

Short Communication

Electronic Cigarette and Pregnancy: The False Good Idea

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Submitted: 14 February 2022

Accepted: 15 April 2022

Published: 20 April 2022

ISSN: 2578-3718

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OPEN ACCESS**Keywords**

- Electronic cigarette
- Pregnancy
- Nicotine

Abstract

Introduction: The past decade has witnessed dramatic changes in the management of smoking among pregnant women. This review of the literature aims to synthesize the information available to date on: the place of electronic cigarettes among women, the effects of its use compared to conventional tobacco and the danger of vaping during pregnancy, specifically, compared to conventional smoking.

Acquisition of evidence: A systematic review of the literature was conducted by consulting the PubMed database to search for relevant articles published between January 2012 and August 2018. A search was conducted with the combination of the words "e-cigarette" and "pregnancy". Articles that reported data from animal studies, in vitro studies, or studies published in a language other than English were excluded. The references of the articles found were recorded using bibliographic software. The pre-established inclusion and exclusion criteria allowed for the inclusion of 14 articles.

Synthesis of evidence: First seen as an alternative to quit smoking, the e-cigarette has gradually spread in our society. This rise in popularity has sparked controversy, due to a lack of scientific evidence on their safety. Indeed, a study focusing on the effects of nicotine on offspring as a result of e-cigarette use by pregnant women is needed. However, careful analysis of the available data reveals that this exposure is responsible for many alterations in the vital structures of the offspring with proven effects on the fetal endocrine, reproductive, cardiovascular, respiratory and neurological systems, in addition to effects on pregnancy with especially induced prematurity.

Conclusions: Known to all, electronic cigarettes are an alluring and notorious product among pregnant smokers. Nonetheless, nicotine is said to be harmful to the offspring and even to the upcoming generations. Hence, it is compulsory that every health professional and component align their strength and work relentlessly to sustain information dissemination as well as further research in the field.

INTRODUCTION

The World Health Organization (WHO) is engrossed by the uprising of smoking deemed as a major public health problem. Despite WHO's relentless awareness and prevention campaigns encouraging countries to ban smoking in public places, increase the price of cigarettes or even dedicate a national day to tobacco control, cigarette consumption continues to increase at an alarming rate [1].

Patented in 2004 in China by a pharmacist named Hon Lik, modern electronic cigarettes weren't as helpful as intended [2]. Initially perceived as an alternative to classic smoking, they gained a considerable foothold in modern society as a whole new recreative substance. In fact, a study led by the French National Institute for Prevention and Health Education (INPES) assesses approximately three million consumers in France alone and 58.1 million vapers worldwide [3]. E-cigarettes are praised as a different way of delivering nicotine to an individual less harmful

to health than combustible cigarettes but also easily scalable and most of all less pricey. Despite being explicitly forbidden by esteemed learned societies, no scientific study has been carried out regarding e-cigarettes repercussions among pregnant women to our knowledge [4].

This review of literature aims to summarize available data on e-cigarettes use among women, its effects compared to conventional tobacco and above all the precariousness of vaping during pregnancy.

MATERIAL AND METHODS

Consonantly with the Preferred Reporting Items for Systematic Reviews and Meta Analyses (PRISMA) recommendations, a systematic review of literature was carried out [5]. The US National Library of Medicine database was searched for relevant articles published between January 2012 and August 2021. A wide research was led using the following items: "pregnancy" OR "pregnancy complications" OR "pregnancy outcome" OR

“newborn” OR “neonate” OR “birth” AND “electronic cigarettes” OR “e-cigarettes” OR “ecigarettes” OR “vaping” OR “vape”. Only publications in English, carried out in humans were taken into account. Articles references were registered using bibliographic software.

Selected articles were the ones addressing the three issues announced at the beginning of our research: The place of e-cigarettes among female population of childbearing age or pregnant, the repercussions of e-cigarettes use compared to classic tobacco and the current available data on the effects of vaping during pregnancy. Case studies and narrative reviews were excluded from the analysis. The articles that we picked out were meticulously analyzed so as to extricate relevant data to elaborate a synthesis that answers our problematic issues.

RESULTS

The initial research identified 165 references. 3 duplicates were ruled out. 145 articles were excluded after title and abstract screening as well as 4 more after a full and thorough reading of the remaining articles. Therefore, 14 references were included in our review of literature (Figure 1).

DISCUSSION

Market infiltration and prevalence in pregnant women

Since their development in 2004, electronic cigarettes rapidly infiltrated the market and gained a considerable foothold [6]. Their popularity among smokers is a result of their heavy advertisement as a safer and less expensive way of smoking compared to classic tobacco regardless of any scientific proof of their physiopathology [7]. Moreover, some physicians recommended their use during pregnancies [7]. Although e-cigarettes were initially conceived as a tool to help and assist tobacco withdrawal, they are nowadays used for recreational purposes. In the other hand, some authors assess that uprising of vaping among pregnant women is bound to their advertised perception as a safe (74%) and effective way of tobacco weaning (72%) [7,8].

A recent online survey demonstrated that pregnant women were more prone to be e-cigarette users (6,25%) or e-cigarette and combustible cigarette users (8,54%) rather than regular classic smokers (5,65%) [9]. Another survey among pregnant

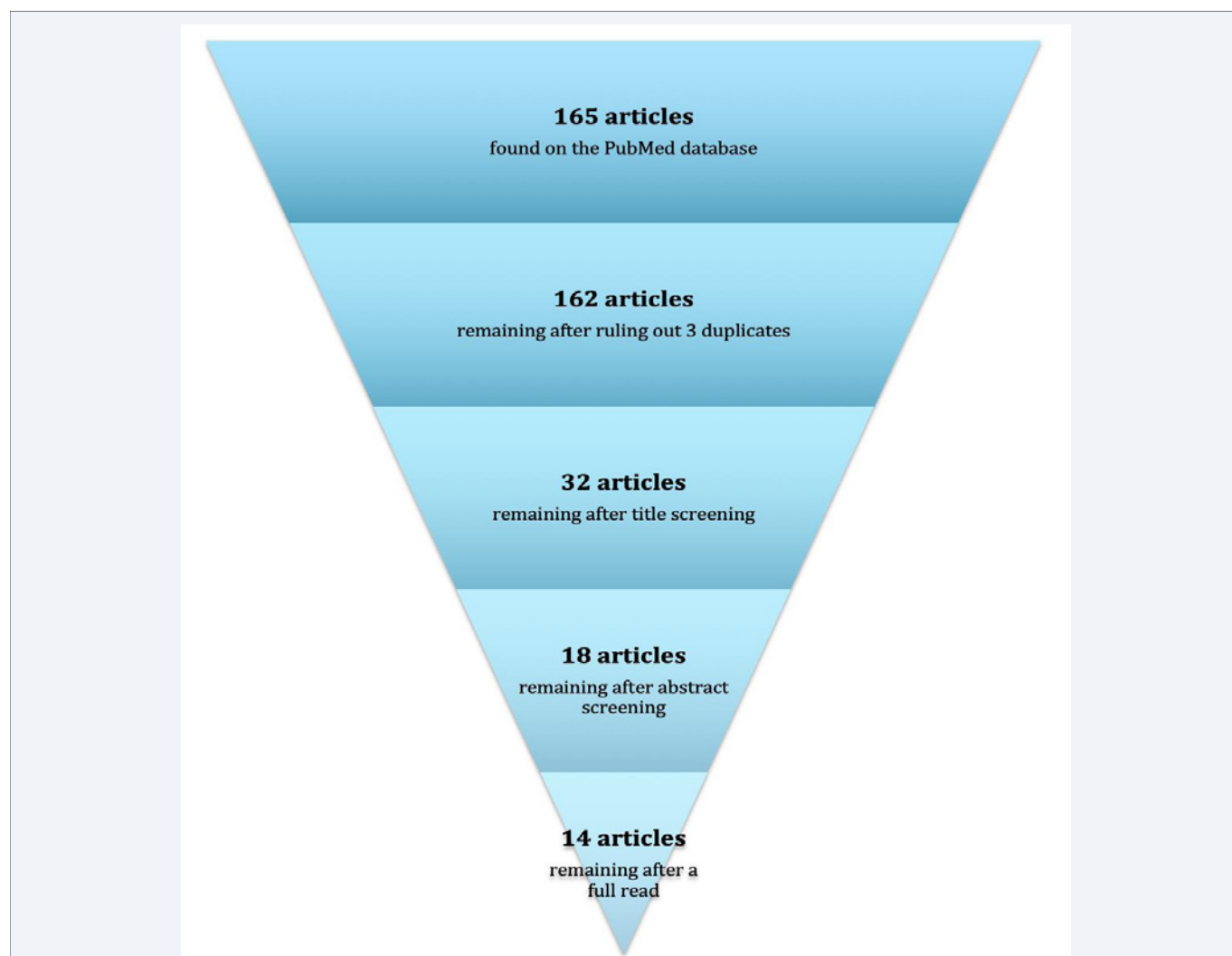


Figure 1 Research Strategy.

women as well showed that e-cigarettes are the most used product in order to quit smoking (15%) followed by nicotine patches (14%) and nicotine gums (7%). Nevertheless, it's important to underline their going back to classic smoking during postpartum [10,11].

However, their uprising popularity sparked controversy due to lack of scientific proof of their safety. As a matter of fact, e-cigarettes have not been tested nor approved by any regulatory authorities such as Food and Drug Agency (FDA) or Medicine and Healthcare products Regulatory Agency (MHRA) before their worldwide marketing [12]. In one hand, e-cigarettes may replace classic smoking hence decreasing the health and economic burden of tobacco consumption. In the other hand, their use may perpetuate nicotine addiction and allure younger consumers rendering every effort to exterminate smoking void [13,14]. Furthermore, e-cigarettes effectiveness as a tool to help and assist smoking withdrawal is nowhere to be proved. All studies considered, literature remains controversial [15,16]. Therefore, quality trials are necessary.

Are e-cigarettes safer than combustible tobacco?

Tobacco cigarettes contain more than 4000 chemicals, of which 55 are known carcinogens [17]. Unquestionably, E-cigarettes hold less chemicals than combustible tobacco hence they are considered as a safer alternative to smoking. However, there are conflicting reports on levels of specific toxins found in their steam. Studies of arsenic, chromium, cadmium, nickel and lead levels produced by e-cigarettes justify the need of a better-quality control of their design and manufacture [18]. The potential source of contamination is probably the atomizer creating aerosols from the cartridge's liquid. The FDA (Food and Drug Administration) didn't issue any regulations on the chemicals used in the cartridges until recently.

Studies using gas chromatography-mass spectrometry have identified major components of e-cigarettes such as nicotine, propylene glycol and glycerin; traces of tobacco specific nitrosamines and diethylene glycol have also been detected [19]. Hereby, we can be particularly interested in nicotine.

Nicotine and e-cigarettes

Firstly, it's important to establish how much nicotine does one e-cigarette produce. There is a shedload of e-cigarettes providing different amounts of nicotine per puff. In south, liquid cartridges hold varying dosage of nicotine. Some Cartridges are sold without nicotine and advertised as a tool to give up smoking. In 16 different e-cigarette brands vapors, nicotine content was listed using an automatic smoking device. Authors found that nicotine levels from 15 puffs of an e-cigarette differed from 0,5 to 15,4 mg [20]. Moreover, nicotine's amount varies conspicuously according to the consumer which sustains the complexity of the matter [20]. Therefore, studying nicotine's repercussions during pregnancy would be a justifiable way to approach e-cigarette's risk assessment.

Nicotine and pregnancy

Effects on pregnancy and prenatality: Ectopic pregnancies and stillbirths are way more frequent among smoking women than in general population. They are more prone to premature

delivery [21]. It's been established that newborns exposed to nicotine before birth tend to have a lower birth weight than their peers as a result of fetal growth restriction [22].

Endocrine and reproductive effects: Exposed to nicotine, children are at a higher risk of overweight and obesity in childhood, adolescence and adult life regardless of a low weight at birth naissance [23]. In utero exposition to nicotine among women may cause an early menarche onset. However, early exposure among men results in a poor sperm quality (lower sperm count and concentration) affecting its fertility and his offspring's health [24].

Respiratory and cardiovascular effects: This population is characterized by a propensity for respiratory infections, asthma and pulmonary artery hypertension although its mechanism is still ambiguous [25]. Pulmonary artery hypertension is often singled out as a result of fetal nicotine poisoning [26].

Neurodevelopment and behavioral effects: Children exposed to nicotine in utero tend to behold poorer school results. In fact, they develop deficits in learning, memory, reading, language development, global intelligence and academic achievement [27,28]. The aggressive and even criminal behavior observed in these children has many possible causes. Indeed, according to Daseking et al. [29], it may be triggered by an increase in impulsivity and a decrease in inhibitory control which leads to an increase in aggressive behavior. Moreover, aggressiveness, drug addiction and poor decision-making would explain the higher rate of arrest for criminal activities among this population [29]. Serotonergic function alteration leads to ADHD increased incidence. As a matter of fact, it's been established that maternal smoking decreases serotonin which is often associated with ADHD [30]. Children of smoking mothers are not only prone to smoking but are also likely to abuse other substances. Many explanations have been put forward ranging from genetic predisposition to learned behavior, including altered reward processing alongside increased stress reactivity with difficulty coping with stressful life events [31]. When a woman exposes her female offspring in utero to nicotine, she exposes both her daughter and her grandchildren. As a matter of fact, gametogenesis occurs during fetal development in females [32]. In order to protect pregnant women and children's health, some authors documented and laid many measures. As those enforced for other tobacco products, levying a legal age limit helps prohibiting young people from accessing e-cigarettes. Besides, up-pricing would curb young population's initiation and use. Moreover, vulnerable populations should behoove from appropriate health warnings. Finally, to protect non-consumers against passive exposure to e-cigarette aerosols, using electronic cigarettes should be prohibited in public areas [33].

CONCLUSIONS

Known to all, electronic cigarettes are an alluring and notorious product among pregnant smokers. Nonetheless, nicotine is said to be harmful to the offspring and even to the upcoming generations. Hence, it is compulsory that every health professional and component align their strength and work relentlessly to sustain information dissemination as well as further research in the field.

AUTHOR CONTRIBUTION

AS: study concept and design, data collection, data analysis and interpretation, writing the paper. HL: study concept, data collection, data analysis, writing the paper. MM: study concept, data collection, data analysis, writing the paper. NZ: study design, data collection, data interpretation, writing the paper. AL: study concept, data collection, data analysis, writing the paper. AB: study concept, data collection, data analysis, writing the paper. AK: study concept, data collection, data analysis, writing the paper.

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