Introduction

Smoking is one of the important risk factors in most diseases, including lung cancer (1), ischemic heart diseases, heart failure, atrial fibrillation, and venous thromboembolism (2), infectious diseases of the respiratory, digestive, and reproductive systems (3), colorectal neoplasia (4), and non-alcoholic fatty liver disease (5). Two-thirds of long-term smokers die prematurely from diseases caused by smoking (6).

Despite the identification of the adverse effects of smoking on the structure and function of different body systems, its use is increasing, especially in less developed countries (7). Further, the age at starting smoking has decreased so that in the population of 13-15 years old in 143 countries of the world, about 11.3% of boys and 1.6% of girls smoke cigarettes (8). This along with health-related harms confronts the society with economic and cultural harms caused by smoking because in this stage of development, behaviors are shaped in people based on health or risk (9).

Preventing non-smokers from smoking and developing different methods for smokers to quit are the plans by the World Health Organization (WHO) to deal with the adverse effects of smoking on the health of people, especially young adults (10). Over the past two decades, a device called an electronic cigarette (e-cigarette) has entered the tobacco industry with the goal to help people quit smoking, but now its performance and effects have been debated. Different studies reported various unexpected effects and complications caused by e-cigarette. This study investigated the effects of e-cigarette on smoking cessation.

Materials and Methods

Related studies were extracted by keywords including e-cigarette, conventional cigarette, smoking cessation, combustible cigarettes, and effects of e-cigarette from PubMed, ScienceDirect, and Scopus. The inclusion criterion was the relevance of the studies to the aim of the study from 2010 to 2022. Finally, the contents were summarized by content analysis.

Results

Due to the non-combustible property of tobacco, many people consider it less harmful. Other features such as different flavors, availability, and modern appearance make it user-friendly. Nevertheless, numerous studies declared the harmful effects of e-cigarettes on the lungs, platelets, and vascular tissue because of the formation of new suspected toxic compounds. Moreover, it has been reported that the use of e-cigarettes not only does not contribute to smoking cessation but also increases people’s desire to conventional smoking, especially in e-liquids containing nicotine.

Conclusion:
The potential of e-cigarette as a safe tool for smoking cessation remains debatable. In addition, due to the greater attraction of young adults, countries should enact laws regarding the distribution, access, and prohibitions.

Keywords: Electronic-cigarette, Smoking cessation, Combustible cigarettes, Conventional cigarettes
30% reduction in smoking by 2025. WHO’s MPOWER package consists of a set of six key strategies for fighting the tobacco epidemic. The smoking cessation approach by offering help to quit smoking is considered as one of the main components. Nicotine replacement therapy and psychological support are two methods used to quit smoking, but according to a study conducted in the European Union from 2012 to 2017, the use of pharmacotherapy and psychological support decreased from 14.6% to 11.1% and from 7.5% to 5%, respectively.

On the other hand, another approach, which is the use of Electronic Nicotine Delivery System, has been developed, and its use has increased from 3.7% to 9.7% (10).

Electronic Nicotine Delivery System, also called e-cigarette, which was first introduced by Hon Lik in 2003, is an electronic device that delivers nicotine to the consumer through vapor inhalation without the combustion of smoke (11). E-cigarettes include a cartridge containing e-liquid, a heating element or atomizer to heat the e-liquid to produce a vapor, a sensor, a rechargeable battery, and a mouthpiece to suck the generated vapor. In some models, a microprocessor produces a red-orange light at the tip of the device and evokes the presence of fire at the tip of a cigarette (12).

The e-liquid in the cartridge, which contains humectants and flavorings with or without nicotine, is heated and turned into vapor through the atomizer. The vapor released through the mouth during suction creates a sensation similar to smoking. The composition of the e-liquid and its nicotine level is different according to the available commercial brands (12).

In recent years, the use of e-cigarettes has increased significantly so that in the United States, 1 out of every 5 smokers uses an e-cigarette. The experience of using e-cigarettes among young people has increased from 3.2% in 2011 to 6.8% in 2012 (11) due to its availability (13), the existence of different flavors in the e-liquid (14), and being considered modern (11,12). In addition, the increasing use of e-cigarettes is due to the view that e-cigarettes can be used as a safe tool to quit smoking by replacing conventional cigarettes. The public’s belief that its use creates low risk or is safe for people’s health has also fueled this issue (15).

According to some sources, since combustion does not occur in e-cigarettes, many harmful substances caused by the combustion of tobacco in conventional cigarettes are not produced in this device (16). However, the results of studies on people using e-cigarettes show a series of complications. In these people, the urinary level of dangerous metabolites for health (e.g., propylene oxide, acrolein, acrylonitrile, and crotonaldehyde) is twice that of non-smokers (17). In the lungs, small particles can be seen which are formed from propylene glycol. Moreover, the presence of nicotine in the e-liquid increases the level of exhaled nitric oxide and stimulates the inflammation of the respiratory tract (18). The use of e-cigarettes in non-smokers has short-term effects on the function of platelets and increases their aggregation, causing damage to vascular tissue and changing the vascular tonicity (18).

On the other hand, studies also indicate that the use of e-cigarettes not only does not play any important role in quitting smoking but also increases people’s desire to smoke. Especially, in cases where the e-liquid contains nicotine, due to its highly addictive effects, many e-cigarette users turn to conventional cigarette smoking. Therefore, the e-cigarette, which was originally created as a smoking cessation tool, is the gateway to conventional cigarette smoking (11,19).

Discussion

Based on the aim of this study, which was conducted to investigate e-cigarette as a cessation tool or a new way to get into conventional smoking, Glantz’s study indicated no significant relationship between e-cigarette use and smoking cessation (20). Further, WHO declares that e-cigarette cannot be considered as an efficient and effective way to quit smoking by stressing the necessity of conducting more detailed studies and providing more convincing pieces of evidence. In addition to the type of e-liquid composition inside the cartridge, the type of materials used in the construction of the body and different parts of the device were also considered as effective factors in creating the risks of consuming this type of cigarette (12).

The results of a longitudinal study in England declared that there is a relationship between the experience of using e-cigarettes and the subsequent experience of conventional smoking. The fear that the use of e-cigarettes through the gateway effect will increase smoking among young people has led countries to pass laws on how to use e-cigarettes or prohibit their use (21). King et al even demonstrated that passive exposure to e-cigarettes is effective in increasing the desire to use e-cigarettes followed by conventional cigarettes (11).

Conclusion

According to the mentioned complications, e-cigarette cannot be introduced as a safe alternative for smoking cessation, and more scientific evidence is needed. In addition, due to the potentiality of e-cigarette to create a gateway for people to enter conventional smoking and greater attraction of young adults to smoking this type of cigarette, countries should enact laws regarding distribution, access, and prohibitions.

Authors’ Contribution

ZM and AM designed the study; ZM searched and screened the studies, reviewed the literature, and extracted and summarized the results; and ZM and AM wrote the manuscript. In addition, all authors read and approved the final version of the manuscript.
Conflict of Interest Disclosures
None declared.

Ethical Statement
Not applicable.

Funding/Support
This paper is the result of independent research without any financial and organizational support.

Informed Consent
Not applicable.

References
1. O’Keeffe LM, Taylor G, Huxley RR, Mitchell P, Woodward M, Peters SA. Smoking as a risk factor for lung cancer in women and men: a systematic review and meta-analysis. BMJ Open. 2018;8(10):e021611. doi: 10.1136/bmjopen-2018-021611.
2. Kondo T, Nakano Y, Adachi S, Murohara T. Effects of tobacco smoking on cardiovascular disease. Circ J. 2019;83(10):1980-5. doi: 10.1253/circj.CJ-19-0323.
3. Jiang C, Chen Q, Xie M. Smoking increases the risk of infectious diseases: a narrative review. Tob Induc Dis. 2020;18:60. doi: 10.18332/tid/123845.
4. van der Sloot KWJ, Tiems JL, Visschedijk MC, Festen EAM, van Dullemen HM, Weersma RK, et al. Cigarette smoke increases risk for colorectal neoplasia in inflammatory bowel disease. Clin Gastroenterol Hepatol. 2022;20(4):798-805.e1. doi: 10.1016/j.cgh.2021.01.015.
5. Akhavan Rezayat A, Dadgar Moghadam M, Ghasemi Nour M, Shirazinia M, Ghodsi H, Rouhbakhsh Zahmatkesh MR, et al. Association between smoking and non-alcoholic fatty liver disease: a systematic review and meta-analysis. SAGE Open Med. 2018;6:2050321217745223. doi: 10.1177/2050321217745223.
6. Levy DT, Borland R, Lindblom EN, Gontiewicz ML, Meza R, Holford TR, et al. Potential deaths averted in USA by replacing cigarettes with e-cigarettes. Tob Control. 2018;27(1):18-25. doi: 10.1136/tobaccocontrol-2017-053759.
7. Todorović I, Cheng F, Stojasavljević Š, Marinković S, Kremenović S, Savic P, et al. Prevalence of cigarette smoking and influence of associated factors among students of the University of Banja Luka: a cross-sectional study. Medicina (Kaunas). 2022;58(4):502. doi: 10.3390/medicina58040502.
8. Ma C, Xi B, Li Z, Wu H, Zhao M, Liang Y, et al. Prevalence and trends in tobacco use among adolescents aged 13-15 years in 143 countries, 1999-2018: findings from the Global Youth Tobacco Surveys. Lancet Child Adolesc Health. 2021;5(4):245-55. doi: 10.1016/s2352-4642(20)30390-4.
9. Delnevo CD, Villanti AC, Wackowski OA, Gundersen DA, Giovenco DP. The influence of menthol, e-cigarettes and other tobacco products on young adults’ self-reported changes in past year smoking. Tob Control. 2016;25(5):571-4. doi: 10.1136/tobaccocontrol-2015-052325.
10. Filippidis FT, Lavery AA, Mons U, Jimenez-Ruiz C, Vardavas CI. Changes in smoking cessation assistance in the European Union between 2012 and 2017: pharmacotherapy versus counselling versus e-cigarettes. Tob Control. 2019;28(1):95-100. doi: 10.1136/tobaccocontrol-2017-054117.
11. King AC, Smith LJ, McNamara PJ, Matthews AK, Fridberg DJ. Passive exposure to electronic cigarette (e-cigarette) use increases desire for combustible and e-cigarettes in young adult smokers. Tob Control. 2015;24(5):501-4. doi: 10.1136/tobaccocontrol-2014-051563.
12. Marques P, Piqueras L, Sanz MJ. An updated overview of e-cigarette impact on human health. Respir Res. 2021;22(1):151. doi: 10.1186/s12931-021-01737-5.
13. Mantey DS, Pasch KE, Loukas A, Perry CL. Exposure to point-of-sale marketing of cigarettes and e-cigarettes as predictors of smoking cessation behaviors. Nicotine Tob Res. 2019;21(2):212-9. doi: 10.1093/ntr/ntz246.
14. Litt MD, Duffy V, Oncken C. Cigarette smoking and electronic cigarette vaping patterns as a function of e-cigarette flavourings. Tob Control. 2016;25(Suppl 2):i67-i72. doi: 10.1136/tobaccocontrol-2016-032233.
15. Palmer AM, Brandon TH. How do electronic cigarettes affect cravings to smoke or vape? Parsing the influences of nicotine and expectancies using the balanced-placebo design. J Consult Clin Psychol. 2018;86(5):486-91. doi: 10.1037/ccp0000303.
16. Jafari Pour F, Soltanmoradi S, Fallahi B, Foroughi S, Fallahi M. The safety and efficacy of electronic cigarettes in smoking cessation. Nursing Development in Health. 2019;9(2):65-74. [Persian]
17. Rubinstein ML, Delucchi K, Benowitz NL, Ramo DE. Adolescent exposure to toxic volatile organic chemicals from e-cigarettes. Pediatrics. 2018;141(4):e20173557. doi: 10.1542/peds.2017-3557.
18. Schober W, Szendri K, Matzen W, Osiander-Fuchs H, Heitmann D, Schettgen T, et al. Use of electronic cigarettes (e-cigarettes) impairs indoor air quality and increases FeNO levels of e-cigarette consumers. Int J Hyg Environ Health. 2014;217(6):628-37. doi: 10.1016/j.ijeh.2013.11.003.
19. Carnevale R, Sciarretta S, Violi F, Nocella C, Loffredo L, Perri L, et al. Acute impact of tobacco vs electronic cigarette smoking on oxidative stress and vascular function. Chest. 2016;150(3):606-12. doi: 10.1016/j.chest.2016.04.012.
20. Glantz SA. E-cigarettes as consumer products. Am J Public Health. 2022;112(1):e4-e5. doi: 10.2105/ajph.2021.306569.
21. Gartner CE. E-cigarettes and youth smoking: be alert but not alarmed. Tob Control. 2018;27(4):359-60. doi: 10.1136/tobaccocontrol-2017-054002.