



Comparison of Side Effects of Vaping Versus Smoking

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Abstract

E-cigarettes or vaping is a recent development that seeks to reduce tobacco harm. Awareness and the use of e-cigarettes have significantly increased in recent years, and many smokers are gradually shifting from tobacco cigarettes to vaping as a way to cut down harmful habits. However, there is a growing need to understand the efficiency of vaping and if it is the best option for reducing smoking. This systematic review sought to compare the side effects of vaping to smoking to establish potential risks with the recent development. The study utilized publicly available research studies from various platforms in researching vaping and smoking. The method used focused on scholarly articles published in the last five years and with at least a focus on the populations in the United States and Canada. Twelve research articles were used to ascertain the comparison between the side effects of vaping and smoking on the users. The findings of the research showed that vaping is currently safer compared to smoking, and this is because of the low levels of nicotine in the e-cigarettes. However, the side effects of vaping on lungs and cardiovascular systems are similar but dependent on the rates and period of usage. The results of this review offer preliminary evidence that vaping is relatively as harmful as smoking.

Keywords: Vaping; Smoking; E-cigarettes; Nicotine; Safety; Reduction; Dependence.

1. Introduction

The best outcome that every smoker seeks is to complete tobacco cessation. However, many of the smokers often continue to struggle with the powerful addictive properties of smoking, particularly nicotine and the ritualistic behavior associated with smoking, and these create a significant hurdle. For a long time, smokers only had two alternatives, and these were either to quit the habit or suffer the grave consequences associated with continued smoking. It is this gloomy scenario that has played a key role in escalating the smoking pandemic, causing millions of deaths annually around the world. Nonetheless, a third choice, entailing the use of alternative and possibly safer sources of nicotine to reduce smoking-related diseases is now available: electronic cigarettes, which are a product of tobacco harm reduction. Instead of smoking, electronic cigarettes have offered the option of vaping to smokers. Vaping refers to the use of the electronic cigarettes that consist of the battery part and an atomizer where the liquid is stored and is aerosolized through the application of energy generation of heat to a resistance encircling a wick [1]. It, nevertheless, does not mean that vaping does not threaten the health and wellbeing of smokers. In turn, this forms the basis of the discussion of this research paper, which seeks to compare the side effects of vaping versus smoking.

2. Method

For this particular systematic review, a search was done through PubMed, Science Direct, Wolters Kluwer Health, Google Scholar, and NCBI by using keywords related to vaping and smoking. The keywords used included vaping, smoking, e-cigarette, cigarette, nicotine delivery, and nicotine intake. The language of the papers was restricted to English. The geographical focus was restricted to articles that were published only in the United States and Canada for the accuracy of this research paper. The search covered scholarly literature published from January 2015 and January 2020. The studies that met all of these criteria were enrolled. The exclusion criteria included any article that was either a recommendation, reviews, expert statement, technical reports, or non-original papers. Besides, any duplicated scholarly publication, systematic reviews, and reviews were excluded.

3. Results

A total of 227 was found. Upon narrowing down the search to scholarly articles published from 2015 January to present, the results were reduced to 29 studies, and these were judged relevant to the study on the effects of both vaping and smoking profile. Additional information was searched through the abstracts for relevance. However, not every research article fits the profile as some publications were outside the geographical focus of this research. Thus any article with data that is not either of the United States or Canada was left out. In total, 12 studies were used and cited in this paper.

According to the studying characteristics, there were two endpoint indicators, and these were smoking reduction and smoking cessation. These two indicators were commonly used through the research articles to analyze the efficiency of vaping in replacing smoking and as a better option with minimal side effects on the users. The other

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endpoint indicator was the adverse events, which were also prevalent in the selected materials as a means of evaluating the safety of vaping or the use of e-cigarettes. Most of the studies assessed the use of e-cigarettes in cutting down smoking or how they can easily lead to dependency and thus questioning the side effects of vaping.

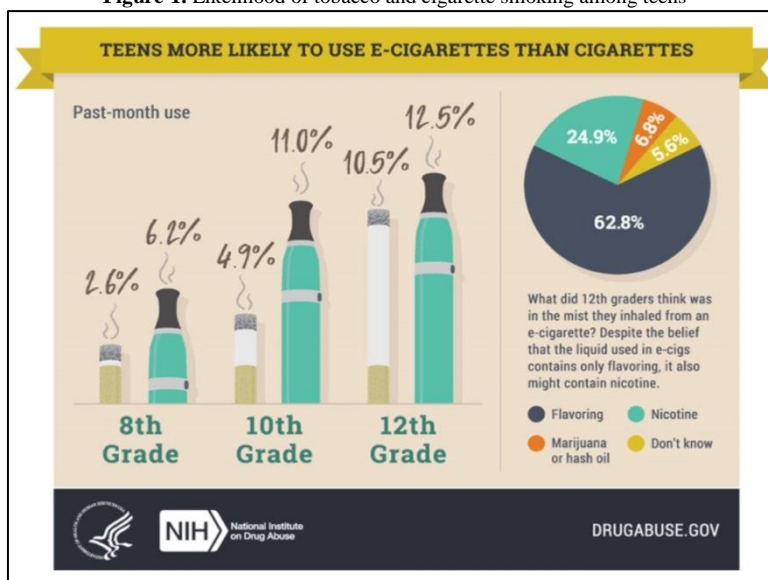
Four studies indicated that there is always a high chance of an increase in relapsing or being initiated with smoking as long as a person has been vaping [1-4]. Four other studies highlighted that the side effects of the vaping are minimal compared to that of smoking mainly because smoking always has high rates of nicotine absorption compared to vaping [1, 5-7]. Qasim, *et al.* [8], however, highlighted that e-cigarettes could be just as harmful as normal cigarette smoking when considered in terms of the impact on cardiovascular diseases. However, the effect of vaping is still minimal compared to smoking. Lee, *et al.* [9], nonetheless, indicated that there is always significant impairment of the viability of the endothelial cells to both vaping and smoking. Nocella, *et al.* [10], reported that there is a substantial increase in the platelet aggregation after exposure to both vaping and smoking. In turn, the results of the studies that there are relative side effects of both vaping and smoking, but in comparing the two, vaping has minimal side effects compared to smoking. However, most of the studies highlighted that there is a need for further studies to determine the long-term effects of vaping on users.

4. Discussion

The research review included 12 studies that were investigating the side effects of vaping and smoking. Also included in this research are studies comparing the impact of vaping and smoking along with the relationship between the two, especially how vaping can initiate smoking or lead to relapse. The core focus of most of the studies was on health and nicotine intake between vaping and cigarette smoking. According to Goldenson, *et al.* [1], youths who vape for an extended period often have higher nicotine concentrations at the baseline, and these individuals are always at a higher risk of starting to smoke especially after six months of e-cigarette use. Goldenson, *et al.* [1], however, argued when comparing youths who have been vaping and those who have been smoking from younger ages, it is smokers who have higher nicotine concentration than those who vape. Jorenby, *et al.* [5], also pointed out that both vapers and smokers have significant levels of nicotine intake, but this is dependent on the time of use. Jorenby, *et al.* [5], further discussed that the side effects could nevertheless be evident in withdrawal symptoms. When comparing reduction and withdrawal rates, the study indicated that e-cigarettes helped in maintaining smoking reduction while at the same time reducing various withdrawal symptoms [5]. The chances of nicotine addiction are, however, low on vaping compared to smoking. According to Prochaska and Benowitz [6], smoking is always associated with high rates of nicotine addiction because of the high concentration of nicotine in standard cigarettes. In a population-based observation in the United States showed that vaping was associated with increased quitting of smoking and this is because it helps in cutting down nicotine dependency [6, 7]. It then highlights the vaping has fewer side effects when it comes to nicotine dependency compared to smoking.

However, the efficiency of vaping in reducing nicotine dependence is still debatable as other studies have shown that there is a likelihood of dependency and relapse or initiation to smoking. Other studies found out that vaping for more than one year after one has quit smoking will lead to relapse [2, 4]. In turn, this shows that though vaping has always been used as a means to help people quit smoking, chances of successful quitting are minimal. The finding closely relates to the study by Levy, *et al.* [3], whose previous study revealed that one of the side effects of vaping is the smoking initiation. In the study performed among youths and young adults in the United States showed that the aggregate effect of initiation is nevertheless negligible at the population level [3]. However, this still remains an issue that needs considering based on the fact that the number of youths and young adults vaping is on the rise. As shown in the diagram below, many youths are gradually being initiated into vaping without realizing, and this will highly likely increase the number of youths who start smoking without realization hence increasing the chance of addiction and switching to cigarette smoking.

Figure-1. Likelihood of tobacco and cigarette smoking among teens



Source: Powertotheparent.org

In analyzing the two findings, it is clear that though there is a chance of relapsing or smoking initiation, the vaping dependency is lower compared to smoking because of the low nicotine levels in vaping, but this depends on the period of usage. It is because of this lessened side effects that vaping has often been considered to be effective in smoking reduction [11]. It thus establishes that the side effect of dependency is minimal in vaping than smoking.

In terms of the impact on health, the side effects of vaping are lower compared to smoking. Glynos, *et al.* [12] performed an in vitro study in the effects of vaping compared to smoking on lungs' health and identified that vaping could be more dangerous than smoking. Glynos, *et al.* [12], stated that exposure to the vapor could trigger inflammatory responses while adversely affecting the mechanics of the respiratory system because of the added flavors in e-cigarettes. Another study on the impact of vaping and smoking on platelet function showed that both e-cigarettes and tobacco cigarettes have adverse effects on the platelet function, and this, in turn, affects the cardiovascular system of the users [10]. At the same time, it is evident that both smoking and vaping are associated with deterioration of the endothelial cells which affects the mechanism of the cardiovascular system because of the oxidants that damage the lipids and proteins [8, 13]. Therefore, when comparing the impact on health, both vaping and smoking have adverse effects on the lungs and cardiovascular systems of the users.

5. Conclusion

Existing evidence indicates that both vaping and smoking have adverse side effects on the users, but when comparing the two, it is smoking that is worse compared to smoking. The main reason for the difference is encountered mainly in the levels of nicotine intake. The studies highlighted that e-cigarettes have low concentrations of nicotine compared to tobacco cigarettes. It is because of this that it is easy to get addicted to smoking than vaping. At the same time, these low levels of nicotine in vaping makes it one of the safest ways to reduce smoking. However, there is still a need for further studies as to whether prolonged vaping can lead to smoking. The studies also showed that both vaping and smoking have adverse effects on the users' health, and this mainly damages the lungs and the cardiovascular systems almost at the same rate but still dependent on the period and frequency of both vaping and smoking.

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