associated to e-cigarettes usage. Whole survey included 16 questions – 5 in first, 8 in second and 3 in third part. We gathered 283 responses and 231 people admitted to use e-cigarettes or used them in the past.

Questions in first part were related to age, sex, place of living of the respondents and if they have ever smoked. There were also a question determining if respondent is or was using e-cigarettes – after confirming, they were moved to the second part and after denying, to the third

In the second part of the survey questions were related to specific aspects of vaping, including: how long they are using e-cigarettes, do they use liquids containing nicotine and if so, what dose have they ever used CBD or THC containing liquids, how much of the liquid they are using during a week and why they started using e-cigarettes. We also asked about situations when respondents feel the need to vape and if they are willing to quit using e-cigarettes. Last question of this part was about feeling side effects of vaping such as respiratory problems.

The third part included questions about harmfulness of using e-cigarettes, probability of appearing side effects and awareness of diseases related to vaping.

### 4. Results

The majority of respondents was younger than 22 years. Almost 46% of questioned people were between 16 and 19 years old, 9,2% - under 16, 7,8% - 22-25 years old and 2,5% - over 26. Men were 63,3% and only 21,2% live in villages.

More than 70% of questioned people tried to smoke traditional cigarettes – 15,5% smokes regularly, 27,6% smokes occasionally and 28,3% used to smoke in the past. Over 81,6% uses e-cigarettes (231 people).

Almost 75% of people who use e-cigarettes have been doing that for a year or longer. Most of them use liquids containing 3mg nicotine per milliliter (44,6%) and 6mg per milliliter (29,4%). As many as 9,1% uses at least 18mg/ml and 9,1% - nicotine-free liquids. Almost 25% used liquids containing THC or CBD at least once.

The most common reasons for starting using e-cigarettes were: a desire to try something new (52,8%), variety of liquids flavors (58,4%), trying to relieve stress (32,9%), peer pressure (25,1%) and substitute for cigarettes (24,2%). There were also single answers suggesting using e-cigarettes to perform vaping tricks or because they are considered to be healthier than traditional cigarettes.

Amounts of liquid used during the week didn't reach more than 10ml for 27,7%. Almost 30% uses between 10 and 20 ml, 18,2% - 20-30ml, 11,7% - 30-40ml and 12,6% - more than 50ml.

People used e-cigarettes most often when they were attending social meetings (68,8%), while drinking alcohol (57,1%), when they needed to “keep their hands busy” (49,4%), while working or studying (45,9%) and in stressful situations (43,7%).

Only 26% is going to give up using e-cigarettes, 1,7% is going to start using traditional cigarettes or devices that heat up tobacco such as GLO or IQOS. Over 72% is not going to quit their addiction.

Most of people feels negative side effects of using e-cigarettes. Most common are: spending more money (46,3%), addiction (26,4%), cough (12,1%), sore throat (13%), hoarseness (11,7%) and breathing problems (5,2%).

Third part of the survey was available for everybody and concerned possible harmfulness of e-cigarettes. 283 answers were gathered.

Most of the questioned people consider e-cigarettes as harmful, 76% of them think they are less dangerous than traditional cigarettes. Only 4,9% consider them harmless.

According to questioned people, the most common health problems related to vaping are: breathing problems (59%), increased risk of cancer (46,2%), increased risk of lung injury (38,3%), circulation system disorders (39,7%). However, 18,8% think e-cigarettes cannot cause any health problems. Almost half of the respondents (48,9%) heard about diseases caused by e-cigarettes.

Answers were statistically analyzed what proved that 131 people using e-cigarettes were younger than 19 years and 21 of them were younger than 16, which is 56% and 9% of all questioned people.

There were 42 people (18% of all questioned) who admitted to regularly smoke traditional cigarettes and vape at the same time. On the other side were 40 people (17%) who vape however they had never smoked.

## 5. Discussion

Until there were introduced, e-cigarettes were surrounded by objections about their alleged harmlessness. Numerous researches were conducted to find out if vaping can cause dangerous side effects. Researches included liquids testing, dangers related to inhaling vape and social aspects of using e-cigarettes.

Study *Are e-cigarettes good or bad?* (Górski, 2017) describes vaping phenomenon and its potential side effects. Analysis of numerous vaping-related researches shows a lot of dangers which could be caused by using e-cigarettes. One of the analyzed studies showed that one-third of people using e-cigarettes regularly have never smoked. Moreover, 19% of under twenty e-cigarettes users have never smoked, which implies serious problem of addiction among teenagers. Researches conducted on American students show that start of using e-cigarettes is usually not related to quitting smoking. Most of the 300 000 examined people were also convinced that there is no proof of e-cigarettes harmfulness.

E-cigarettes were considered a way to quit smoking, however, numerous researches are supposed to deny that thesis. Study *Efficiency and Safety of an electronic cigarette (ECLAT) as tobacco cigarettes substitute: a prospective 12-month randomized control design study* (Caponetto, 2013) showed that there is no difference in an amount of cigarettes smoked during one day between people who use e-cigarettes and those who use nicotine-free cigarettes. Moreover, there was no relation between e-cigarettes using and quitting smoking in most of the cross-sectional observational researches. Those results are in correlation with results of our survey, which showed that 75% of questioned people are not going to quit

smoking and only 24,2% admitted that they started to use e-cigarettes in order to quit smoking.

Reasons for using e-cigarettes often include peer pressure and belief that they do not cause any health problems, what was presented as well by our survey and results of numerous analyzed studies. One of them, *E-cigarettes. A scientific review* (Grana et al., 2014) implies that celebrity endorsement can have a huge impact on increasing e-cigarettes popularity. Moreover, the way that e-cigarettes are advertised is also important. 59 web pages of companies distributing e-cigarettes were studied and it was noticed, that the most often use sentences were: less harmful (95%), lower costs (93%), allowed to use in any place (88%), no smoke (76%), modern (73%). One of the most essential aspects of e-cigarettes popularity, variety of liquid flavors is also included in this research. The fact that liquids appears in almost every flavor can cause inappropriate use of e-cigarettes by teenagers encouraged by sweet or alcohol-like tastes.

One of the most dangerous aspects of using e-cigarettes is health problems that they cause. In 2019 newly discovered disease called EVALI (E-cigarette or Vape Associated Lung Injury) was one of the main problems of the United States healthcare and caused 64 deaths until February 2020. The disease causes pneumonia-like symptoms and can have a rapid course. Researches shows that EVALI is related to vitamin E acetate which is used as a thickener, mostly in THC or CBD containing liquids. Acetate was found in most of BAL samples from patients with respiratory symptoms. Increasing amount of patients diagnosed with EVALI implies serious problems with e-cigarettes using. CDC also warns not to use liquids of unknown origin, especially in countries where THC is not legal. Liquids bought form anywhere else than certified vape shops can contain harmful substations such as vitamin E acetate and can increase the risk of EVALI.

## 6. Conclusions

Results of our survey as well as studies from last decade confirms that increasing amount of people using e-cigarettes is a serious issue. E-cigarettes popularity is still increasing, what is also worrying because of dangers associated with using them.

One of the most serious dangers related to e-cigarettes is undoubtedly the fact, that there is a group of underaged who uses them regularly in spite of they have never smoked. It can be caused by the fact that e-cigarettes and liquids are relatively easily accessible even for teenagers. Another problems are peer pressure, variety of attractive liquid flavors and probably the effect of advertisements in social media and celebrity endorsement.

Another worrying issue is the fact that most of questioned people are constantly using e-cigarettes what causes high nicotine intake and finally to addiction. Respondents also admit that they can notice some negative effects of vaping such as respiratory system disorders. Unfortunately, there is still a group of people who consider e-cigarettes significantly less harmful than traditional cigarettes and even people convinced vaping is harmless.

E-cigarettes were also supposed to be a way to quit smoking, however, there is lack of evidence proving its effectiveness. Amount of nicotine in one milliliter can be much lower than in one cigarette, anyhow, it is hard to control its daily intake. Moreover, there were only a small group of people who started using e-cigarettes in order to quit smoking.

Most of questioned people admitted that they are not going to quit using e-cigarettes what can be caused by belief that e-cigarettes are harmless, peer pressure and addiction. Moreover, only half of them are aware of diseases caused by e-cigarettes. Low social awareness of development of diseases such as EVALI could be cause of increasing problems with e-cigarettes using.

Nowadays there is still a significant amount of people addicted to nicotine, however more and more of them are getting addicted to e-cigarettes. Results of many studies related to the topic, analysis of the literature and results of our survey implies necessity of taking some serious actions leading to decrease or eliminate dangers related to e-cigarettes using.

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