A Study on E-Cigarette Impact on Human Health

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Abstract -The study aims to compare the effects of electronic cigarettes (e-cigarettes) on human health to traditional cigarettes. It will begin with a comprehensive overview of the history, types, and applications of e-cigarettes. It will next examine the known compounds included in each type of nicotine delivery technology, potential health implications, and the effects of nicotine exposure to highlight the health hazards associated with both e-cigarettes and conventional cigarettes. Finally, the study will examine data from previously published studies to assess the potential health risks associated with e-cigarettes versus traditional cigarettes.

Keywords -E-cigarette, Vaping, Nicotine health risks, Smoking addiction

INTRODUCTION

In particular, this study will explore the existing evidence on the effects of using e-cigarettes on human health, including the potential respiratory, cardiovascular, and behavioural effects of using e-cigarettes. The influence of different types of e-cigarettes, nicotine concentrations and flavours will be examined to assess possible health concerns.This is a secondary examination of current scientific studies on e-cigarettes. We will review and analyse existing data on e-cigarettes and their health consequences. We will also gather data from surveys and epidemiological studies on e-cigarette use.This study will shed light on the health consequences of e-cigarette usage. In addition, we will discuss the implications of the current evidence and provide recommendations for policymakers and public health professionals.

BACKGROUND

E-cigarettes are devices designed to simulate traditional tobacco smoking without the combustion of tobacco. Over the past ten years, they have become incredibly popular, especially with teenagers and young adults. Health experts warn that although e-cigarette users believe they are a safer alternative to traditional cigarettes, there may be some health risks associated with this product. The inhalation of the chemicals in e-cigarette aerosol, along with the presence of nicotine, has most prominently been connected to a number of diseases and negative health effects. As an emerging trend, further research needs to be conducted in order to better understand the biological, physiological, and epidemiological impacts of these devices. The aim of this study is to evaluate the impact of e-cigarettes on human health and determine whether these devices are more or less

REVIEW OF LITERATURE

Cullen, Andrea and Gentzke (2019) did research on e-Cigarette Use Among Youth in the United States.The Objectives of the research were to estimate the prevalence of e-cigarette use among US high school and middle school students in 2019 including frequency of use, brands used, and use of flavoured products.Cullen, Andrea and Gentzke used descriptive and mentioned Statistical analyses were conducted using SAS-callable SUDAAN (SUDAAN version 11.0.3, Research Triangle Institute) to account for the complex sampling design. A weighting factor was applied to each student record to adjust for nonresponse and for varying probabilities of selection weights were adjusted to ensure that the weighted proportions of students in each grade matched national population estimates. The weight adjustment for student nonresponse was made by sex and grade within schools so that the sum of student weights over participating students within a school matched the total enrollment by grade and sex in the school during data collection. At the school level, nonresponse adjustments used school type (public, nonpublic), National Center for Educational Statistics locale indicator, and school-level poverty status. Weighted prevalence estimates and 95% CIs for current use of any tobacco product, cigarettes, and e-cigarettes were assessed among high school and middle school students separately. Estimates are considered statistically unreliable and are suppressed if the unweighted denominator is less

than 50 or the relative standard error is greater than 30%.As well Cullen, Andrea and Gentzke out that in 2019, the prevalence of self-reported e-cigarette use was high among high school students and middle school students, with many current e-cigarette users reporting frequent use and most of the exclusive e-cigarette users reporting use of flavoured e-cigarettes.

Krysten, Bold, Kong, Deepa and Camenga (2019) did a Trajectories of E-Cigarette and Conventional Cigarette Use Among Youth.The Objectives of the research were to show electronic cigarette (e-cigarette) use rates are high among youth, and there are concerns that e-cigarette use confers risk for future conventional cigarette use.Prospective research is needed to characterise the stability and directionality of these tobacco use trajectories over time.Krysten, Bold, Kong, Deepa and Camenga used descriptive primary outcomes to capture recent use, which may be less prone to recall bias, the primary outcomes of interest were past-month use (1 = yes, 0 = no) of cigarettes and e-cigarettes at each wave and data analysis were run by using Mplus (version 7.4).Outcome data were missing for 6.5% of cases across waves and were handled by using maximum likelihood estimation with robust

standard errors. Past-month cigarette and e-cigarette use outcomes were modelled as binary variables with a logit link function.As well Krysten, Bold, Kong, Deepa and Camenga out that This study is the first to examine reciprocal associations between cigarette and e- cigarette use among youth across 3 longitudinal waves. The observed relationship between cigarette and e-cigarette use over time was unidirectional. E-cigarette use was associated with future cigarette use across 3 longitudinal waves, yet cigarette use was not associated with future e-cigarette use. Potential mediators of this effect should be examined in future research to better understand the mechanisms through which e-cigarette use increases the risk for future cigarette use. Prevention and intervention efforts and policies targeting youth e- cigarette use may be needed to reduce future conventional tobacco use among youth.

Richard,Wang, Bhadriraju, Stanton and Glantz (2021) did a E-Cigarette Use and Adult Cigarette Smoking Cessation: A Meta-Analysis.The Objectives of the research were to show determine the association between e-cigarette use and smoking cessation.Richard, Wang,Bhadriraju, Stanton and Glantz used descriptive data sources and searches an

academic librarian developed the search strategy and searched PubMed, Web of Science Core Collection, and EMBASE databases on January 14, 2020 and eligibility criteria considered studies eligible if (1) the target population was adults aged 18 years or older (2) the exposure was e-cigarette use, however this was defined by study authors (definitions included ever use, current use, and daily use, among others); and (3) the outcome was smoking cessation,As well Richard, Wang, Bhadriraju, Stanton and Glantz out that as consumer products, in observational studies, e-cigarettes were not associated with increased smoking cessation in the adult population. In RCTs, provision of free e-cigarettes as a therapeutic intervention was associated with increased smoking cessation.

Marques, Piqueras and Sanz (2021) did an updated overview of e-cigarette impact on human health.The Objectives of the research were to show understanding the impact of these new inhalable compounds on human health. Results of toxicological analyses suggest that e- cigarettes can be safer than conventional cigarettes, although harmful effects from short-term e-cigarette use have been described. Marques, Piqueras and Sanz used descriptive consequences of nicotine 3 content of Comparison of the degree of harmful effects documented from e-cigarette and conventional cigarette consumption. Human studies in vivo mice exposure and in vitro studies. All of these effects from e-cigarettes were documented to be lower than those exerted by conventional cigarettes, which may suggest that e-cigarette consumption could be a safer option than conventional tobacco smoking but not a clear safe choice, Content comparison of the most common carbonyl compounds from e-cigarettes versus conventional tobacco and the last one Content future research needed in the impact of e-cigarette-consumption in human health cigarette consumption.Marques, Piqueras and Sanz out that The harmful effects of CS and their deleterious conse- quences are both well recognised and widely investigated. However, and based on the studies carried out so far, it seems that e-cigarette consumption is less toxic than tobacco smoking. This does not

necessarily mean, how- ever, that e-cigarettes are free from hazardous effects. Indeed, studies investigating their long-term effects on human health are urgently required. In this regard, the main additional studies needed in this field are summa- rized in content 3.The composition of e-liquids

requires stricter regu- lation, as they can be easily bought online and many incidences of mislabelling have been detected, which can seriously affect consumers' health. Beyond their unknown long-term effects on human health, the extended list of appealing flavours available seems to attract new never-smokers, which is especially worrying among young users. Additionally, there is still a lack of evidence of e-cigarette consumption as a smoking ces- sation method. Indeed, e-cigarettes containing nicotine may relieve the craving for smoking, but not the conven- tional cigarette smoking habit.

Dale, Maria, Stephanie and Clendennen (2016) dia a E-Cigarette Marketing Exposure Is Associated With E-Cigarette Use Among US Youth.The Objectives of the research were to show study investigates the association between exposure to e-cigarette marketing and susceptibility and use of e-cigarettes in youth.Dale, Maria, Stephanie and Clendennen used descriptive data were obtained from the 2014 National Youth Tobacco Survey. Participants were 22,007 US middle and high school students. Multivariate logistic regression models assessed the relationship between e-cigarette marketing (internet, print, retail, and TV/movies) and current and ever use as well as susceptibility to use e-cigarettes among never e-cigarette users. Dale, Maria, Stephanie and Clendennen found that findings highlight the significant associations between e-cigarette marketing and e-cigarette use among youth and the need for longitudinal research on these relationships.

Thomat, Rebecca, James and Frederick (2018) did a Longitudinal study of e-cigarette use and onset of cigarette smoking among high school students in Hawaii.The objective of the research were to show use of electronic cigarettes (e-cigarettes) is prevalent among adolescents, but there is little knowledge about the consequences of their use.examined, longitudinally, how e-cigarette use among adolescents is related to subsequent smoking behaviour. Thomat, Rebecca, James and Frederick used descriptive and mentioned longitudinal school-based survey with a baseline sample of 2338 students (9th and 10th graders, mean age 14.7 years) in Hawaii surveyed in 2013 (time 1, T1) and followed up 1 year later (time 2, T2). We assessed e-cigarette use, tobacco cigarette use, and psychosocial covariates (demographics, parental support and monitoring, and sensation seeking and rebelliousness). Regression analyses including the covariates tested whether e-cigarette use was related

to the onset of smoking among youth who had never smoked cigarettes, and to change in smoking frequency among youth who had previously smoked cigarettes.As well Thomat, Rebecca, James and Frederick out that adolescents who use e-cigarettes are more likely to start smoking cigarettes.This result together with other findings suggests that policies restricting adolescents' access to e-cigarettes may have a rationale from a public health standpoint.

Rehan, Harmeet ,Maini, Jahnavi and Amrit (2018) did a vaping *versus* Smoking: A Quest for Efficacy and Safety of E-Cigarette.The objective of the research were to show with the glorification of ECIG, its use has increased even among non-tobacco users. This makes it critical to understand and discuss a true picture of safety and utility of ECIGs by reviewing the literature. Rehan, Harmeet ,Maini, Jahnavi and Amrit used descriptive literature search for narrative review was done on PubMed, Scopus and Web of Science databases using the keywords viz electronic cigarette, e-cigarette, electronic nicotine delivery systems, NRT, vaping and electronic nicotine delivery device.The review was sub-categorized into four themes (potential role in smoking cessation, chemicals in the smoke of traditional cigarette and ECIGs, pharmacology of nicotine delivery via ECIG and current regulatory status across the globe). As well found out search revealed a total of 40 articles out of which 29 were included in the review. ECIGs achieved modest cessation rates with benefits of behavioural and sensory gratification. On the contrary, in many studies where ECIGs were introduced as an intervention, participants continued to use them to maintain their habit instead of quitting. A total of 22 toxic substances apart from nicotine were reported in liquid of ECIG cartridges and its emissions. Many compounds had lower concentrations in ECIG compared to tobacco smoke. There existed a wide variation in the content of ECIG cartridges and strengths of nicotine in refill solutions. It has been observed that the second generation ECIGs deliver nicotine with a similar kinetic profile as conventional cigarettes. In 2013, US FDA gave market authorization to ECIG as substitutes for quitting smoking and cigarette substitutes. The United Kingdom also advocates ECIGs as a medicinal quit aid but bans it from workplaces and other public spaces. India along with many other countries still need to come up with a formal regulatory stand regarding ECIGs. There is a need to

conduct large long- term global clinical trials in real life settings to ascertain the potential uses, adverse effects of ECIG and achieve harmonisation of nicotine solution concentration.

Kenneth E.Warner (2014) did a Frequency of E-Cigarette Use and Cigarette Smoking by American Students.The Objectives of the research is High school students' electronic cigarette (e-cigarette) use rose rapidly in 2014, to levels higher than cigarette smoking, which declined significantly Using Monitoring the Future data in 2015, this study evaluated the association between students' smoking and frequency of 30-day e-cigarette use in 2014, focusing on high school seniorsBecause most students have never smoked, never smokers constituted 25% of all seniors who used an e-cigarette. Among tenth- and eighth-graders, 43% and 48% of past-month e-cigarette users had never smokedNon-smoking high school students are highly unlikely to use e-cigarettes; among those who do, most used them only on 1–2 of the past 30 daysBy contrast, current smokers are likely to use e-cigarettes and on many more daysTwo national surveys—Monitoring the Future (MTF)1 and the National Youth Tobacco Use Survey (NYTS)2—reported high rates of electronic cigarette (e-cigarette) usage among American students in 2014Seventeen percent of 12th-graders in the MTF survey said they had used an e-cigarette within the past 30 days The NYTS reported a tripling of 30-day use from the previous year for middle and high school students, to 13.4%. In both surveys, 30-day e-cigarette usage exceeded 30-day smoking of conventional cigarettes

E-cigarette

The electronic cigarette is a type of electronic device that has become increasingly popular over the last decade due to its ability to deliver a nicotine-based vapor without releasing toxic smoke. This device is considered to be a relatively safe alternative for smokers who are trying to quit or reduce their exposure to nicotine. E-cigarettes are generally composed of a battery, an atomizer, a cartridge filled with nicotine liquid, and a mouthpiece.The use of electronic cigarettes began in 2004 and can be credited to a Chinese pharmacist called Hon Lik. There are two basic types of e-cigarette designs, open and closed systems. Open tank systems, also known as e-liquids, allow users to fill the tanks with their own choice of liquid flavors or nicotine concentrations. This allows the user to customize their experience and select the nicotine concentration that is suited for them. Closed systems are pre-filled pods that are completely disposable. This type of design is best suited for cigarettes with moderate nicotine concentrations. E-cigarettes also appeal to many users because of their design and the range of options available. Depending on the battery capacity and the atomizer, users can enjoy a longer lasting experience and different levels of vapor production. This makes e-cigarettes a great way for people who enjoy being able to customize their smoking experience to their preference and needs. E- Cigarette usage can still, however, have some negative side effects. First, there are concerns of what individual components are used to manufacture e-cigarette devices and the amount of nicotine they contain. In addition, studies suggest users may be exposed to various chemicals in the vapor itself, including nicotine, propylene glycol, and other compounds. Furthermore, psychologists have suggested that e-cigarettes might be providing an alternate or 'gateway' route to smoking traditional cigarettes, which have greater health risks than e-cigarettes. Despite these risks, many researchers argue that the benefits of e-cigarettes far outweigh their potential risks. Although more research is needed to determine the long-term consequences of using e-cigarettes, it is clear that e-cigarettes can be a viable option for people who want to lead a healthier lifestyle by eliminating the consumption of traditional cigarettes and substantially reducing their consumption of nicotine.
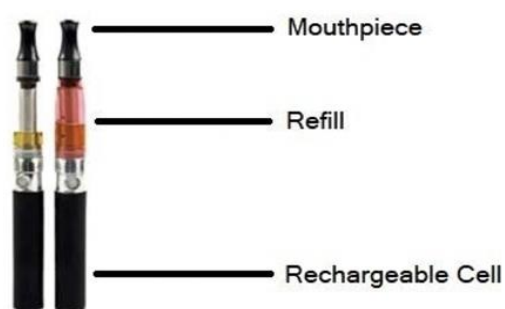
Side effects of Nicotine content In E-cigarette

The advent of e cigarettes and their accompanying nicotine content has been the subject of considerable debate over the past few years. Nicotine, as an addictive stimulant, has been linked to a number of adverse health effects, and there remains a great deal of uncertainty about the long-term consequences of nicotine exposure from e cigarettes. This paper will explore the potential side effects of nicotine content in e cigarettes, focusing primarily on the effects seen in the 2000s. The primary source of nicotine in e cigarettes is the nicotine- containing liquid. This

liquid is typically composed of propylene glycol, vegetable glycerin, flavorings, and nicotine. Nicotine is an alkaloid derived from the tobacco plant and is known to cause dependency upon regular use. Short-term side effects of nicotine use include increased heart rate, nausea, headaches, and dizziness. Long-term effects can include addiction and withdrawal symptoms if nicotine consumption is discontinued. Inhaling of nicotine-containing aerosols has also been linked to oxidative stress and inflammation, as well as other respiratory related ailments such as chronic bronchitis, coughing, and wheezing. These side effects can be particularly damaging as a result of the e cigarette aerosol's different composition from traditional cigarette smoke. The particles in the aerosol are much finer and can be more easily inhaled and deposited deep in the lungs, potentially causing more severe inflammation and longer-term consequences. Furthermore, the flavorings used in the liquid nicotine solution can contain toxins and volatile organic compounds, which can increase the risk of cardiopulmonary irritation. These compounds can also be particularly damaging if inhaled over long periods of time. Additionally, the risk of nicotine poisoning can be heightened as a result of the e cigarette delivery system, as nicotine can be easily over- consumed due to the unregulated amounts in use. In addition to the physical consequences, nicotine content in e cigarettes can also have a significant social and legal impact. The high levels of nicotine in e cigarettes have led to bans in certain countries, including the United States, due to the high public health risks that nicotine poses. By making e cigarettes unavailable to those under the age of 18, these bans are intended to protect those who are particularly vulnerable to the negative effects of nicotine. In conclusion, nicotine content in e cigarettes can have numerous adverse effects on users' health and well-being. The short and long-term physical consequences of nicotine use, as well as the potential for respiratory irritation, are concerning and warrant further research into the impact of e cigarettes. The social and legal implications of nicotine content in e cigarettes are also an important consideration, and bans on the use of e cigarettes by minors should be actively enforced The advent of e cigarettes and their accompanying nicotine content has been the subject of considerable debate over the past few years. Nicotine, as an addictive stimulant, has been linked to a number of adverse health effects, and there remains a great deal of uncertainty about the long-term consequences of nicotine exposure from e cigarettes. This paper will explore the potential side effects of nicotine content in e cigarettes, focusing primarily on the effects seen in the 2000s. 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also an important consideration, and bans on the use of e cigarettes by minors should be actively enforced

E-Cigarette Usage in COVID-19 time

Impact of the COVID-19 pandemic on e-cigarette usage has been the increase in prices due to supply shortfalls. As vaping has become increasingly popular, so too have the demands for e- cigarettes seen its prices rise significantly. Smokers are becoming increasingly dependent on vaping in order to maintain their habit and the increase in price of the necessary consumables has put further strain on their finances. It is also worth mentioning that even though the sale of cigarettes has been restricted, its demand isn't affected much. This can be attributed to the fact that smokers are likely to maintain their habit regardless of prices or restrictions. Though vaping has been endorsed as one of the more healthier alternatives to smoking, it is still highly important to pay heed to safety measures during the COVID-19 pandemic, such as proper social distancing and the wearing of masks. Vaping in particular should be avoided in public places, as the density of air particles, even when using closed device, is much higher than outdoor air, making it contagious. Moreover, the World Health Organization (WHO) has also declared that nicotine based e-cigarettes could have an adverse effect on the lungs and cardiovascular system. All in all, e-cigarettes have seen a great deal of change due to the COVID-19 pandemic. Countries have placed a number of restrictions on the sale and usage of e-cigarettes. Though vaping is seen as a much healthier alternative to traditional cigarettes, it is still not hugely recommended and the WHO has warned against the usage of nicotine based e-cigarettes. As with any other form of smoking, it is highly important for the smokers to pay heed to the safety measures during this time and make sure that they are not putting themselves at risk of contracting the virus.

Side Effects of flavouring

E-cigarettes have been marketed as a healthier alternative to traditional cigarettes, as they do not produce any of the carcinogenic substances found in tobacco smoke. However, there is still much debate over the safety of E-cigarettes, as the long-term health effects are still unknown. One of the main concerns about E-cigarettes is the use of flavouring compounds. These compounds are added to the liquid in the E-cigarette to give it an appealing taste, but they may also have negative health effects.

Flavouring compounds are typically added to E-cigarettes as a way to make the experience more enjoyable for the user. These compounds can be derived from natural sources, such as fruits or spices, or they can be artificially created in a laboratory. Some of the most common flavouring compounds used in E-cigarettes include menthol, vanilla, cherry, and cinnamon..There is some evidence to suggest that the flavouring compounds used in E-cigarettes may have negative health effects. One of the main concerns is that these compounds may be toxic when inhaled. In particular, some studies have found that some flavouring compounds can damage cells in the lungs, and may even cause cancer. Other research has suggested that these compounds may also lead to inflammation and other respiratory issues. In addition to the potential for toxicity, some studies have suggested that the use of flavouring compounds in E-cigarettes may lead to a higher risk of addiction. This is due to the fact that flavouring compounds can increase the pleasure derived from using the device, which may lead to more frequent use. Furthermore, flavouring compounds may also contain nicotine, which can also be addictive. Finally, it has been suggested that the use of flavouring compounds in E-cigarettes may also lead to an increased risk of accidents. This is because the flavouring compounds can make the device more attractive to children, which may lead to them accidentally ingesting the liquid or otherwise coming into contact with the device.

CONCLUSION

The findings of this study demonstrate that there are certain dangers to human health and safety associated with e-cigarette use. Particularly, there is research that suggests nicotine in e-cigarettes may harm young people's developing brains and cardiovascular systems. When vaping, there is also a chance that harmful substances will enter the body. To completely comprehend the long-term impact of e-cigarettes on human health, more investigation is nonetheless required. To ensure that the potential health hazards are as low as possible in the interim, sensible restrictions that restrict the marketing and accessibility of e-cigarettes to children must be put in place.

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