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Health effects of using popular alternatives to smoking - a review of the literature

Radosław Oronowicz, Weronika Kmiotek, Gabriela Różańska-Smuszkiewicz, Paweł Smuszkiewicz-Różański, Aleksandra Karuś, Grzegorz Jama, Paweł Staszczak, Barbara Jaworska, Dagmara Ragan, Joanna Długosz

Radosław Oronowicz
Regional Hospital named after Dr. H. Jankowski, 16 Szpitalna Street, 37-200 Przeworsk
Radoslaw.oronowicz@gmail.com
ORCID: https://orcid.org/0009-0008-8784-3858

Weronika Kmiotek
Clinical Regional Hospital No. 2 named after St. Hedwig of Anjou in Rzeszów Lwowska Street 60, 35-301 Rzeszów
weronika55.12@o2.pl
ORCID: https://orcid.org/0009-0009-7699-0585

Gabriela Różańska-Smuszkiewicz
Clinical Regional Hospital No. 2 named after St. Hedwig of Anjou in Rzeszów Lwowska Street 60, 35-301 Rzeszów
gabrielarozanskaa@gmail.com
ORCID: https://orcid.org/0009-0005-3857-8830

Paweł Smuszkiewicz-Różański
Health Care Centre in Strzyżów, 700th Anniversary Street 1, 38-100 Strzyżów
pawels161@gmail.com
ORCID: https://orcid.org/0009-0009-3178-2029

Aleksandra Karuś
University of Rzeszów, St. Tadeusza Rejtana 16C, 35-310 Rzeszów
aleksandrakarus@gmail.com
https://orcid.org/0009-0007-9478-7674

Grzegorz Jama
Clinical Regional Hospital No. 2 named after St. Hedwig of Anjou in Rzeszów Lwowska Street 60, 35-301 Rzeszów
grzegorzjama@gmail.com
ORCID: https://orcid.org/0009-0004-8108-5428

Paweł Staszczak
SPZOZ University Clinical Hospital No. 1 named after Norbert Barlicki in Łódź.
dr. Stefana Kopcińskiego 22, 90-153 Łódź
pawel.staszczak@stud.umed.lodz.pl
ORCID: https://orcid.org/0009-0005-8324-9956

Barbara Jaworska
Independent Health Care Center of the Ministry of Interior and Administration in Lublin
Grenadierów Street 3, 20-331 Lublin
barbaraewajaworska@gmail.com
ORCID: https://orcid.org/0009-0000-9155-5084

Dagmara Ragan
T. Marciniak Lower Silesian Specialist Hospital - Emergency Medicine Centre
General August Emil Fieldorf Street 2, 54-049 Wrocław
dagmara.ragan@gmail.com
ORCID: https://orcid.org/0009-0002-2423-0698

Joanna Długosz
District Health Center - Specjalist Hospital in Brzeziny
Maria Skłodowska-Curie Street 6, 95-060 Brzeziny, Poland
joanna.dlugosz123@gmail.com
ORCID: https://orcid.org/0009-0005-0922-6190

Abstract

Introduction and Purpose: More and more alternatives to traditional smoking are available on shop shelves. Are other ways of using nicotine healthier for us? What are the advantages and disadvantages? The aim of this article is to trace the health effects of new, popular alternatives to the traditional cigarette.

Materials and methods: A literature search was conducted using the medical databases PubMed and Google Scholar. Articles were retrieved in English, employing the key words: "Iqos", "Glo", „ e-cigarette" and „ tobacco" appropriate configurations.

Conclusions: Modern tobacco devices, such as IQOS and Glo, emit significantly less harmful substances than traditional cigarettes. Emissions of carbon monoxide, formaldehyde and polycyclic aromatic hydrocarbons, in particular, are significantly lower. Nevertheless, nicotine remains the main ingredient in these products, with serious health risks. Regular use of nicotine can lead to addiction, cardiovascular disease and problems with the nervous system and oral cavity. Inhaling aerosol from tobacco devices such as IQOS, Glo and disposable e-cigarettes can lead to damage to lung cells and other respiratory health problems. Despite the lower risks, the use of alternative smoking methods is still harmful to our health.

Key words: Iqos, Glo, e-cigarette, tobacco, smoking, heated tobacco, nicotine, tobacco heating system.

Introduction

Modern society is increasingly looking for alternatives to traditional cigarettes that are less harmful to health. Developments in technology and innovations in tobacco products have led to new forms of stimulants such as IQOS, Glo and disposable e-cigarettes. These modern devices have gained popularity as potentially less harmful options compared to traditional smoking. However, despite their growing popularity, there are still many questions regarding their impact on the health of users. The aim of this paper is to analyse the health impact of using alternatives to cigarettes such as IQOS, Glo and disposable e-cigarettes. The thesis will present the definitions of these devices, their principles of operation and a detailed review of the research on their health effects. The research paper aims to provide a comprehensive analysis and understanding of how new tobacco technologies affect human health. This analysis is particularly relevant in the context of the growing popularity of these devices and the need to inform consumers about the potential risks and benefits of their use. The paper will conclude with the analysis and recommendations for further research and regulation in this area.

1. Health effects of using an IQOS device

1.1 IQOS - definition of device

IQOS (I Quit Ordinary Smoking) is a modern smokeless electronic device that, unlike traditional cigarettes, does not burn tobacco but heats it. This innovative approach to tobacco consumption involves heating specially designed tobacco cartridges to a temperature of around 350°C, which reduces harmful chemical emissions compared to traditional smoking. IQOS, which is a product of one of the traditional cigarette companies, has been on the global market since 2014 and is part of a broader strategy to offer less harmful alternatives to traditional cigarettes [1].

1.2 Principles of IQOS device operation

IQOS is a device that works by heating the tobacco instead of burning it. A key element of its operation is dedicated tobacco cartridges. Each pack contains 20 of these cartridges, which are designed exclusively for heating and are not suitable for traditional smoking. The tobacco in the cartridges is specially compressed, making it only suitable for heating in the IQOS

system. The IQOS heater is small - its length, including the inserted tobacco cartridge, is no longer than the length of a pen. This makes it easy to carry and discreet to use. To use the IQOS, the warmer must first be charged in a portable charger, which is powered by a rechargeable battery that is charged via a USB cable connected to an AC adapter. In the IQOS heater, the tobacco is heated and not - as with traditional cigarettes - burnt. This reduces the risk of starting a fire when using the IQOS, as there is no need to use a fire. In addition, there is no unpleasant smell of cigarette smoke, and the user inhales the aerosol produced by heating the tobacco cartridge [2]. Before use, it is necessary to charge the device's batteries. Then remove the tobacco cartridge from the packet, place it in the heater, hold down the button located on the side and release it when the green LED starts blinking. As soon as the blinking stops (which takes about 5 seconds), you can start inhaling. A single use of IQOS is timed - enough for approximately 6 minutes or up to 14 inhalations. When the time is up, the LED turns orange, indicating that approximately 30 seconds of use or 2 inhalations are left. It is not possible to use the IQOS continuously - it is necessary to recharge the heater to use the next cartridge. After using 20 tobacco cartridges, the heater should be cleaned with the included cleaner to ensure proper operation and longer life. Despite the advantages associated with the absence of combustion, the IQOS is not completely free of harmful substances. The aerosol generated by the device contains various harmful and carcinogenic substances. The differences in heating temperature are also significant. The nicotine liquid in e-cigarettes is heated to between 150 and 180°C, whereas the tobacco cartridges in IQOS reach temperatures more than 300°C. Higher temperatures can lead to the release of more toxic substances. Studies have shown that the concentration of carcinogenic N-nitrosamines in aerosol from IQOS is slightly lower than in smoke from traditional cigarettes, but significantly higher than in aerosol from e-cigarettes [3].

1.3 The impact of IQOS on health

IQOS, although containing some harmful substances, releases far fewer of these than traditional cigarettes. Nevertheless, independent studies show that IQOS also involve a combustion process, leading to the release of toxic and carcinogenic components. Studies on tobacco heating devices indicate that harmful substances may be released during their use, albeit in smaller quantities than with traditional smoking. The surface of the heating plate that meets the tobacco may introduce additional chemical changes in the composition of the generated aerosol. As a result, although IQOS users may be exposed to smaller amounts of toxins, they

are not completely free of harmful substances. Reducing emissions of harmful chemicals is the main goal of the technology, but research is still underway to determine its exact health effects. The researchers stress that further research is needed to understand the long-term effects of IQOS use. There is a need for more detailed analyses to fully understand the chemical processes that occur when tobacco is heated in this device. Knowledge of the exact processes and compounds produced by IQOS is still limited. Despite the reduction in toxic substances compared to traditional cigarettes, IQOS can still pose a health risk. Increased emissions of certain harmful compounds can still have negative consequences for the health of users. Researchers are continuing to investigate to determine the full extent of the effects of these substances on human health [4]. Nicotine, the main ingredient in IQOS, is responsible for an increased risk of developing hypertension, venous thrombosis and atherosclerosis. Nicotine also affects oral health, causing gum and dental disease. Nicotine's mechanism of action is to constrict blood vessels, which impairs blood flow to various tissues, including the skin. As a result, the skin receives less oxygen and vitamins, which contributes to the formation of wrinkles, especially around the mouth. Nicotine also affects sexual function, causing erectile dysfunction in smokers. The constriction of blood vessels by nicotine restricts blood flow to the genitals, which can lead to erection problems. The effects of nicotine on the cardiovascular system are widely documented and long-term use can lead to serious health problems. Nicotine is also neurotoxic, meaning that it can affect the functioning of the nervous system. Studies show that regular inhalation of nicotine can lead to addiction, which in turn can result in long-term negative health effects. Despite the fact that IQOS delivers nicotine in a different way than traditional cigarettes, the risks associated with its use still exist. IQOS users need to be aware of the potential risks associated with nicotine, even though the device may be perceived as a less harmful alternative. Awareness of the health effects of nicotine is crucial for those considering using IQOS as an alternative to traditional cigarettes [5]. Research by Dr P. Sharma of the University of Technology Sydney and the Woolcock Institute of Medical Research has shown that inhaling nicotine with both smoke and aerosol from tobacco heating devices is toxic to lung cells. The results of these studies indicate that nicotine and other substances present in IQOS aerosol can cause damage to lung cells. The researchers noted that inhaling IQOS aerosol leads to similar toxic effects as inhaling cigarette smoke. These studies highlight that despite lower levels of some toxins, IQOS is not free of harmful effects on lungs. A publication by Dr S.A. McGrath-Morrow of the University of Alabama published in early 2018 in the journal Pediatrics also supports these conclusions. This research indicates that IQOS smoke contains similar levels of harmful substances as cigarette smoke. Concentrations of carcinogenic

polycyclic aromatic hydrocarbons, carbon monoxide and nicotine in IQOS smoke are comparable to those in cigarette smoke [6]. This means that IQOS users are still at risk from inhaling these substances. Scientists warn that despite the reduction in some toxins, IQOS still poses health risks. Inhaling IQOS aerosol can lead to similar health problems as traditional cigarette smoking. Further research is needed to accurately determine the long-term effects of IQOS use on users' health. Researchers emphasise that IQOS is not risk-free, and its use should be carefully monitored and studied. Furthermore, research by Dr Sharma's team revealed that more than half of those interested in tobacco heating devices had never smoked before. This raises concerns that such devices may increase interest in tobacco products and contribute to an increase in smoking rather than a decrease. New technologies may attract people who have not previously been exposed to nicotine, which could lead to new addictions. Researchers are concerned that IQOS may provide a gateway to regular smoking for young people and people who have not smoked before [7]. Studies show that IQOS users may switch to traditional cigarettes, which increases risk of becoming traditional smokers. The impact of new tobacco technologies on smoking patterns is complex and requires further research. Despite the benefits of lower levels of some toxins, IQOS may contribute to the maintenance of nicotine addiction in the population. Research into the user behaviour of IQOS is key to understanding its impact on public health. Decisions on the regulation of these devices must take into account the potential risks associated with their use by people who have not previously smoked. It is necessary to monitor the impact of IQOS on smoking patterns in different demographic groups. Researchers emphasise that IQOS can have an impact on public health, so it is important that regulation is based on sound scientific evidence. In April 2019, the US Food and Drug Administration (FDA) allowed Philip Morris International to sell IQOS as an alternative to cigarettes. The agency stated that the products produce fewer toxins than traditional cigarettes but noted that they are not risk-free. The decision was preceded by a two-year research process that included an analysis of scientific studies conducted by Philip Morris. The FDA highlighted that despite the reduction of some toxins, IQOS still contains harmful substances. In its position statement, the agency noted that these products may provide a less harmful alternative to traditional smoking, but that they are not safe to use [8]. In the UK, public health agency Public Health England also recommends smokers who cannot quit switch to less harmful alternatives, such as e-cigarettes or tobacco heating devices. Research by Public Health England indicates that IQOS may be less harmful than traditional cigarettes, but still requires further study. Researchers from different countries are continuing to study the health effects of IQOS to determine its exact risks and benefits. Regulatory decisions on IQOS must consider the latest

scientific evidence and monitor the impact of these devices on public health. Scientific research on the product has been conducted for many years. When comparing the IQOS aerosol with smoke from a reference cigarette intended for research, tests showed a more than 90% reduction in aerosol cytotoxicity. In genotoxicity, a reduction of 95% was recorded. The level of reduction in levels of harmful substances in the aerosol from IQOS ranges from 90 to 95%, depending on which harmful substances are measured. Globally, a list of the most harmful substances contained in cigarette smoke is accepted by the US FDA, Canada's Health Canada, or the IARC Carcinogens [9]. In a clinical study, the levels of noxious agents in people who switched to IQOS during the 90-day tests decreased to levels recorded in people who had completely given up smoking. In Poland, research into the effects of IQOS on bronchial cells was conducted by the M. Nencki in Institute of Experimental Biology of the Polish Academy of Sciences. The study showed that the aerosol produced by tobacco warmers, compared to cigarette smoke, significantly reduces mitochondrial stress and inflammation in human cells [10]. These results suggest that the use of IQOS may be less harmful to bronchial cells than traditional smoking. However, it is difficult to predict whether these results will be reflected in long-term health studies of IQOS users. The effects of long-term use of these devices are still unknown, as they are relatively new to the market [11].

2. Health effects of using the Glo device

2.1 Glo- definition of device

Glo is a smokeless electronic device that heats tobacco instead of burning it. Developed by British American Tobacco (BAT), it is being promoted as a less harmful alternative to traditional cigarettes. During use, specially designed tobacco cartridges are heated to a temperature of approximately 240°C. Through this process, the tobacco releases an aerosol containing nicotine and tobacco flavours, which the user inhales. The device operates on battery power, which eliminates the need for an open flame, minimising the risk of fire and reducing smoke and ash. Glo aims to deliver nicotine in a way that potentially reduces toxicity compared to traditional cigarettes, making it an attractive option for those seeking less harmful alternatives [12].

2.2 Principles of Glo device operation

The Glo device consists of a heater and dedicated tobacco cartridges. To use the Glo, the warmer, which is powered by a battery, must first be charged. Charging is done via a standard USB cable, allowing the device to be conveniently replenished anywhere with access to power. Once charged, the tobacco cartridge is placed in the warmer. When the device is switched on, the tobacco cartridge is heated to approximately 240°C. This heating process, as opposed to combustion, reduces the amount of toxic emissions, such as carbon monoxide and tar, that are present in cigarette smoke [13]. Heating the tobacco in Glo releases an aerosol, which the user inhales. The aerosol contains nicotine and other tobacco-specific aromatic compounds. Due to the lower heating temperature compared to combustion, the amount of harmful chemicals in the aerosol is reduced [6]. The Glo device operates on battery power, which provides mobility and convenience. The battery in the device needs to be recharged regularly to maintain the correct temperature for heating the tobacco. Once charged, the Glo is ready for use and can deliver nicotine to the user by heating tobacco cartridges without generating smoke [6]. Indicators on the device inform the user of battery charge status and readiness for use, ensuring easy and intuitive operation. After each use, the heater can be recharged, allowing continuous use of the device according to the user's needs. Tobacco heating in the Glo is an electronically controlled process, ensuring temperature stability and optimal aerosol release. The Glo's tobacco heating technology is designed to reduce harmful health effects compared to traditional cigarette smoking, offering an alternative for those seeking less harmful methods of nicotine delivery [14].

2.3 The impact of Glo on health

By heating the tobacco instead of burning it, the Glo device reduces the amount of toxic emissions. Compared to traditional cigarettes, the aerosol produced by the Glo contains lower levels of harmful chemicals such as carbon monoxide, formaldehyde and polycyclic aromatic hydrocarbons. Research by British American Tobacco indicates that the amount of harmful substances in the aerosol from Glo is significantly lower compared to cigarette smoke. These findings were confirmed by an independent study by a team of researchers from King's College London, who found that the levels of toxins in Glo aerosol are significantly lower than in cigarette smoke, potentially reducing the risks associated with their inhalation. The lower levels of toxins in Glo aerosol may mean that users of this device are at lower risk of some harmful

health effects, such as respiratory disease and cancer [14]. Nevertheless, the reduction of toxins does not mean that the risk is completely eliminated. The aerosol produced by Glo still contains nicotine and other chemicals that can have negative health effects. Studies indicate that even small amounts of harmful substances can have a cumulative effect on users' health. It is therefore important to continue research into the long-term health effects of using tobacco heating devices. Even if Glo is less harmful than traditional cigarettes, users should be aware that health risks still exist. Regular monitoring and research are the key to understand the full range of potential risks associated with Glo use. Ultimately, decisions to regulate these devices should be based on the latest scientific evidence and take into account the potential benefits and risks [15]. Nicotine, the main component of the aerosol produced by Glo, is a highly addictive substance and affects the health of users. Despite reducing other toxins, nicotine can still lead to the development of cardiovascular diseases such as hypertension, venous thrombosis and atherosclerosis. Regular inhalation of nicotine can also cause gum and dental problems and contribute to wrinkles by constricting blood vessels and restricting blood flow to the skin. Nicotine affects the functioning of the nervous system, which can lead to addiction and other health problems. Nicotine addiction is difficult to overcome and can lead to long-term health problems. Studies show that nicotine also affects cognitive function, which can have a negative impact on concentration and memory [16]. Glo users, despite having fewer toxins, are still at risk from inhaled nicotine. Further research is needed to understand the full range of health effects of nicotine in the context of tobacco heating device use. It is also worth noting that nicotine inhalation can lead to serious health problems, even if the amount of other toxins is reduced. Therefore, users should be aware of the potential risks associated with regular inhalation of nicotine from Glo. Education about the risks of nicotine is crucial to prevent addiction and promote healthier habits. Public health organisations should continue awareness campaigns to highlight the potential risks of using tobacco heating devices [17]. Studies on the safety of the Glo device by British American Tobacco and independent scientific institutions indicate reduced toxicity of the aerosol compared to cigarette smoke. In laboratory studies conducted by BAT, Glo aerosol was found to have lower levels of many harmful substances compared to cigarette smoke. However, independent studies indicate that despite the reduction in levels of some toxins, Glo aerosol still contains substances potentially harmful to health. A study published in the journal Tobacco Control shows that despite lower levels of toxins, Glo use can still lead to lung cell damage and other negative health effects. These findings suggest that although Glo is less harmful than traditional cigarettes, it is not entirely risk-free. The researchers emphasise that further research into the long-term effects of Glo use is needed [18].

Long-term studies are crucial to understand exactly what health effects may result from regular use of tobacco heating devices. In addition, it is important to monitor how changes in the technology and composition of tobacco cartridges may affect the safety of users. Further research should also consider different demographic groups to understand how Glo use affects the health of different populations. Knowledge of the full range of potential risks associated with Glo use can help shape health policies and regulations for these devices. Ultimately, research should aim to ensure that products such as Glo are as safe as possible for users. Due to the relatively recent introduction of Glo to the market, long-term data on its health effects are lacking. Public health organisations, such as the World Health Organisation (WHO), emphasise the need for further research into the long-term effects of tobacco heating devices. Studies to date mainly focus on short-term health effects, which may not reflect the full risks associated with long-term Glo use [19]. It is also worth investigating what the long-term effects of Glo use are compared to traditional cigarettes and other tobacco alternatives. In the context of public health, it is important to have a complete picture of the impact of these devices on society. Research on long-term effects can also help to identify which groups of people are most at risk. Ultimately, a full understanding of the long-term impact of Glo can lead to more informed decisions on health regulations and policies. This is particularly important in the context of the growing popularity of tobacco heating devices in the global market. This research may also provide the information needed to develop prevention and harm reduction strategies. In addition, there is concern that such devices may attract young people who have never used tobacco products before, which may lead to an increase in the number of nicotine addicts [20]. Research into the impact of Glo on user behaviour is key to understanding how these devices may affect smoking and nicotine use patterns in the population. There is also concern that Glo use may lead to switching to traditional cigarettes later, increasing health risks. Regulation of the sale and marketing of Glo should address these potential risks. Public health organisations emphasise that the healthiest option is to avoid tobacco altogether, regardless of the form of consumption. Introducing education about the risks of Glo use can help prevent addiction. Researchers and policymakers should work together to ensure that policies on tobacco heating devices are evidence-based. Long-term monitoring and research can help evaluate the effectiveness of these policies and their impact on public health. Ultimately, protecting public health should be a priority in the context of the increasing popularity of new tobacco technologies [21].

3. Health effects of using disposable e-cigarettes

3.1 Disposable e-cigarettes - definition

A disposable e-cigarette, as the name suggests, is an electronic smoking device that is not reusable once the liquid has been used up - it cannot be refilled or recharged. Disposable e-cigarettes are designed for convenience and ease of use. Each device is pre-charged and pre-filled with e-liquid for immediate use out of the box. A built-in e-liquid cartridge, which contains nicotine, and an alkaline battery allow for continuous use until either is depleted. E-cigarettes are popular because of their simplicity - they do not require any additional accessories or complicated operation. Once the liquid is used up or the battery runs out, the device must be discarded, eliminating the need to recharge or replace cartridges. Disposable e-cigarettes are also more affordable compared to reusable devices, making them an attractive option for new users or those looking for a quick and easy solution [22]. Despite their simplicity, disposable e-cigarettes have their limitations. Their lifespan depends on the length and frequency of inhalation sessions and the depth of inhalation. A standard disposable e-cigarette can last for around 500 puffs, while other models can offer up to 700 or 800 puffs. Ultimately, the duration of use may vary depending on individual user habits. Compared to reusable e-cigarettes, which have built-in rechargeable batteries and replaceable cartridges, disposable e-cigarettes are less environmentally sustainable due to their single use. Nevertheless, their popularity is growing due to their convenience and ease of use [23].

3.2 Principles of operation of disposable e-cigarette

The single-use e-cigarette is ready to use immediately after purchase. These devices are pre-loaded and filled with e-liquid, eliminating the need for additional preparation. Disposable e-cigarettes typically allow for around 300 to 500 puffs, depending on the model and manufacturer. Once the e-liquid or battery is depleted, the device should be discarded and, if possible, recycled to minimise environmental impact [24]. In addition to disposable e-cigarettes, there are also closed-system e-cigarettes with replaceable pods. These devices have a built-in rechargeable battery and allow the e-liquid pods to be interchanged, adapting them to the user's preference. In a closed system, e-cigarettes offer a longer lifespan than their disposable counterparts, but require regular recharging and the purchase of new pods. The main difference between disposable e-cigarettes and closed-system e-cigarettes is that the latter can

be reused, which is more economical and environmentally friendly [25]. Heating of the liquid in e-cigarettes is done using a heating element that turns the liquid into inhalation vapour. This process, although less harmful than burning tobacco, still involves the inhalation of nicotine and other chemicals. For many e-cigarette users, the ability to choose from a variety of e-liquid flavours is an additional advantage that increases the appeal of this method of nicotine use [26].

3.3 Health impacts of disposable e-cigarettes

Disposable e-cigarettes, like their reusable counterparts, have an impact on users' health, albeit to a lesser extent than traditional cigarettes. They produce vapour instead of smoke, which reduces the number of harmful substances emitted. Nevertheless, there are still significant health risks associated with their use. One of the main components of e-liquid in disposable e-cigarettes is nicotine, which is a highly addictive substance. Regular inhalation of nicotine can lead to the development of dependence, which can result in long-term e-cigarette use and increased risks associated with exposure to other harmful substances. Nicotine affects the cardiovascular system by raising blood pressure and heart rate, which can lead to hypertension and other cardiac problems. Studies have shown that nicotine can also impair brain development in young people, which is of particular concern for teenagers who use e-cigarettes. The effects of nicotine on the developing brain can lead to problems with learning and memory and increase the risk of mood disorders. Nicotine is also neurotoxic, meaning that it can damage nerve cells and affect the functioning of the nervous system. Long-term use of nicotine can lead to addiction. Nicotine addiction can also increase the risk of switching to other forms of smoking, such as traditional cigarettes, further increasing health risks. Although e-cigarettes are promoted as a less harmful alternative, nicotine addiction remains a serious health problem [27]. Furthermore, inhaling vapour from e-cigarettes is not entirely safe. There may be chemicals in e-liquids, such as propylene glycol and vegetable glycerine, which are safe to ingest, but their long-term inhalation effects are not fully investigated. Long-term exposure to these substances can lead to respiratory irritation, coughing and other respiratory problems. Studies indicate that some flavours added to e-liquids can be toxic when inhaled and can cause lungs damage [28]. For example, compounds such as diacetyl can lead to serious health problems such as ‘popcorn lung’ (bronchiolitis obliterans), a lung disease that causes coughing and shortness of breath. Other chemicals, such as formaldehyde, can be present in the vapour produced by e-cigarettes, increasing the risk of cancer. Inhalation of these chemicals can lead to inflammation and damage to lung cells. The long-term effects of inhaling these substances are still unclear, but

there are concerns that they may contribute to the development of lungs disease and other serious health problems [27]. Disposable e-cigarettes can also contain heavy metals such as nickel, tin and lead, which can be released into the vapour when heated. Inhalation of these metals can lead to serious health problems such as damage to the lungs, kidneys and nervous system. A study by the Johns Hopkins Bloomberg School of Public Health found that levels of heavy metals in e-cigarette vapour can be much higher than in smoke from traditional cigarettes. These metals can cause chronic inflammation in the lungs, which in turn can lead to chronic obstructive pulmonary disease and other respiratory conditions. In addition, inhalation of heavy metals can affect the cardiovascular system, increasing the risk of heart disease and stroke. Heavy metals are also neurotoxic, meaning that they can damage nerve cells and affect brain and nervous system function. Although disposable e-cigarettes are promoted as a less harmful alternative to traditional cigarettes, this does not mean that they are completely safe. Many users may mistakenly believe that switching to e-cigarettes eliminates all health risks associated with smoking, which may lead to increased nicotine consumption. In addition, the ease of access and attractive flavours of e-liquids may attract young people, leading to an increase in the number of young people addicted to nicotine [26]. Studies indicate that young people who start using e-cigarettes are more likely to start smoking traditional cigarettes. E-cigarettes can act as an introduction to nicotinism, which increases the risk of long-term health problems. Advertisements for e-cigarettes often target young people, which may lead to an increase in young users. Some studies suggest that e-cigarettes may be helpful as a smoking cessation tool for adult smokers who are unable to quit by other means. However, there is also concern that they may act as a gateway to nicotinism for people who have not previously smoked. Further research is needed to better understand the long-term health effects of disposable e-cigarettes and their potential role in addiction prevention programmes [27].

Conclusions

This paper examines the health effects of modern tobacco devices such as IQOS, Glo and disposable e-cigarettes. Based on the data collected, several key conclusions can be drawn that shed light on the potential benefits and risks of their use. Modern tobacco devices, such as IQOS and Glo, emit significantly less harmful substances than traditional cigarettes. Emissions of carbon monoxide, formaldehyde and polycyclic aromatic hydrocarbons are significantly lower. Nevertheless, nicotine remains the main ingredient in these products, with serious health risks. Regular use of nicotine can lead to addiction, cardiovascular disease and problems with

the nervous system and oral cavity. Aerosol inhalation from modern tobacco devices, such as IQOS, Glo and disposable e-cigarettes, can lead to damage to lung cells and other respiratory health problems. While there is a lack of long-term research into the health effects of these technologies, there is a clear need for further research to understand the full range of their health effects. The ease of access to modern tobacco devices and their attractive flavours may attract young people, leading to an increase in the number of young people addicted to nicotine. There is a risk that young people who start using e-cigarettes are more likely to start smoking traditional cigarettes. Therefore, educational campaigns targeting young people are crucial to raise awareness about the risks of using these devices and to prevent addiction. Introducing stricter regulations on the sale and advertising of modern tobacco devices is important to reduce their availability, especially to minors. Health policies should monitor the impact of these devices on public health. Health professionals should keep abreast of the latest research and guidelines on modern tobacco devices to better advise patients on their use and health impacts.

Summary

This thesis aimed to analyse the health effects of using modern tobacco devices such as IQOS, Glo and disposable e-cigarettes. Through a detailed discussion of the definitions of these devices, the principles of their operation and a review of research on their health effects, a broad picture of both the potential benefits and risks of their use was obtained. The analysis shows that although modern tobacco devices may be less harmful than traditional cigarettes, they are not entirely free of health risks. Inhaling nicotine and other chemicals present in the aerosols produced by these devices can lead to a range of health problems, including addiction, respiratory problems and cardiovascular disease. This work is aimed at a wide audience. It provides consumers with information on the potential risks and benefits of using modern tobacco devices, allowing them to make informed decisions about their health. Health professionals can use the data collected to better advise their patients on the use of these devices and their impact on health. Regulators and policymakers will find the information helpful in creating and implementing regulations on the sale and advertising of modern tobacco devices, which is key to protecting public health. Researchers, on the other hand, will gain insights into areas that require further research, particularly in the context of the long-term health effects of using these devices. Based on the analysis, it is recommended that consumer awareness be raised through educational campaigns that highlight the risks associated with the use of modern tobacco devices, particularly among young people. Introducing stricter regulations on the sale

and advertising of these products is also important to limit their availability, especially to minors. It is also important to promote research into the long-term health effects of modern tobacco device use to better understand the full extent of their impact on public health. In conclusion, this work provides important information on the health effects of using IQOS, Glo and disposable e-cigarettes. It has been shown that while these devices may be less harmful than traditional cigarettes, they are not risk-free. Therefore, education, regulation and further research are needed to ensure public health is protected and to help consumers make informed decisions about their health.

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Authors do not report any disclosures.

Author's contribution

All authors contributed to the article.

Conceptualization: Oronowicz R, Kmiotek W, Staszczak P, Jaworska B, Ragan D, Długosz J;

Methodology: Oronowicz R, Różańska-Smuszkiewicz G, Smuszkiewicz-Różański P;

Software: Oronowicz R, Kmiotek W, Karuś A, Jama G, Staszczak P, Jaworska B, Ragan D;

Formal analysis: Oronowicz R, Różańska-Smuszkiewicz G;

Investigation: Oronowicz R, Smuszkiewicz-Różański P, Karuś A, Długosz J;

Resources: Oronowicz R, Karuś A, Jama G, Staszczak P;

Data curation: Oronowicz R, Kmiotek W, Jaworska B, Długosz J;

Writing - rough preparation: Oronowicz R, Kmiotek W, Karuś A;

Writing - review and editing: Oronowicz R, Kmiotek W, Różańska-Smuszkiewicz G, Smuszkiewicz-Różański P, Karuś A, Jama G, Staszczak P, Jaworska B, Ragan D, Długosz J;

Visualization: Oronowicz R, Kmiotek W, Różańska-Smuszkiewicz G, Smuszkiewicz-Różański P, Karuś A, Jama G, Długosz J;

Supervision: Oronowicz R, Jama G, Jaworska B, Ragan D;

Project administration: Oronowicz R, Kmiotek W, Ragan D, Długosz J;

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